

ReCiPSS

D2.1-Demonstrator baseline and market characteristics report

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List of abbreviations

<i>Abbreviation</i>	<i>Explanation</i>
AAM	Automotive aftermarket
BECE	Backcasting and eco-design for the circular economy
BM	Business model
BMI	Business model innovation
BMC	Business model canvas
BSC	Balanced Scorecard
CE	Circular economy
CBM	Circular business model
CLSC	Closed loop supply chain
CRM	Customer Relationship Management
EoL	End of Life
EoU	End of Use
EMF	Ellen McArthur Foundation
EU	European Union
IaaS	Infrastructure as a service
IAM	Independent Aftermarket
IC	Information and communication
ICT	Information and Communications Technology
IT	Information technology
IoT	Internet of Thing
IS	Information system(s)
LSP	Logistics service provider
OE	Original Equipment
OEM	Original Equipment Manufacturer
OES	Original Equipment Services
PaaS	Platform as a service
PLC	Product life cycle
PPW	Pay per wash
PSS	Product service system
TCO	Total cost of ownership
SaaS	Software as a service
SLR	Systematic literature review
TL	Trade level
UA	User acceptance
UI	User interaction
VP	Value proposition
WP	Work package
2PL	Second Party Logistics Provider
3PL	Third Party Logistics Provider
4PL	Fourth Party Logistics Provider

Executive Summary

The purpose of this deliverable is to define the current baseline and the target/improved circular business models for two demonstrators (task 2.1) and to analyse both demonstrators' markets characteristics and their impact on the target circular business models (task 2.2).

The first demonstrator from the automotive aftermarket is Robert Bosch GmbH or Bosch group (Bosch) as remanufacturing parts supplier and Circular Economy Solutions GmbH (C-ECO) which provides reverse logistics services for remanufacturer in the automotive aftermarket upon the brand of CoremanNet. The main project purpose regarding this demonstrator is to streamline the reverse flows of cores for the remanufacturing business, to improve the information flow related to the cores and to promote circularity of cores via CoremanNet. The second demonstrator is Gorenje Gospodinjski Aparati D.D. (Gorenje) in the case of the white goods industry. The aim of the project is to develop a new circular business model(s) for smart washing machines, specifically for the pay per use business model for end-customer (businesses and organizations) and final consumer enabling three product life cycles.

Deliverable first summarizes existing knowledge of business models, business models innovation and circular business models as well as of the innovative tools that are invented and proposed for the changes, adaptations and transitions of linear business models into the circular ones. Systematic literature review of documented and reported knowledge relevant for both demonstrators was performed in this step.

Second, environmental forces which create and influence the need for the changes and improvements in the current value creation, value delivery and value capture toward circularity are identified for both demonstrators.

Third, the deliverable identifies and proposes the potential and alternative circular business models for both demonstrators. The review of the appropriate and applicable innovative tools for the transition and improvement of the existing models are incorporated into this proposal. Deliverable also provides the preliminary lists of challenges, opportunities, risks and barriers for the alternative models. These factors should be taken into consideration for the detailed development of the models that both demonstrators will pursue in practice during the demonstration.

This document is the result of the initial systematic and state-of-the-art literature review and an initial market analysis and circular business models proposal and provides the input for more in-depth analyses and more detailed CBM development within WP2 (Task 2.3 - *Planning the circular business implementation of the demonstrators*), for the detailed plan of circular business models demonstration within WP3 and WP4 and for the IT platforms development (WP5) as well as for the deployment of solutions by both demonstrators in the form of real testing (WP6 and WP7) and evaluation of circular business models performance in the end of the demonstration (WP2, task 2.4; WP3, task, 3.5; WP6, task 6.7 and WP7, task 7.5).

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1 Introduction

The main objective of WP2 is the development of innovative business models supporting circular manufacturing systems in the context of the two demonstrators. The deliverable D2.1 concentrates on defining the current baseline and the target new circular business model – in case of the White goods demonstrator Gorenje - and the improved existing circular business model – in the case of the demonstrator Bosch. The focus is on drawing a relatively comprehensive picture about the current business approach of both demonstrators and based on the summary of the existing knowledge of circular economy, circular business models and the innovative tools the aim of this deliverable is to outline and justify proposals of suitable circular business models with alternative solutions and suggest the suitable path for the innovation process.

The questions to be answered in this report are as following:

1. What are the forces and factors that stand behind the circular economy and which may bring companies to do their business in a circular way? What forces and what factors might be the opportunities and challenges and what might be the threats and risks for the white goods (washing machines) circular business and for the automotive aftermarket and automotive remanufacturing circular business?
2. What is the purpose, the essence and the components and linkages between components of business models as a system views on doing the sustainable and circular business?
3. What specificities do the existing circular business models have in comparisons with non-circular models and what are the reasons for these specificities (what factors influence their structure and content)?
4. What are the most viable structure and content of the circular business models for both demonstrators? Who are the customers in circular business models? Which other actors play the role of customers in circular business? What are the needs, wants and the characteristics of customers and stakeholders – as customers' segments and what is the "circular value" proposition for them that can satisfy these needs and wants? How can the "circular value" be delivered to the relevant segments? What resources, competencies and capabilities do companies need to be effective and efficient with the circular business models? Who are the key partners for the "circular value creation", value delivery and value capture? What customers and other relevant stakeholders as customers pay for in "circular value – what is the revenue structure? What specific costs and what cost structure does exist with circular business models?
5. What are the innovation processes and the innovative tools, methods as well as strategies, approaches, models, frameworks for the business models transition, improvements or adaptations that can be used in for both demonstrators to make needed steps towards circular economy?

To answer these questions, the following steps are taken:

1. A systematic literature review on circular business models and business models' innovative tools towards circular economy is performed to build the knowledge base.
2. Pilot survey (Gorenje) of consumers from Austria, Denmark, Netherlands and Slovenia (where the demonstration of the pay per wash system will be realized) and pilot in-

circular business models

depth interviews with the automotive aftermarket players in France and Germany (where the demonstration of the cloud platform as the tool for the streamlining the reverse flows will be put in practice) are provided to obtain feedback on circular value propositions for both demonstrators. The insight is used for the optimization of circular product offerings, for specifying customer segments and their market readiness for circular economy and business approaches.

3. External and internal environmental scanning of the markets and market analysis which identifies factors for both demonstrators that might be relevant when modelling circular business is executed. The purpose of market analysis is to evaluate the potential of all 6 markets for circular business models proposed in the project.
4. Current business models of both demonstrators covering problems, challenges, barriers, gaps are described.
5. Building on the existing theoretical and empirical knowledge circular business models are suggested for both demonstrators with the relevant alternatives that correspond with the resources, competencies, capabilities of demonstrators and are in harmony with the market trends. Appropriate innovative tools for the transition and improvement accompanied these models. Models will serve as the frameworks for further development within the work of WP2.3, WP3, WP4, WP5, for the implementation by both demonstrators (WP6 and WP7) and for the evaluation of results (WP2-WP8) during the following phases of the project.

1.1 Document Scope

This report characterizes the existing value proposal, value creation, value delivery and value capture of the:

- a) reverse logistics solution to enhance the needed supply of the cores from the end-customer/consumer to the remanufacturing facilities with the aim to satisfy the demand for remanufactured spare parts and
- b) the traditional linear washing machine business with only limited reverse logistics processes with the rather limited circularity of products, spare parts, raw materials and packaging.

Further, a literature review of the circular business solutions and circular economy potential for the business model innovation is provided in the context of both demonstrators. Together with the market analysis of the automotive aftermarket and reverse logistics in this market as well as of the washing machine and laundering market, circular business models are proposed altering to the existing and potential risks, barriers, challenges and opportunities. Relevant innovative tools, methods, strategies, models, frameworks, approaches that help with the transition and improvements are suggested as well.

1.2 Methodology

The character of the project requires multimethod research. A triangulation research design as one of the multimethod research approaches is recommended by several authors especially in business, management and entrepreneurship research (Bryman and Bell, 2003; Davidsson, 2003; Westhead and Wright, 2000). The main idea of the triangulation is in the enrichment and supplementation of the pieces of findings from the individual approaches. Triangulation enables to reach wider and deeper context and facilitates the interpretation of the relationships

circular business models

between different phenomena and to answer distinct research questions related to the same problem or theme or task (Bryman and Bell, 2003).

We applied all four forms of triangulation proposed by Denzin (1989):

1. Data triangulation, which entails gathering data at different times, from different sources, at different spaces and different situations and from different persons or groups of people (in the context of the project from different stakeholders);
2. Investigator triangulation, which means the use of more than one and different researchers in one or from more fields to gather and interpret data;
3. Theoretical triangulation, which involves the use of multiple theoretical perspectives to the same phenomenon for the process of interpreting data;
4. Methods triangulation, which refers to the use of several and different methods (and techniques).

1.2.1 Literature review

A combination of a *state-of-the-art review* and *systematic literature review* (SLR) was applied for this report.

- a) **The state-of-the-art review** concentrates on more current issues and matters. This type of review “may offer new perspectives on an issue or highlight an area in need of further research” (Grant and Booth, 2009, p. 101). The state-of-the-art review was used for understanding the contextual situation regarding the potential circular business models of both demonstrators. This review relieved the themes we believe are connected to the circular business models running. Figure 1 shows the main keywords that were applied to the state-of-the-art review.

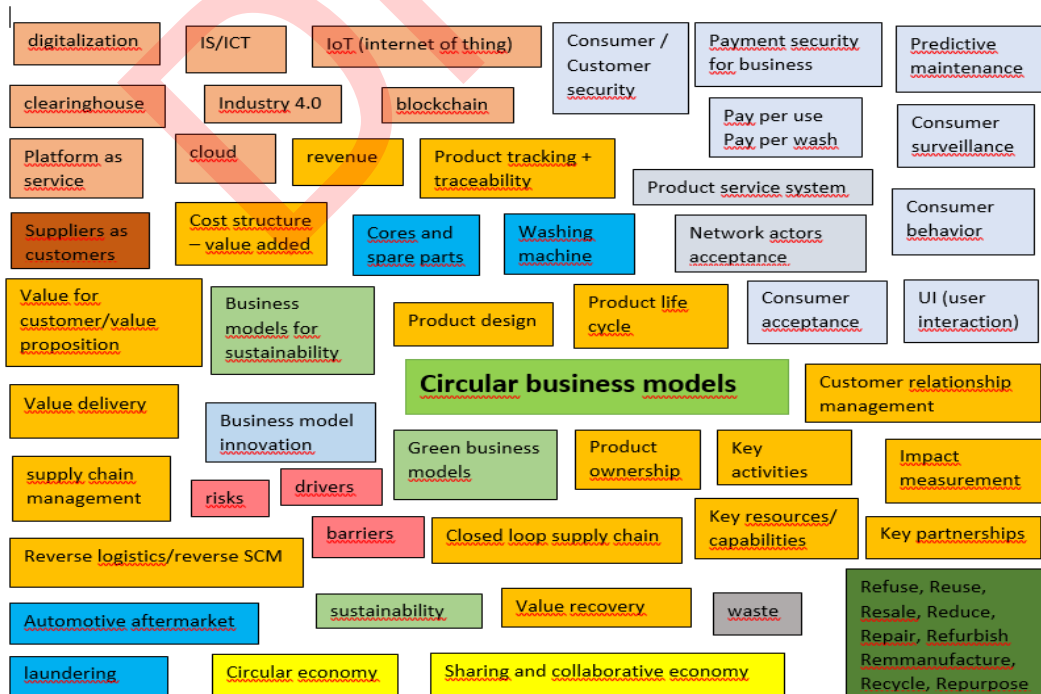


Figure 1: Visualisation of keywords for literature review (authors)

circular business models

b) **Systematic literature review** is, according to Denyer and Tranfield (2009, p. 672), “a specific methodology that locates existing studies, selects and evaluates contributions, analyses and synthesizes data, and reports the evidence in such a way that allows reasonably clear conclusions to be reached about what is and is not known”. SLR comprehensively identifies, appraises, and synthesizes all relevant studies on some specific topic and helps to identify gaps and diversity in current research (Petticrew and Roberts, 2006; Correia et al, 2017). Essentially, SLR aims to synthesize knowledge of multiple original studies.

No unified process for SLR exists – authors differ in the number of steps and in detail content of each step. For this report, based on Correia et al (2017) and Okoli and Schabram (2011) we defined six phases: 1. Formulation of the purpose of the literature review; 2. Formulation of the research questions; 3. Literature search; 4. Evaluation and screening of research; 5. Research analysis and 5. Presentation of results.

There are **two main purposes to do a systematic literature review in relation to the ReCiPSS project** and this deliverable:

- 1. to understand the substance of circular business models and their innovation and**
- 2. to summarize and to evaluate the appropriate tools (methods, strategies, approaches, models, frameworks...) that could be used for the transition (in the case of Gorenje) and improvement (in case of Bosch) of business models to be (more) circular.**

Based on the task 2.1 within WP2 which should be accomplished through SLR following research questions were formulated:

RQ1: What specific features circular business models have in comparison to linear business models?

RQ2: What are the main features of business model innovation in the current literature?

RQ3: What challenges exist within the process of innovation of business models towards circular ones?

RQ4: What innovative tools for the business model change, transition, transformation, adaptation, improvement to become (more) circular are appropriate for both demonstrators within the project?

RQ5: Which synergies and cross-fertilization opportunities can exist across cases of both demonstrators in their circular business models’ innovation processes?

The most often recommended databases – Web of Science and SCOPUS were used for the search of the existing knowledge. For answering the RQ4 also cross-references, Proquest database and review of the first 100 articles in Google Scholar was done to enlarge the scope of potential sources of knowledge.

1.2.2 Environmental scanning and market analysis

Environmental scanning and market analyses enable to understand driving forces which urge companies to make adaptations, changes and/or innovation of their way of doing business as well as in the core of their business logic. Opportunities and threats, challenges, risks, barriers should be detected and evaluated during these processes.

Some trends were found out also from the in-depth interviews with the automotive aftermarket (AAM) companies (see chapter 2.2.4).

circular business models

Environmental scanning and market analyses encompass all levels of the environment as can be seen from Figure 2.

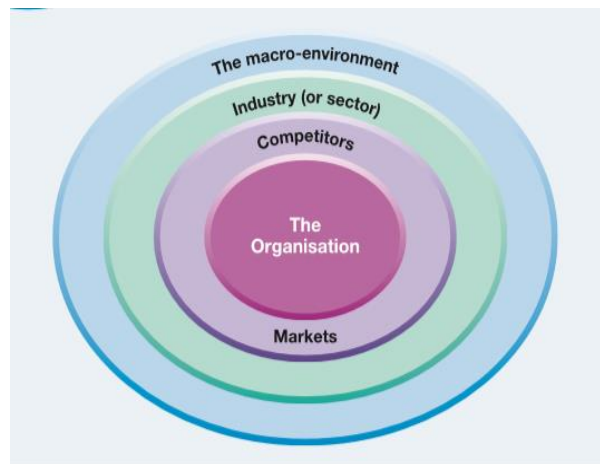


Figure 2: Layers of the business environment (Johnson et al, 2008, p. 54)

1.2.3 Current business models description

For the current business models description, a mix of several methods was used again. All of them can be covered by the umbrella term “qualitative content analysis”. We analysed contents of the transcripts from the on-site visits’ presentations, interviews and discussions with the representatives of both demonstrators served as the key informants (Kumar et al, 1993). Expert interviews were used for the exploration and orientation in the situation researched in the project and for collection of context information helping to gain needed insight (Bogner and Menz, 2002).

Content analysis from the first introductory co-creation workshops realized by TUD Delft during the first on-site visits with both demonstrators was also incorporated into the description of current business models. Finally, content analysis of webpages of demonstrators, their annual reports, market reports, news, and online practitioners’ journals provided needed information as well as existing articles from academic journals. Most information was collected and analysed as part of the environmental scanning (see Chapter 6 and 7).

1.2.4 Pilot surveys, in-depth interviews and co-creation sessions

The most effective way for the needed information and data from the consumer markets, where the demonstration of the pay per wash model should be realized (Austria, Denmark, Netherlands and Slovenia), was to use pilot surveys (also recommended in the project proposal). Online surveys with the use of the questionnaire were realized with the help of professional market and marketing research agency Focus during the end of March and beginning of April 2019. The target sample size for every country was 150 responses (which is higher than recommended for a pilot survey). The questionnaire in five languages versions is available in the Appendix to this report.

The main purpose of the survey was to explore what is the laundering behaviour of consumers, what experience and attitudes do they have with renting, leasing and pay per use models; what is their perception and the attitudes to refurbished products and specially to washing machines. Conjoint analysis (part of the questionnaire) aims to detect potential preferences of various pay per wash options.

circular business models

The questionnaire design (topics and questions wording) was inspired by two sources: the published conceptual and empirical research (Antikainen et al. 2015; Gullstrand Edbring, Lehner, and Mont 2016; Lieder et al. 2018; Collins, Steg, and Koning 2007; Hsu 2014; Jiménez-Parra, Rubio, and Vicente-Molina 2014; Mugge, Jockin, and Bocken 2017; Sweeney and Soutar 2001; Wang and Hazen 2016; Subramanian and Subramanyam 2012) and by the co-creation session conducted within the ReCiPSS project on 10/12/2018 with Slovenian consumers. Technically, the questions were constructed as single and multiple choice, as 3-, 5- and 7-point scales, open-ended questions and one ranking question for conjoint analysis. The missing data were not substituted but were deleted, in particular analyses list- or case-wise.

For the automotive aftermarket in-depth interviews instead of the pilot survey was more appropriate, first due to the higher probability to get informants and secondly, due to the more explorative character of the research problem. Areas of interest and questions were prepared with the very intensive cooperation with the C-ECO team and the involvement of TU Delft. Recruitment of the informants was provided by the market research agency B-inside. Recruitment and in-depth interviews (face to face and telephone) took place during April and beginning of May 2019. From the databases with 120 companies in Germany and 120 companies in France (divided into the three categories – IAM distributors, buying groups and garages) 11 interviews in Germany and 11 in France were realized and the results are used for the content of this report.

The content analysis of surveys and interviews focused on behaviour and practices and reasons for such behaviour and practices and for defining gains and pains, needs and wants, awareness, attitudes and perceived risks of:

- a) consumers with current laundering practices, with the pay per wash model and refurbished washing machine; and
- b) independent automotive aftermarket distributors and garages (workshops) with current reverse logistics processes and information system as well as deposit (surcharge) system for cores. With these actors also their awareness and perception of trends and experience and attitudes to cloud-based information management of the forward and reverse logistics processes were discussed.

Findings from the content analysis of the co-creation sessions with the consumers for the Gorenje case which were organized by TU Delft in Netherlands and Slovenia in October and November 2019 also represent the part of empirical research needed for the project.

The results of all content analyses and from the pilot surveys were used to develop circular business models for both demonstrators and especially for formulating value propositions.

1.2.5 Circular business model development

Circular business models have been developed using a combination of the general methodology of Wirtz (2011), “business model canvas” (BMC) approach and inspiring ideas from “The IoT Business Model Builder” (Bilgeri et al, 2015).

Wirtz suggests going through 4 steps of business model design process – idea generation, feasibility study, prototyping and decision making.

Wirtz’s methodology was combined with the Zott and Amitt (2009, p. 7) proposed Activity system design framework (see Figure 3).

Framework provides insight by:	
	Giving business model design <i>a language, concepts and tools</i>
	Highlighting business model design <i>a key managerial/entrepreneurial task</i>
	Emphasizing <i>system-level design</i> over partial optimization
Design elements	
Content	<i>What</i> activities should be performed?
Structure	<i>How</i> should they be linked and sequenced?
Governance	<i>Who</i> should perform them, and <i>Where</i> ?
Design themes	
Novelty	Adopt <i>innovative content, structure or governance</i>
Lock-In	<i>Build in elements to retain business model stakeholders, e.g. customers</i>
Complementarities	<i>Bundle activities</i> to generate more value
Efficiency	<i>Reorganize activities to reduce transaction costs</i>

Figure 3: Activity system design framework

As this deliverable is created in the very first phase of the whole project schedule, step 2 of business model design process – feasibility study – covers only part of the first two substeps – analysis of the existing markets and assessment of the potential. Complex outputs of the step 2 and 3 are dependent on the results of further work of WP2, WP3, WP4, decision making of WP6 and WP7 and work of WP5. Final step 4 - decision making will be the result of whole ReCiPSS project.

In the **idea generation phase**, several creativity techniques were used to generate a multitude of proposals for every strategic component of the potential circular business models for both demonstrators. Knowledge from the literature review was combined with the outputs from applying these techniques and based on the rough features of the models' orientations and the first rough concept have been determined and developed (Wirtz, 2011).

Brainstorming meetings were organized for every individual component of circular business models with the purpose to generate as many ideas for the forms and contents of every component as possible. Brainstorming was complemented with the *synectics technique* with the aim to generate also unconventional business model ideas by employing personal, fantasy and direct analogies (Wilson et al, 1973). Synectics was used in this initial work only in a non-systematic way for washing machine value proposition understanding. The results help to design alternative circular business models/alternative components of business models probably not feasible to deploy in the near future, but with some potential for the next decades (Wirtz, 2011).

For the feasibility analysis phase findings from the Environmental scanning (see Chapter 2.2.2) and both literature reviews (on business models and their innovation and on circular business models and innovative tools) were employed. Basic conditions as well as the trends of the environment which shape and will shape the circular business models and their individual components - especially customer and market component - were determined.

Components and the core logic (architecture) from the business model canvas (see also Chapter 3.1) and its variants and adaptations (proposed in the academic literature and practice for sustainability-focused and circular business models) were used for the circular business models development.

1.2.6 Document Structure

The document is divided into 9 parts (without the Introduction and Discussion and conclusions. Chapter 2 contain the introduction and methodology to several researches and analyses realized during the 1st year of the project duration. Chapter 3 and Chapter 4 summarize the background of literature on business models and a systematic literature review on business models innovation. Chapter 5 presents results of a systematic literature review on circular business models and innovative tools for the transition from the traditional linear or less developed circular business models towards (more) circular ones. Findings from the environmental scanning and market analyses as well as from the in-depth interviews and online surveys for both demonstrators are provided. Chapter 8 describes current business models of Bosch and C-ECO's cores market and of Gorenje's washing machine market. Chapter 9 brings proposals of circular business models focusing mainly on the target approaches of both demonstrators defined in the ReCiPSS project proposal and recaps risks, barriers, challenges and opportunities connected to the proposed business models. The suitable tools (methods, strategies, frameworks, model etc.) for the innovative steps toward circularity in business models are part of this chapter.

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2 Literature review – business models and business model innovation

This section summarises basic knowledge of the business models concept and the role and process of business models innovation.

2.1 Business models

The business model (BM) concept appeared in the late 1960s but only gained momentum in the 1990s (Demil & Lecocq 2010) when it started to diffuse among management scholars, namely in the areas of innovation and entrepreneurship studies. This upsurge is related to the emergence of new opportunities and challenges for value creation and capture linked to the digital transformation (e.g. e-commerce) (Wirtz et al. 2016). Figure 4 shows the growth of academic publications using the concept (Scopus database, 10/11/2018. Search query: TITLE-ABS-KEY ("business model") AND (EXCLUDE (PUBYEAR, 2019)).

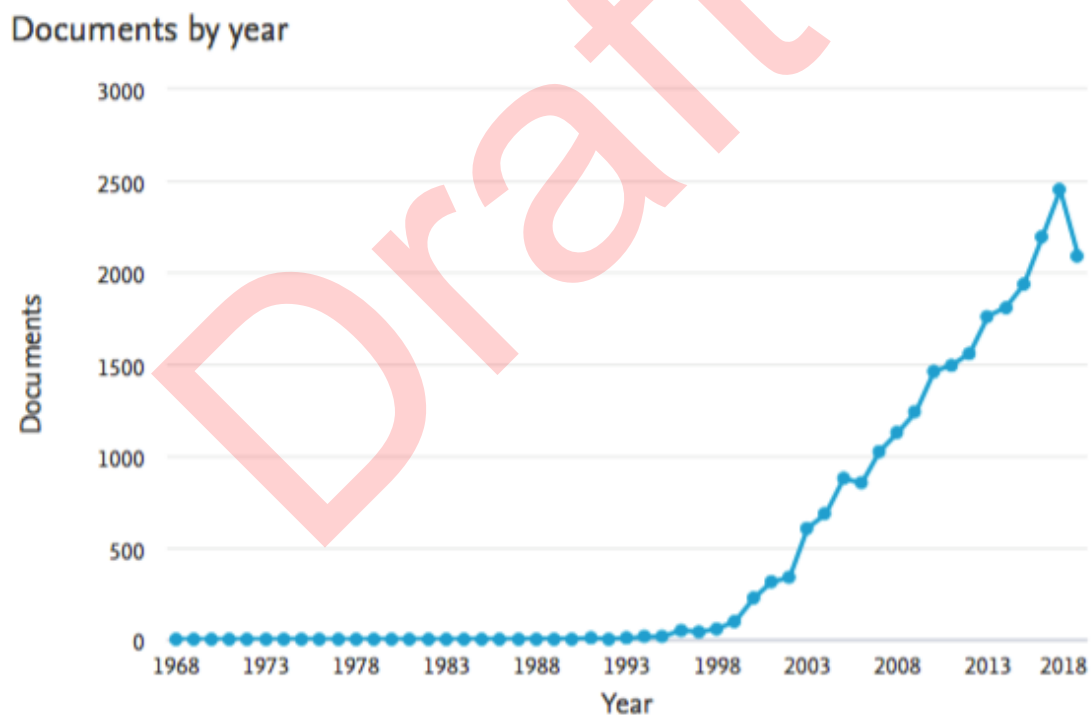


Figure 4: Number of publications on Business Models in Scopus Indexed

Despite the proliferation of research on business models, there is still no agreement on what a business model really is (Arend 2013; Casadeus-Masanell and Ricart 2010; DaSilva and Trkman 2014; Demil & Lecocq 2010; Morris et al. 2005; Osterwalder et al. 2005; Zott et al. 2011). The conceptual diversity can be problematic since the concept is not always used in a coherent way and sometimes is used as a synonym for terms like ‘business idea’ or ‘revenue model’ (Wirtz et al 2016)

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This means that there are many definitions of business models. For instance, Seidel et al (2017, p. 150) define business model *“as a structured, simplified and intelligible representation of how a company buys and sells goods or services and, in that process, earns money”*. Demil and Lecocq (2010, p. 227) define business model as the concept that *“refers to the description of the articulation between different BM components or ‘building blocks’ to produce a proposition that can generate value for consumers and thus for the organization”*.

Wirtz (2011, p. 13) sees a business model to be *“the comprehensive description of entrepreneurial activity in aggregated form”*. Wirtz also adds some roles or purposes of business models – more are introduced further in the text: *“business models enable a manager to focus on the essential aspects of his responsibility. Due to the reduction of complexity and the resulting focus on relevant information, the quality of decision-making can be enhanced, which allows for more well-founded strategic and operating decisions”* (p. 16).

Margretta (2002, p. 89) states that *“...a good business model answers Peter Ducker’s age-old questions: Who is the customer? And what does the customer value? It also answers the fundamental questions every manager must ask: How do we make money in this business? What is the underlying economic logic that explains how we can deliver value to customers at an appropriate cost?”*

“A business model describes the design or architecture of the value creation, delivery and capture mechanisms employed. The essence of a business model is that it crystallizes customer needs and ability to pay, defines the manner by which the business enterprise responds to and delivers value to customers, entices customers to pay for value, and converts those payments to profit through the proper design and operation of the various elements of the value chain. Put differently, a business model reflects management’s hypothesis about what customers want, how they want it and what they will pay, and how an enterprise can organize to best meet customer needs and get paid well for doing so.” (Teece, 2010, p. 191).

Amit and Zott (2001, p. 513) conclude that *“A business model depicts the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities.”*

According to Osterwalder et al (2005, p. 17-18) a business model is a conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value and relationship capital, to generate profitable and sustainable revenue streams.

Business models have different functions and so they can be used for different purposes. Based on Osterwalder (2004), Osterwalder et al (2005), Wirtz (2011) and Sarasini and Linder (2018, p. 15) we summarize them into the following categories:

- understanding and sharing – they can help to capture, visualize, understand, communicate and share the business logic or the key mechanics of an existing business;
- to describe some company-level activities, focusing on the creation and distribution of value;
- to link firm-level activities with market outcomes;
- analysing – they can help to analyse the business logic of a company, improve measuring, tracking, observing, and comparing the business logic of a company with

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other companies (or other business logic of the same company if different business models are pursued). In that case business models can be used as a new unit of analysis.

- managing – they can help to design, plan processes to follow business logic, help to manage modifying, changing or innovation and implementation of business models. This can also improve the alignment of strategy, business organization and technology.
- prospects – they can serve as the basis for innovation routes, for improving the current business structure and operations, for testing and also for stock (prepared for the potential future use);
- patenting of business models – however, business models used to be very individual solutions and patenting is not very frequent;
- to identify outsourcing opportunities – business models enable to define which processes and activities should be internalized and which are possible and more efficient to externalize.

The distinction between a strategy and a business model should be understood as business models describe what and strategies help to answer how to achieve the “what”. Teece (2010, p. 179) states that a “*business model is more generic than a business strategy*”. He also adds that to protect competitive advantage resulting from new business model design coupling strategy and business model analysis is needed. Business models are seen to bridge the gap between strategy (the positioning, objectives and goals of the company) and business processes (involving the understanding and implementation of strategic information (Osterwalder and Pigneur, 2002, p.77).

Business models should work on business level as a complex; however, they do not exist in a vacuum. Particularly in bigger organization, several business models co-exist sometimes and should be in harmony with others. Their success and sustainability is dependent both on action programs or tactics (or operations) across the whole organization and on networks created by relationships (Wirtz, 2011).

Teece (2010, p. 180) stresses that strategy analysis is an essential step in designing a competitively sustainable business model. For a circular business model, some of his comments are important. He **alerts on the easiness of replicability of some “observable” characteristics of business model, for instance, leasing vs owning**. This is why figuring out and implementing “isolating mechanisms” (e.g. patents, trade secrets, rapid scaling to secure large market share and cost advantages) that can hinder or block imitations by competitors and disintermediation by customer and suppliers. The last example of the isolating mechanism could be problematic because of the low predictability of sustainable success of new model.

Summarizing the above-mentioned information, despite the conceptual diversity, there seems to be a consensus on the fact that business models are related to the articulation between different activities designed to produce value (and proposition of value to customers) and to capture that value.

According to Demil and Lecocq (2010), two approaches to business models can be found in the BM literature: a static and a dynamic one. The first approach deals with the description of the way the company generates value, helping the managers to set a coherent system. The second approach has a transformational nature, where the BM is understood as a tool to address change and to promote innovation both at the level of the company and at the level of the BM itself. The concept of BM innovation relates to this second approach.

In this study, to design the business models for the two demonstrators, we adopt the framework

circular business models

developed by Osterwalder and Pigneur (2010). The authors introduce a framework to design BM, which they call ‘canvas’ (see Figure 5, Osterwalder et al, 2014, p. 19), based on the nine building blocks: customer segments, value propositions, channels, customers’ relationships, revenue stream, key resources, key activities, key partnerships and cost structure. This framework has been widely used by academics and practitioners both in management and in sustainability/circular economy literature as a tool to design, redesign, innovate or develop a new BM.

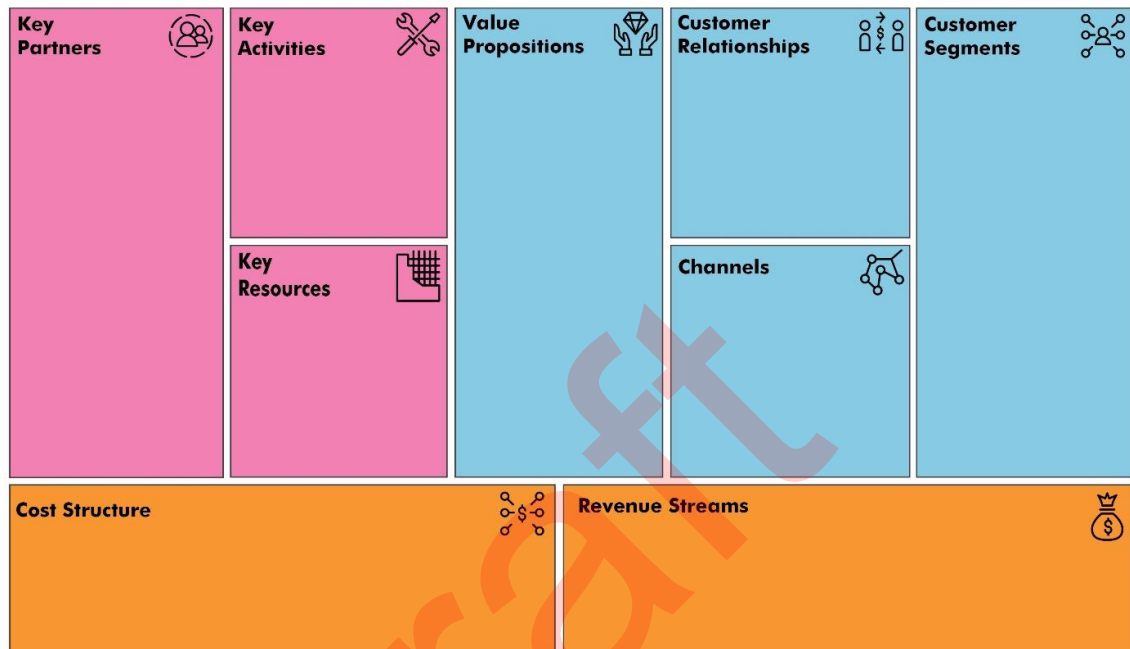


Figure 5: Business model canvas

2.2 Business models innovation and the transition to sustainable societies through circular economy

In business model (BM) innovation the focus is on new BMs or on the transformation of existing ones. BM innovation is considered an important source of firm’s competitive advantage (Spieth et al. 2014). Recently, it is also pointed as a fundamental aspect in a transition to a more sustainable society. The transformation in businesses, and therefore in BM, is considered as a big challenge for companies, as there are many drivers and obstacles to the implementation of a circular economy at the company and value chain and network level (R2π, 2018; Lewandowski 2016). This idea started in the practitioners’ arena (e.g. EMF & McKinsey 2012; EMF & McKinsey 2013; EMF, McKinsey & SUN 2015) but the evolution of the number of publications, shows that sustainable/ circular BM are becoming a popular topic of research among academics. However, in the CE literature, BMs are still insufficiently investigated (Antikainen & Valkokari 2016; Blomsma & Brennan 2017; Lewandowski 2016; Lieder & Rashid 2016).

The following systematic literature review should give an overview of the main features of business model innovation. These features represent the core of management thinking and managerial processes in the attempt to make any changes or transition from the existing way of doing business, and therefore the awareness of them can help open the space for new ideas and activities.

2.3 Business models innovation – systematic literature review

In terms of research, BMI is still in its infancy (Hossain 2017) and the literature on BMI lacks well-established definitions, proper constructs, and a theoretical foundation (Bock et al., 2012). This is intrinsically linked to lack of a clear concept of business model (Arend 2013; Casadeus-Masanell and Ricart 2010; DaSilva and Trkman 2014; Demil & Lecocq 2010; Morris et al. 2005; Osterwalder et al. 2005; Zott et al. 2011).

This chapter presents a systematic literature review of the studies on BMI, with the aim of mapping the extant research on the topic. The search was conducted in two bibliographic databases – SCOPUS and Web of Science in the 1st of March 2019. The table presents the procedures adopted in the SLR.

Step	Decision	Comment / Result
Selection of the database	SCOPUS Web of Science	databases containing journals that are generally highly regarded by the academic community; a large number of sources, providing broad coverage of the academic literature
Keyword search SCOPUS	Search query: TITLE-ABS-KEY("business model innovation" OR ("business model" AND innovation))	N = 1096
Keyword search Web of Science (all databases)	TOPIC (("business model innovation" OR ("business model" AND innovation))	N = 818
Inclusion criteria	Document type = Article OR Article in Press (including Language = English	SCOPUS: N = 581 Web of Science: N = 439
Database integration	Exclusion of duplicates (documents that are in both databases)	N = 652
First scanning through title, abstract and keyword reading	Exclude 134papers because they were out of scope: - did not meet the research criteria, as containing the words "business model" or "innovation" within the title, abstract and keywords; - BMI was not dealt in a fundamental way (i.e. that mention the concept but not use it) - they are discussing entrepreneurial universities or business education.	N = 518

Access check	14 articles were excluded because full text was not available	N = 504

Table 1: Systematic literature review procedure

The 504 articles were uploaded to Atlas.ti for thematic analysis. On Atlas.ti, through detailed reading, the main body of each article and key information was coded. The coding procedure was guided by the analytical dimensions and categories presented in Table 2. Additionally, each study was classified in terms of its method and empirical context.

Table 2. Dimensions and categories used for the coding process in the systematic literature review

Dimension	Categories	Subcategories
Emergence of BMI concept	BMI Definitions BMI types	
Drivers	Technological Competitive pressure Sustainability pressure Demands of stakeholders	
Processes of BMI	Barriers/facilitators Capabilities Leadership Learning Tools to manage the process	
Innovative BM	Scope Degree of novelty/change Context	Architecture Component Industry, market, company, the existing business/incumbent, new venture)
Outcomes and consequences	Industry level Firm – financial performance Firm – capabilities (e.g. strategic flexibility)	

Table 2: Dimensions and categories used for the coding process in the systematic literature review

1. The emergence of BMI concept

BMI literature lacks a construct clarity (Suddaby, 2010). The existence of multiple BMI definitions (some examples are provided in Table 3) hampers the operationalization and measurement of the empirical application of business model innovation processes and their outcomes (Foss and Saebi, 2017).

Authors	Definition	Citations*
Markides (2006:20)	“Business model innovation is the discovery of a fundamentally different business model in an existing business.”	100
Teece (2010:173)	“Business model innovation can itself be a pathway to competitive advantage if the model is sufficiently differentiated and hard to replicate for incumbents and new entrants alike.”	1838
Yunus et al. (2010: 312)	“Business model innovation is about generating new sources of profit by finding novel value proposition/value constellation combinations.”	357
Amit and Zott (2012: 36)	“BMI can consist of adding new activities, linking activities in a new way or changing which party performs an activity”.	251
Bucherer et al. (2012:184)	“process that deliberately changes the core elements of a firm and its business logic.”	90
Casadesus-Masanell and Zhu (2013: 464)	“search for new logic of the firm and new ways to create and capture value for its stakeholders; it focuses primarily on finding new ways to generate revenues and define value propositions for customers, suppliers, and partners.”	163

*Number of citations in the SCOPUS or WoS database (1st March 2019)

Table 3: Some definitions of BMI

It is possible to classify BMI according to its forms and types. Amit and Zott (2012) propose three basic forms of BMI: (1) adding new activities to an existing business model, (2) organizing activities in novel ways, and (3) changing some parties that perform the activities. Koen et al. (2011) propose three types of BMI: technology, value network, and financial hurdle. Hwang and Christensen (2008) categorize BMI into three broad categories: solution shops, value-adding business processes, and facilitated user networks.

2. Drivers

New technologies are mentioned as the BMI drivers, by some scholars, since they facilitate the emergence of new business models (Hossain, 2017) and create opportunities for firms to consider new business models (Mezger, 2014).

Internet and digitalization have disrupted many previously successful, long-standing business models (Holm et al., 2013) and led to new types of BM (Karimi and Walter, 2016). The reasons for the relevance of ICT for BMI as a driver include the fact that these technologies change the way companies, users, customers, and other stakeholders interact (Aagaard and Lindgren, 2015), the data gathering opportunities (Chandy et al, 2018; Trabucchi et al, 2018).

Some of the ICT technologies deserving the attention of scholars are cloud computing (Berman et al., 2012; Gorrell, 2012; Khanagha et al, 2014), social media (Bouwman, Nikou et al 2018) and big data (Bouwman, Nikou et al 2018; Cheah and Wang, 2017; Chandy et al, 2018; Trabucchi et al, 2018).

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Studies also stress the role of 3D printing technologies in promoting BMI, by enabling rapid prototyping and improve the value proposition by better products and personalized consumption experience (Flammini et al, 2017; Holzmann et al, 2017; Jia et al, 2016; Rayna and Striukova, 2016b).

But not all changes in the firms' environment are technological. Market, sustainability and social factors are also mentioned in the literature.

The fast change of market environments increases the obsolescence of existing BM and drives the need for continuous BMI, to outperform the competition (Mitchell and Coles, 2003) and achieve long-term success (Sosna et al., 2010). Scholars stress the role of competitive pressure and hyper-competition (Krishnamoorthy and Damle, 2017; Michalski, 2003; Sosna et al 2010), globalization (Ludviga, 2013; Taran et al, 2015) and increased customer expectations (Sorescu et al, 2011).

Sustainability is increasingly considered as a BMI driver. Climate change, resource depletion and energy transition have substantial impacts on existing BM (Gorissen et al., 2016). Moreover, new BM is needed to promote sustainable development (Baldassarre et al 2017).

Some sustainability factors that are stressed as BMI drivers are: need to optimize material and energy (Bocken et al., 2014); the need to change consumption patterns (Bocken, 2017); the need to align with users' desire for a lower environmental impact (Girontra and Netessine, 2013).

Finally, some studies also mention the role of social needs in stimulating BMI (Alegre and Berbegal-Mirabent, 2016).

3. Process of BMI and resources and activities

Scholars stress the fact that BMI that involves steps, resources and activities. Sinfield et al. (2011) propose that new BMI can be explored by conducting three sequential steps: creating a template for the study of alternative answers to key BM questions, using that template to find alternative approaches to value creation, and determining what will remain unchanged and what needs to be changed in the business model.

Capabilities

In process of BMI the existence of needed **capabilities** as resources are central. Scholars stress specifically the interlinking between dynamic capabilities and BMI (Li et al, 2008; Roaldsen, 2014; Schoemaker et al, 2018; Teece, 2018; Vicente et al, 2018; Wathan and Abi, 2017). Mezger (2014) sees BMI as a distinct **dynamic capability**, related to the capacity to sense opportunities, seize them through the development of valuable and inimitable BM and consequently reconfigure the firms' competencies and resources. Nair et al. (2013) argue that **the firm's ability to understand, manage, and measure its core competencies** is pivotal to BMI success.

Bucherer et al. (2012) argue that BMI is not a static system but rather a dynamic one, demanding constant adjustments to react to both internal and external changes. Since BMI is a dynamic process, the firm's disposition and capability to modify its business model has a positive effect on BMI success (Cucculelli et al., 2014; Cucculelli and Bettinelli, 2015). In this process, strategic flexibility/agility becomes of utmost importance (Arbussa et al, 2017; Bock et al, 2012; Liao et al, 2018; Schneide and Spieth, 2014).

Experimentation is also considered as an important capability in BMI since it allows to learn and improve BMI activities and to create external and internal engagement (Bocken et al., 2018). Its role has been especially stressed in the context of sustainable BMI (Bocken et al., 2018, 2019).

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Also, in the context of sustainable BMI, Inigo et al (2017) study the role of several organisational and managerial capabilities related to sensing, seizing and reconfiguring for BMI.

Bouncken et al, (2016) highlight the role of entrepreneurial orientation (EO) and modularity as triggers of BMI;

Leadership

The literature also shows that leadership plays a major role in BMI (Schoemaker et al, 2018). Chesbrough (2010) claims that leadership of organizational change must be necessary to overcome barriers (obstruction and confusion) that emerge in BMI. Guo et al. (2013) demonstrate how the human and social capital of top managers can shape BMI. Liao et al (2018) conclude that distributed leadership has a significant direct and indirect (by enhancing strategic flexibility) influence on BMI.

Learning

Scholars also stress **the importance of learning processes** as a source of BMI (Andries and Debackere, 2013; Eppler et al., 2011; Sosna et al., 2010;), often relating them to experimentation and to trial and error processes.

It is claimed that the learning approaches used by firms in BMI change over time. Andries & Debackere (2013) show that, under conditions of uncertainty, firms develop new business models through commitment, incremental experimentation, or radical experimentation; firms need to change their learning approach over time in order to successfully renew their business model. Berends et al (2016) distinguish two patterns that can result in radical BMI: “drifting” and “leaping”. The first starts with a focus on experiential learning and shifts later to cognitive search, while the second starts with an emphasis on cognitive search and shifts later to experiential learning.

4. Innovative BM

Scope

Some scholars consider that changing one of the BM components can be enough to achieve BMI (Amit and Zott, 2012; Bock et al., 2012; Schneider and Spieth, 2013). Another way to conceptualize BMI is through the change of multiple business model elements simultaneously (Frankenberger et al., 2013; Sorescu et al., 2011; Wahyono, 2018). Other scholars go further and consider BMI as an entirely novel combination of all BM components and their interactions (Velamuri et al, 2013; Yanus et al, 2010).

This last view is related to the independence of the BM building blocks: changing one element will not only impact other elements but also the interactions between these elements. According to Zott and Amit (2010), innovative business models can be developed through linking activities in a novel way that generates more value. However, the extant literature provides few insights on how to change multiple BM components simultaneously (Wahyono, 2018) and on the interdependences among components in the BMI process (Sorescu et al, 2011).

Most studies focus on value creation (Wahyono, 2018), namely on the value proposition, which is seen as its core element. (Landau et al 2016). However, capturing value is also detrimental for the BMI, namely through formal and informal protection strategies (Bonakdar et al 2017).

Degree of novelty/change

Related to the previous topic, some scholars contend that BMI can be framed as an evolutionary process of incremental changes to some elements of the BM (Amit and Zott, 2012; Landau et

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al., 2016; Velu, 2016). Others argue that BMI results from revolutionary processes that replace the existing BM (Bock et al., 2012). Witell and Löfgren (2013) identify **three degrees of BMI: (1) change in the business model, (2) incremental BMI, and (3) radical BMI.**

Some scholars stress the fact that companies can use more than one BM simultaneously, or even engage in multiple BMI processes. Khanagha et al (2014) advocate that in the BMI process companies have several strategic options related to the implementation of the new BM, ranging from the incremental evolution and transformation to complete replacement of the existing business model. If the company opts to manage the two BM (existing and new) at the same time Markides (2013) points to the existence of three options: to create a separate business unit; to integrate the two business models from the beginning, or to integrate the second business model after a certain period. Flammini et al. (2017) conclude that, in a situation of co-existence of BM, if a company needs to choose one of them it may prefer the most familiar one, particularly if it faces high uncertainty.

Context

Some studies stress that market differences can affect BMI. They contend that BMI differs in emerging markets when compared to developed countries. Examples of studies focusing on emerging/low-income/base-of-the-pyramid markets include: Abraham (2012); Sánchez and Ricart (2010); Yunus et al., 2010; Gebauer et al 2017a,b,c).

Another important factor that can affect BMI is the nature of the company, namely if it is an incumbent or a new venture. Bohnsack et al. (2014) argue that incumbents and entrepreneurs consider BMI in distinct ways, but over time, their business models ultimately converge. Kim and Min (2015) explore how incumbent firms react to the emergence of a disruptive business model by integrating the new business model into their existing one.

5. Outcomes and consequences

BMI is positively related to firm performance (Bouwman, Nikou et al 2018; Cucculelli and Bettinelli, 2015; Giesen et al., 2010; Huang et al., 2013; Huang et al. 2012; Kastalli et al. 2013). Financial value capture can be measured using several indicators, with return on equity being commonly used (Bouncken and Fredrich, 2016).

Authors also stress that having a novel BMI is not enough for a firm to make profits. Value capture issues are relevant: intellectual property protection and complementary assets management may play a crucial role in a profitable BMI (Desyllas and Sako, 2013). Entry timing can also play a role in the success of BMI (Park 2011)

3 State of the art review – circular business model

3.1 Circular economy and circular business models - introduction

Just a few years ago, interest of practitioners, academics, politicians, and individuals has begun to grow rapidly about what is hidden in, how can be the “what” captured in real and what is not and why as regards the concept of circular economy (CE) (Homrich et al, 2018). Despite the fact that the basic ideas of CE can be found in several schools of thoughts (Ghisellini et al, 2016) and the idea behind a circular economy has existed for a long time (Murray et al, 2017), which can be tracked even to the prehistoric era (Park and Chertow, 2014), only recently some forces push more and more business to turn the attention and intensify the effort of being “less linear” (Lieder and Rashid, 2016).

The prevailing perception of CE is to become a better alternative to the dominant economic development model, so-called “take, make and dispose” (Ghisellini et al, 2016). It means that the CE approach does not reject or does not keep down the strategy of a (economy, business...) development, only the understanding of how sustainable development can be achieved and for the gains and pains of which parties, has started to change. So, the space around the sustainability continues to expand.

There are many conceptions of circular economy and no commonly agreed definition exists yet (Kirchherr et al, 2017). European Commission, who is a big promoter and booster of circular economy in practice, states that *“In a circular economy the value of products and materials is maintained for as long as possible; waste and resource use are minimized, and resources are kept within the economy when a product has reached the end of its life, to be used again and again to create further value”* (EC, 2015, p. 1).

According to Geissdoerfer et al (2018a, p. 712) CE *“is based on the idea of putting private business into the service of the transition to a more sustainable system”*. System view is also stressed by Merli et al (2018) who are of the opinion that CE *“proposes a circular system in which the value of products, materials and resources is maintained in the economy as long as possible”* (p. 703). Camacho-Otero et al (2018, p. 1) state that a circular economy *“aims at decoupling value creation from waste generation and resource use by radically transforming production and consumption systems”*.

The circular economy is viewed as a “business’ business” and is predominantly concentrated on ways how to operationalize implementation of sustainability issues at an environmental, economic and social level (Merli et al, 2017). This is obvious from the definition of one of the leading advocates and protagonists of the circular economy, Ellen McArthur Foundation (EMF, 2013, p. 14): *“A circular economy is an industrial system that is restorative or regenerative by intention and design....”* It replaces the end-of-life concept of a product with one that emphasizes reuse, repair, remanufacturing or recycling *“through the superior design of materials, products, systems and business models”*.

However, CE is not only a “business business”. Such view is inherited for instance in the comprehensive definition formulated by Kirchherr et al (2017, pp. 224-225): *“A circular economy describes an economic system that is based on business models which replace the ‘end-of-life’ concept with reducing, alternatively reusing, recycling and recovering materials in*

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production/distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations.”

For the term “circle” also a “loop” is sometimes used as a synonym. Stahel (1994) states that there are basically two kinds of loops that differ fundamentally with regard to their feasibility, hence to understand this is extremely important for decision making which circular strategy to follow. First is “reuse of products”, which “means an extension of the utilization period of goods, through the design of long-life goods; the introduction of service loops to extend an existing product's life, including reuse of the product itself, repair, reconditioning, and technical upgrading; and a combination of these. The result of the reuse of goods is a slowdown of the flow of materials from production to recycling” (p. 179). Second is recycling of materials, which “means simply closing the loop between posture waste (supply) and production (resource demand)” (p. 179).

Stahel (1993) explains the essence of **five key principles of circular economy** (which he labels to be about stock optimization (stock as a wealth in the form of manufactured products, health, education and skills) (p. 3). Those principles are:

1. The smaller the loop (activity-wise and geographically) the more profitable a resource efficient it is – where activity-wise means: “don't repair what is not broken, don't remanufacture what can be repaired and don't recycle what can be remanufactured); Stahel in this point also criticises global recycling business;
2. Loops have no beginning and no end – which replaced the value-added concept of the linear economy;
3. The speed of the circular flows is crucial: the efficiency of managing stock in the circular economy increases with a decreasing flow speed; this principle is extremely important for product design – quality of design itself and quality of material and component which influence how many times product can be “circled” in one level of the recovery options hierarchy (from resell to incineration);
4. Continued ownership is cost-efficient: reuse, repair and remanufacture without a change of ownership save double transaction costs;
5. A circular economy needs a functioning market.....services are needed.

However, for instance, Daly (1977) argues that due to the entropy law for an economic system it is impossible to be fully circular with products and energy turning back to raw materials forever.

Lewandowski (2016, p. 5) summarizes **other key principles of circular economy**:

- (1) Design out waste/Design for reuse
- (2) Build resilience through diversity
- (3) Rely on energy from renewable sources
- (4) Think in systems
- (5) Waste is food/Think in cascades/Share values (symbiosis)

Another key principle of a circular economy is to drive system-wide change (Webster, 2017 in Wastling et al, 2018).

The Ellen McArthur Foundation (EMF, 2015) defines the **following three principles** (p. 22):



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- **Preserve and enhance natural capital** by controlling finite stocks and balancing renewable resource flows—for example, replacing fossil fuels with renewable energy or using the maximum sustainable yield method to preserve fish stocks.
- **Optimise resource yields by circulating products, components, and materials at the highest utility at all times in both technical and biological cycles** – for example, sharing or looping products and extending product lifetimes.
- **Foster system effectiveness by revealing and designing out negative externalities**, such as water, air, soil, and noise pollution; climate change; toxins; congestion; and **negative health effects related to resource use**.

Based on these principles EMF proposed the **ReSOLVE Framework** containing **six business actions**, which can be understood as a tool for generating circular strategies and growth initiatives (pp. 22-23):

REgenerate - shift to renewable energy and materials; reclaim, retain, and regenerate the health of ecosystems and return recovered biological resources to the biosphere;

Share - keep product loop speed low and maximise utilisation of products, by sharing them among different users (peer-to-peer sharing of privately-owned products or public sharing of a pool of products), by reusing them through their entire technical lifetime (second hand), and by prolonging their lifetime through maintenance, repair, and design for durability.

Optimise - increase performance/efficiency of a product; remove waste in production and supply chain (from sourcing and logistics to production, use phase, end-of-use collection etc.); leverage big data, automation, remote sensing and steering. All these actions are implemented without changes to the actual product or technology.

Loop - keep components and materials in closed loops and prioritise inner loops. For finite materials, it means remanufacturing products or components and recycling materials. For renewable materials, it means anaerobic digestion and extracting biochemicals from organic waste.

Virtualise - dematerialise resource use by delivering utility virtually: directly or indirectly.

Exchange - replace old with advanced non-renewable materials, apply new technologies and choose new products/services.

Four distinct ways how to create value in circular business models are identified by EMF (2013) in the conceptualization of different powers:

- Power of the inner circle
- Power of circling longer
- Power of cascaded use
- Power of pure circles

Hierarchy of “powers” reflects both the challenge for the companies to be overcome, the need for new resources and reengineering, innovation in relationships and partners’ network as well as the redesign of value creation, delivery and capture the logic and of course also the level or extent of circularity.

Bocken et al (2016) based on Stahel (1994) distinguish three strategies towards the cycling of resources:

(1) **Slowing resource loops** (design of long-life goods and product-life extension (i.e. through maintenance, repair, share, reuse, upgrade, refurbishing and remanufacturing) In this strategy following design options are included in: **design for attachment and trust; design for reliability**

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and durability, design for product-life extension, design for ease of maintenance and repair, design for upgradability and adaptability, design for standardization and compatibility and design for dis- and reassembly.

(2) **Closing resource loops through recycling.** Within this strategy only three design options are offered: **design for a technological cycle, design for a biological cycle and design for dis- and reassembly;**

(3) **Resource efficiency or narrowing resource flows through using fewer resources per product and** by reducing the amounts of materials and components in the manufacturing system - this strategy is considered by authors not to be applicable for circular economy. However, we can argue that – from the resources list point of view to manufacture a tangible product – companies can spend less time, effort and costs and spare them for other cycling processes. This strategy could be used in combination with some of the above-mentioned ones.

Six business model strategies for the two above mentioned strategies (slowing and closing the loops) were proposed by the authors - it means no full business model, only strategic directions or the main characteristic feature of potential business models development. Core ideas implemented in these business model strategies can serve as the springboard to think about the architecture of the business model to create and deliver value and how to capture value following the chosen strategic direction. Some examples of value, value creation, value delivery and value capture within individual strategies and in several cases are also mentioned in the article and can be used for CBM design and development for both demonstrators. Strategies and their definition are in Table 4 ((Bocken et al, 2016, p. 313).

Strategies	definition
Business model strategies for slowing loops	
Access and performance model	Providing the capability or services to satisfy user needs without needing to own physical products
Extending product value	Exploiting residual value of products – from the manufacturing, to consumers, and then back to manufacturing – or collection of products between distinct business entities
Classic long-life model	Business models focused on delivering long-product life, supported by design for durability and repair for instance
Encourage sufficiency	Solutions that actively seek to reduce end-user consumption through principles such as durability, upgradability, service, warranties and reparability and a non-consumerist approach to marketing and sales
Business model strategies for closing loops	
Extending resource value	Exploiting the residual value of resources: collection and sourcing of otherwise “wasted” materials or resources to turn these into new forms of value
Industrial Symbiosis	A process-orientated solution, concerned with using residual outputs from one process as feedstock for another process, which benefits from geographical proximity of businesses

Table 4: Business model innovations to slow and close resource loops

Accenture (2014) develop five distinct approaches named as the circular business strategies:

1. *Product life extension* - by repairing, upgrading, remanufacturing or remarketing products. Usually, the inner circles are involved, and the idea of circling longer is followed in this strategy.
2. *Resource recovery* - is about capturing embedded value in products at the end of one product lifecycle to feed into another via recycling and upcycling processes, often provided as services or manufacturing processes by other players. Circling longer is enabled by this strategy, and also cascade use and even the emergence of pure circles can work here.
3. *Product as a service* – offers to buy service done by a product instead of buying the product itself, usually through operational leasing or renting and/or pay-for-use arrangements. Durability and upgradability are the main design characteristics for the product in this model. The inner circle and circling longer are typical for this strategy.
4. *Sharing platforms* - are based on the collaboration among product users, and even product owners, whether individuals or organizations. The main function of platforms is to facilitate the sharing of overcapacity or underutilization, thus increasing productivity and intensify the use of products. In this understanding the inner circle and circling longer are reached, however in some form also cascade use may exist.

3.2 Specificities of the circular business models

As can be seen, circular economy brings many challenges to the traditional linear business models and adding the focus on sustainability does not always help to solve the problems which circular economy aims to cope with. This chapter thus gives some answers to the **RQ1: What specific features circular business models have in comparison to linear business models?**

Similar to what happens to business models, the conceptualisation of Circular BM (CBM) is lacking in the academic literature. In fact, few authors provide a clear CBM concept. Linder and Williander (2017, p. 2) define a circular business model as “***a business model in which the conceptual logic for value creation is based on utilizing the economic value retained in products after use in the production of new offerings.***”

Thus, a circular business model implies a return flow to the producer from users, though there can be intermediaries between the two parties. The term circular business model, therefore, overlaps with the concept of closed-loop supply chains, and always involves some “recycling” principles or strategies, as summarized into a framework by Kircherr et al (2017, p. 224) (see **Error! Reference source not found.**Figure 6).

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Circular economy

Strategies

Smarter product use and manufacture	R0 Refuse	Make product redundant by abandoning its function or by offering the same function with a radically different product
	R1 Rethink	Make product use more intensive (e.g. by sharing product)
	R2 Reduce	Increase efficiency in product manufacture or use by consuming fewer natural resources and materials
Extend lifespan of product and its parts	R3 Reuse	Reuse by another consumer of discarded product which is still in good condition and fulfils its original function
	R4 Repair	Repair and maintenance of defective product so it can be used with its original function
	R5 Refurbish	Restore an old product and bring it up to date
	R6 Remanufacture	Use parts of discarded product in a new product with the same function
	R7 Repurpose	Use discarded product or its parts in a new product with a different function
Useful application of materials	R8 Recycle	Process materials to obtain the same (high grade) or lower (low grade) quality
	R9 Recover	Incineration of material with energy recovery

Figure 6: 10Rs (from the original 9Rs) framework

Geissdoerfer et al (2018b) delineate **circular business models** as the subcategory of the sustainable business model and characterise them as **not only creating sustainable value, employing proactive multi-stakeholder management, and having a long-term perspective, but – except the above-mentioned closing, slowing, narrowing also intensifying and dematerialising resource loops.**

Geissdoerfer et al (2017) search for similarities and differences between sustainability and circular economy. They also summarize **warnings about negative impacts of CE:** a) circular systems will require **specific costs**; b) CE will have to cope with the **technical impossibility to really close the circle**; c) **recycling will be accompanied with growing demand on energy** which means that negative impact of this demand will be **higher** especially in the form of the **emission of greenhouse gasses** than the overall environmental effect of acquiring the material from conventional sources like mining.

Despite the lack of conceptualisation, as mentioned before, the topic of CBM has been attracting the attention of scholars, since it has been realized that the **shifting to a circular economy demands the understanding of how companies can introduce circularity into their business models** (Lewandowski, 2016). As mentioned, this means a change in several building blocks of the firms' BM, namely value proposition, channels, resources and activities or changes in the whole model as well as the development of a new one(s). In this point, Nußholz (2017a) argues that **"the key difference of circular business model elements, compared to linear ones, appears to be the embeddedness of a circular strategy in the offer, which can alter material flows.**

Only scarce knowledge exists about circular business model components and corresponding sub-components. Among the few, for instance, Mentink (2014) evaluates the specific character of BMC for circular business. Ranta et al (2018, p. 996) summarized findings from the three-cases study where specific approaches within 3Rs strategies were found for the general components (see Figure 7 **Error! Reference source not found. Error! Reference source not found.** with some examples within components and strategies). Knowledge of these specificities

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enables to understand which changes of the components are in line with the shift towards circularity.

Business model component	Reduce	Reuse	Recycle
Offering	Reducing mixed waste by increasing source-separation and increasing recycling.	Take-back services and sales of used and refurbished products.	Cheaper materials for manufacturing or sustainable high-quality end products.
Target Customer	New target customers through take-back services.	Used products to consumers.	New target customers for recycled materials.
Resources and Capabilities	Capability to provide take-back services that are accessible to customers.	Capability to separate working products and components from waste and refurbish them for resale.	Capability to capture source-separated waste for efficient recycling.
Organization	Take-back of products and materials operated separately from product manufacturing, either through partners or by other business units.	Separating reusable products from materials and refurbishment organized together.	Use of recycled materials in producing products is based in a separate business unit from the recycling system.
Position in the Value Chain	Diverting waste to recycling in various parts of the value chain.	Early separation of reusable products from waste streams.	New position in the value chain, either in sales of new products from recycled materials or in waste management or take-back services.
Revenue sources		Refurbished reused products.	Sales of recycled materials or products made from recycled materials.
Economics of the Business	Increasing source-separation and thus reducing mixed waste reduces waste management costs.	The sales and refurbishing of used products is subsidized.	Recycled materials cheaper than virgin materials.

Figure 7: Components, strategies and themes with circular business model,

The implementation of CE principles would affect all the building blocks of the BM framework, since they change the logic behind value creation, delivery and capture. Some examples of BM innovation, related to the implementation of CE, are:

- New value propositions, namely based on longer product life cycles, with designing for more durable products (Hawken et al. 2000) and to support the end of life strategies (Norden, 2015) and on higher customer service levels (Barquet et al. 2013; Bocken et al. 2016)
- New customer relationships need to be developed, namely that promote the shared use of products among users (collaborative consumption) and reward customers (Bocken et al. 2016)
- New revenue models, namely those not based in selling products, but instead in selling services, leasing or accessing the products under pay per use mechanisms (Barquet et al. 2013; Lacy & Rutqvist 2015)
- New key activities, related to closing production loops, like reverse logistics and maintenance (Bocken et al. 2016). It is critical to develop closed-loop supply chains, a combination of forward supply chains (from producer to consumer) and reverse supply chains (from consumer to producer) enabling components and materials to enter again the production process (Wells and Seitz 2005).

Probably four terms – beyond remanufacturing and recycling and other value recovery practices (e. g. Verstrepen et al, 2007) - are the most often associated with CE and circular business models and to a certain extent they reflect the content of the ReSOLVE framework: **Product Service Systems (PSS), Consumer (Customer) acceptance, Sharing (and collaborative economy) and Internet-of-things (or industry 4.0) and so they reflect – more or less – the specific features of circular business models.** There are many interdependencies among the content of those terms, however, they can exist in practice also independently. For instance, Kjaer et al (2018, p.

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666) argue that “PSS are often mentioned as a means to enable a transition from a linear to a circular economy”. Providing services within PSS is more and more dependent on different functionalities which industry 4.0 and IoT brings (Bressanelli et al, 2017). Use-oriented PSSs are often related to sharing and collaboration business models (Annarelli et al, 2016).

3.2.1 Product service system (PSS)

Tukker (2004) defines PSS “as consisting of ‘tangible products and intangible services designed and combined so that they jointly are capable of fulfilling specific customer needs (2004, p. 246) and as “an integrated bundle of products and services which aims at creating customer utility and generating value” (2015, p. 87). Several synonyms and/or alternations to the **combination of products and services in one bundle or package** to the customers to the term exist: solution development, functional product, functional sales, function-oriented business models, full-service contracts, performance-based contracting, integrated solutions, servicing or product-life extension services (Tukker, 2004; Lay et al, 2009). Annarelli et al (2016) mention that PSS is by some authors understood as the entire business model.

Baines et al (2007) add another view on Product-Service System: “PSS can be thought of as a market proposition that extends the traditional functionality of a product by incorporating additional services” (p. 1543).

How the bundle is created and how is related to circularity issues depends on many circumstances, among all for instance on existing resources and capabilities, customer demand and needs, position of a company in value chain and value network, tangible and intangible costs and benefits for the provider(s), customers, environment and society and circularity feasibility.

Companies may choose some of the PSS from three options presented in **Error! Reference source not found.** (developed by Tukker, 2004, p. 248)¹, complemented by Neely (2009 with other two categories: “**integration oriented Product-Service Systems**” and “**service-oriented Product-Service Systems**”² or being inspired by the Morphological box developed by Lay et al (2009, p. 447) which incorporates also differentiating parameters of the individual option (ownership during use and at end of life; financing; maintenance personnel; payment; number of customers; location of the operation; and retrieval and recycling when the final one is not apparent in the box) – see FigureFigure**Error! Reference source not found.**Figure.

¹ Tukker defines these three options as: a) in product-oriented services the business model is still mainly geared towards sales of products, but some extra services are added; b) in use-oriented services the product stays in ownership with the provider, and is made available in a different forms, and even sometimes shared by a number of users and c) in result-oriented services the client and provider in principle agree on a result, with no special need to the pre-determination of product involved.

² Neely explains these two options as (p. 11): “*Integration oriented PSS result when firms seek to add services by going downstream and vertically integrating. Service oriented PSS result when firms add services to products, by integrating those services into the product*”, p. 11

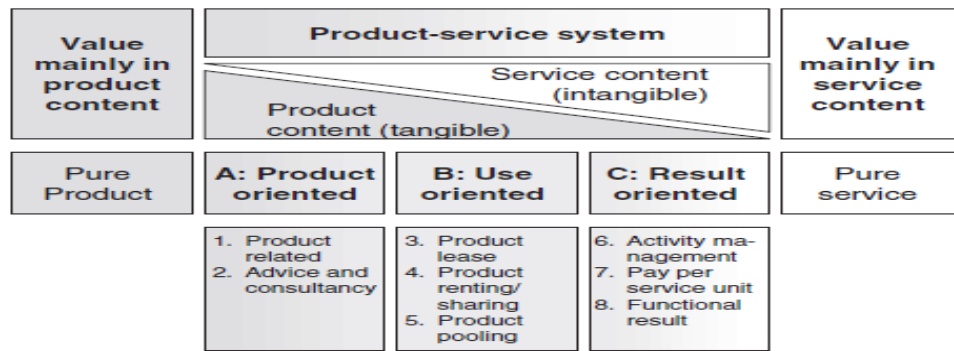


Figure 8: Product-service continuum and three subcategories of PSS

Characteristic Features		Options			
Ownership	during phase of use	Equipment producer	Leasing bank	Operating joint venture	Customer
	after phase of use	Equipment producer	Leasing bank	Operating joint venture	Customer
Personnel	Manufacturing	Equipment producer	Operating joint venture	Customer	
	Maintenance	Equipment producer	Operating joint venture	Customer	
Location of operation		Equipment producer's establishment	Establishment "fence to fence" to the customer	Customer's establishment	
Single / multiple customer operation		In parallel operation for multiple customers		Operation for a single customer	
Payment model		pay per unit	pay for availability	fixed rate	pay for equipment

Figure 9: Morphological Box as a framework for PSS

According to Tukker (2015), the most important issue for companies regards to PSS is to be aware of success factors in general and be aware of many risks and challenges associated with PSS. He also presents some existing findings from literature: well-regarded brand reputations, relevant service competencies, and strong buyer-seller relationships, shared innovativeness, an ability to enhance utility and/or create transaction efficiencies, and effective marketing support. Besides some ways how to evaluate PSS he also points to some risks or barriers of PSS, especially for consumer markets and in result-oriented systems (the power of ownership, lesser care of products from the consumer side and need for the most radical change of business model).

With circular economy, the use-oriented PSS is probably the most accepted approach. **The use-oriented or access-based model** contains different strategies (and business models) with the core idea of the **ownership of product being remained by the provider/seller**, who makes the product available to users, who do not pay for the possession but for its use. As the **pay-back period is much longer in comparison to the traditional sales of product**, the products used to be of a higher quality, more robust, less repair-dependent and designed for the long service life and for the reuse of parts as much as possible after the end of the product's life (Tukker, 2015).

For setting this model up appropriately, there is a need to understand customer\consumer preferences, consumers' everyday lives and the role of material objects in their lives more deeply. For that reason, researchers have started also engaging in consumers' attitudes, motivations and barriers in relation to access-based services (Antikainen et al., 2015). Even

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though it is claimed, that consumers are generally interested in access-based services, attitude differs based on the type of product. For example, toward renting or leasing home textiles, beds or kitchen have consumer much more negative attitude in comparison with renting household appliances or furniture (tables, chairs, etc.) (Edbring et al., 2016).

According to Raja et al. (2013), **the key success factors for consumer satisfaction** in access-based consumption are: **the ease of use, guaranteed access, trust toward providers and dynamics of the relationship between consumers and providers**. By other authors, **flexibility** is considered as a critical element for forming consumers' attitude as well. The main reason of this is that consumers may feel a sense of freedom by only having access to the products when they need them (Catulli et al., 2013). **Flexibility also relates to the type of contract** under which are products rented or leased. Although short-time renting was mentioned in many studies as more preferred, for white goods which are used on a more permanent basis consumer prefer long-term renting. That is because the responsibility remains on the side of the provider, who is responsible for maintenance and reparation, when the product is broken or replaced, when the product becomes out-dated. This may indicate that products with a fast innovation cycle are for consumers more attractive to rent and not to buy (Edbring et al., 2016).

As another **main reason to engage in the access-based model**, the **economic reasons and benefits** (Bardhi and Eckhardt, 2012) were mentioned. Renting may be seen as a more favourable option because consumers can skip the direct investment.

To summarize the above-mentioned issues, it should be clearer now, that short-time contract would be preferable by consumers than long-term. Another aspect, which plays an important role is the **setting of contracts in the appropriate form** and provide right explanation to consumers (Poppelaars et al., 2018). Another problem, which could occur is related to the **payment terms**. Those should be properly set up and communicate toward the consumer. Some consumers, who decided to join renting or leasing program, were unpleasantly surprised at the end, that they have to pay extra money for repair, maintenance or even for insurance. This is related to another obstacle toward access-based consumption. The consumer is often uncertain about the rules in the event of the leased or rented product breaking or becoming damaged (Catulli, 2012). Therefore, the provider should **clearly communicate the rights and responsibilities of the provider and adopter**.

The content of offering and the price are very sensitive points for the contracts and extremely important for the revenue for product owner/service provider. For the different schemes of payment Leider and Sahin (2012, p. 6) argue that on B2C market **consumers prefer choosing "a flat rate contract (unlimited usage plans) over a pay-per-use option even if it leads to a lower consumption value"** probably due to *"the risk aversion, demand over-estimation, and a distaste for paying per consumption"*.

3.2.2 Sharing (collaborative) economy (SE; CE)

Access-based consumption is connected to the concept of sharing and collaborative economy. Both are the fast-growing phenomenons disrupting mainstream manufacturing industries. It is not a new phenomenon at all – Cohen and Munoz (2016, p. 90) citing Price (1975) state that SE is *"the most universal form of human economic behavior and has been so for several hundred thousand years"*. Stranger and pseudo-sharing instead of family, friends and true-sharing (without payment being required) are linked to the business models in CE (Ranjbari et al, 2018). Sharing and collaborative consumption encompasses activities that involve customers and consumers as both providers and "obtainers" of resources. But this is more typical for non-

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business life. Both sharing and collaborative economy are forms of consumption which aims are to recirculate the products and intensify the use of otherwise underutilised assets (Camacho-Otero et al, 2018). As Ranjbari et al (2018) summarize “*through collaborating the consumption of the resources by different consumers, material goods or less tangible assets are redistributed and efficiently used, and this can release society from hyperconsumption, and leads to environmental*”... (and social and economic) ...”benefits” (p. 8).

Frenken (2017) articulates three possible futures of the sharing economy: 1. **monopolistic super-platforms allowing for seamless services**; 2. **government regulation of platforms through taxation** and 3. **platform cooperativism**. In the last case, he introduces **ideas about cooperatives and their role as sharing economy platforms providers** with examples of such business in Germany.

3.2.2.1 *Sharing, collaboration and value co-creation*

Vasantha et al. (2012) define a product-service system as “*an integrated product and service offering that delivers value in use to the customer.*” Vargo et al (2008) argue that in service systems, value is not just delivered to the customer and put emphasis on his active role in the value creation process. In their view, the firm is responsible for the value proposition and service provision, but the value is only determined and derived through use. From this perspective, producers and consumers are not on opposite sides. Co-creation is a collaborative process in which value is created through interactions (Galvagno and Dalli, 2014). However, these interactions are not limited to the firm and its customers. Vargo et al (2008) acknowledge the importance of the network of stakeholders such as suppliers, employees, stockholders, government agencies, etc.

From a cultural viewpoint, value is not created only materially but also symbolically (Galvagno and Dalli, 2014). As Edvardsson et al (2011) suggest, the perception of value is influenced by the degree of social consensus about such value. **Value is therefore not static but relative, partly dependant on the social context. In the context of a circular economy, this might have important implications for consumer acceptance of PSS offerings as a society often supports ownership** (Rexfelt and Hiort af Ornäs, 2009).

Apart from the use phase, value co-creation can also be present in the design phase of service offerings as well as products. Co-creation might be regarded as customers’ participation in producing the offering for themselves (Kaasinen et al., 2013). This is also referred to as co-production (Fernandes and Remelhe, 2016). Another approach to co-creation is the engagement of customers in the development of new products and services (Kaasinen et al., 2013). Fernandes and Remelhe (2016) argue that while co-production is an integral part of the transaction and thus not voluntary, users’ participation on development of new offerings, also known as **collaborative innovation**, is relatively optional, voluntary and effortful. Companies often struggle to identify customers’ requirements, which may be even more difficult when it comes to services due to their intangible nature (Rexfelt and Hiort af Ornäs, 2009). Involving users in design helps the company to better fit their needs (Kaissen et al., 2013).

Fernandes and Remelhe (2016) examined consumer motivations to engage in virtual communities for collaborative innovation. They concluded that the most important motivators were knowledge acquisition and intrinsic motivation, while the financial reward was viewed as a less important factor. According to Gebauer et al (2013), **collaborative innovation activities create a sense of community among the participants and may help increase loyalty and establish valuable relationships with customers**. However, they argue that interactions between companies and users might also initiate negative reactions. When the interactions

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between service systems cause a decline in at least one of the system's wellbeing, the process is referred to as value co-destruction (Plé and Chumpitaz Cáceres, 2010). Value co-destruction occurs when customers misbehave, fail to process information (Järvi, Kähkönen and Torvinen, 2018) or misuse the product (Plé and Chumpitaz Cáceres, 2010). In Business-to-business market, value co-destruction is the result of the absence of trust among the actors, inadequate human capital, poor coordination and power or dependence imbalance (Järvi et al, 2018).

In service encounters, interactions potentially occur among individual customers (Yoo et al, 2012) through sharing product information and experiences (Adjei et al, 2010). These **customer-to-customer (C2C) interactions** may be powerful marketing tools. Customers can contribute to disseminating information through word of mouth, influence other customers' perceptions, acquire new customers Fernandes and Remelhe (2016), promote brand knowledge and service satisfaction (Yoo et al, 2012). On the other hand, posting a negative review is seen as another form of value co-destruction (Järvi et al, 2018).

3.2.3 Consumer (customer) acceptance

Consumer acceptance is considered to be one of the main reasons why the circular economy solutions have not been widely adopted in the markets in spite of their potential environmental benefits (Camacho-Otero et al, 2017). The issue of acceptance deals with various areas which are in more details elaborated in the following text. They can be grouped into the three broad and often interlinked categories – access-base (or use-oriented) PSS, “not-new” products and Internet of Thing or smart products and digitalized services.

A significant change in peoples everyday lives required by the transition to PSS is **giving up ownership** (Camacho-Otero et al., 2018). Consumers accumulate things to have the sense they are building an estate and consuming material good to express their image, self-identity or social position (Catulli et al., 2013). According to Thompson and Haytko (1997) thanks to owning of some good can even make consumers feel they “stand out” at the top of the socioeconomic ladder, and they even think they can help them to gain advantages in life and career. On the other hand, this barrier might be lower for products that are used for their primary function in comparison with the products which are associated with social status or some emotional value, because consumer **doesn't buy them** to express their personal style or their identity (Edbring et al., 2016). In this context, literature pointed out that consumers behave less responsible for the product, which they don't own. It is because they don't build strong attachments to them which consequently leads to less care and increased wear of the product (Bocken et al., 2018). This phenomenon was also confirmed by Bardhi and Eckhardt (2012), who proved that people don't develop a sense of ownership to the products in access-based consumption model, because of the temporary nature of involvement which those products.

Contradict opinion is brought by Belk and Llamas (2012), who claim that consumers might feel a sense of ownership also over the shared products. A good example could be aircraft or yachts, which are very expensive and only a small group of consumers can afford to buy them. Thanks to sharing of their use, sense of ownership might be created and consequently defines who they are and what community they belong to (Catulli et al., 2013). This is to some extent in line with the idea that the ownership is believed to provide a specific intangible added value (Cherry and Pidgeon, 2018) .

Having conducted a series of workshops with the public in order to explore the concerns regarding the pay-per-use concept, Cherry and Pidgeon (2018) concluded that **willingness to give up ownership differs according to product types and circumstances. The perceived benefits of ownership were higher in case of more personal items connected to personal**

identities such as clothes or furniture. On the other hand, the convenience of non-ownership was appreciated for more functional products like appliances and tools. The results of the case study conducted by Lieder et al. (2018) do not contradict the latter observation. When comparing washing machine offers, consumers showed a preference for access rather than ownership.

Schrader (1999) suggests that **the acceptance of ownership substituting services is influenced by various socio-demographic and socio-psychographic factors such as age, education, apartment size, income, etc.** He argues that younger consumers are less likely to consider products like cars or washing machines as status-enhancing goods. Furthermore, a portion of older people among innovators is usually smaller. Innovators, early adopters and environmentally aware consumers have a generally higher educational background. The costs of storing goods that are not used frequently arise with the smaller apartment size. Finally, the influence of income and household size is believed to be ambivalent.

According to Ceschin et al (2010), a role of aesthetics in users acceptance of eco-efficient PSS should be taken into account. It should be pointed out that instead of focusing on product aesthetics alone, it is important to consider aesthetic of all the PSS elements – products, services, communication and interactions which can be referred to as system aesthetic.

PSS can provide access to a certain product for the customers who could not afford to purchase it. It is also believed to generate important cost savings for those who do not need to use the product often enough or those who like to have the latest upgraded version. Moreover, PSS reduces customers financial risk related to owning and maintaining the product (Lacy and Rutqvist, 2015). However, consumers sometimes fail to recognize the potential economic benefits of PSS solutions. In fact, PSS offerings are often considered more expensive than the purchase of products due to lack of knowledge about lifecycle costs when users do not consider the use, the maintenance, the repair and the disposal costs (Ceschin et al, 2010). **Sharing is also influenced by the perceived risk of unfamiliar people** – in particular, if regards sharing their own products (Cheng and Chow, 2018).

Focusing on the transaction costs rather than on the net present value is also the reason for non-acceptance of upgrading products to more durable ones instead of replacing them with new ones (Planing, 2015). Concerns about the financial risks of a pay-per-use model were also expressed by the participants of the above-mentioned workshop led by Cherry and Pidgeon (2018). More specifically, they highlighted the risk of **financial lock-in** and fears of inability to pay the service charges due to a sudden change of personal circumstances. For some participants, insurance-based protection would help to overcome these concerns. Another barrier to pay-per-use acceptance identified by the participants includes distrust in contracts and business and a fear of losing freedom regarding the use of products.

Lack of PSS acceptance seems to concern **B2B markets** as well. Schenkl et al (2014) suggest that identifying factors of acceptance of outsourcing helps to understand the market acceptance of PSS since both these systems rely on the transfer of activities or the responsibility to a service provider. **Perceived benefits include cost savings, transparency about the total cost of ownership (TCO), budget certainty, and lower need for investment or risk reduction associated with changing fix costs into variable costs. Market acceptance can be hindered by the perceived loss of control or service providers' access to customers' sensitive information.**

In some cases, a shift to a circular economy requires giving up newness. (Camacho-Otero et al., 2018). Having examined consumer acceptance of **refurbished** smartphones, van Weelden et al (2016) discuss the level of **perceived risk**, which may represent a barrier to acceptance. More specifically, the risks can be categorized as **financial, performance and time risks**. Perceived

circular business models

risk-benefit balance is significantly influenced by warranty and service while a brand and a seller can also serve as a form of warranty. In addition, a lack of knowledge about the refurbishment process reduces the perceived value. Buyers with prior experience with refurbished products showed a lower level of perceived risk. The authors further suggest that **benefits customers link with refurbishment are mainly financial and environmental benefits**. However, environmental benefits do not play a significant role in decision-making. Similar results were reported by Bittar (2018) whose research showed that consumers environmental consciousness does not influence their purchase decision in case of remanufactured laptops. These decisions were mainly driven by brand and price. On the other hand, Wang and Hazen (2016) found that “**green knowledge**” had a significant effect on perceived value of remanufactured products, although still lower than cost and quality knowledge. Since quality seems to be a major determinant and consumers do not have the possibility to verify it before purchase, the authors call for a collaboration between government and remanufacturers to promote that remanufactured products are as good as new. Government incentives have a potential to pull consumers towards remanufactured products (Hazen et al, 2017). The environmental dimension of remanufactured products could be communicated **through eco-labels and green certification**. Wang et al. (2018) demonstrated that green certification has a positive impact on purchase intention on remanufactured automotive parts via building trust.

For refurbishment or remanufacturing to work, the consumers should accept these products as substitutes to new ones. **Quality perception of the former as well as willingness to pay is currently lower** (Mugge et al, 2017). However, there might be product categories in which consumers prefer used products over remanufactured ones such as products related to safety e.g. child car seats. Indeed, consumers’ acceptance of refurbishment seems to vary for specific product categories. As suggested by Mugge et al (2017) for hedonic products like watches or vases, aesthetics is of high significance, and it is important that the product looks new. Products serving a utilitarian purpose that are usually not visible to others are more likely to be accepted refurbished even if they are visually damaged. The perceived risk seems to be lower when the quality of a refurbished can be easily checked. In this respect, purchasing refurbished electronics entails a higher level of risk than furniture. Another important factor is the level of involvement. For the categories requiring a great financial investment, consumers need assurance on the product quality such as warranty or more information about the refurbishment process. In the case of low involvement products such as hangers, perceived financial benefits are not significant, and it is advised to communicate the environmental benefits. Dynamic product categories influenced by a fast-technological advancement face a risk of obsolescence; it is therefore important to highlight their durability and functional quality. Categories perceived as less suitable for refurbishment also include personalized products and hygienic products that are in contact with users’ skin or food. Baxter et al (2017) use the term **contaminated interactions to designate the decline of object’s perceived value caused by its past use. These interactions represent a barrier to circular flows.**

Apart from giving up ownership and newness, consumers in the circular economy should engage in returning goods (Camacho-Otero et al., 2018). Botelho et al. (2016) examined the impact of incentive schemes for take-back of waste electrical and electronic equipment on consumer acceptance in Portugal. From five proposed alternatives, **exchange for money and exchange for a new product were the most valued by the consumers, while the discount coupons the least.**

3.2.4 Internet of Thing (IoT) and industry 4.0

3.2.4.1 IS/ICT

In many industries, technological development and associated costs decrease lead to higher information content in product and processes (Porter and Heppelmann, 2015). It is the new digital technologies that are the backbones of the “fourth industrial revolution” by enabling serviced business models and transition towards Circular economy (partially as a consequence of servitization). The role of ICT as a driver/enabler for CE is being already proposed by the Ellen McArthur Foundation.

Up to date, any detailed analysis of the ICT in the CE-transition process has not been done (Bressanelli et al., 2018), in other words, there has been limited knowledge of how to use these technologies for the circular economy (Pagoropoulos et al, 2017).

The technical reason for ICT lies in the fact that ICT supplements the product with feedback control, which can be used for evaluating of stakeholders` actions throughout (multiple) product life (Pagoropoulos et al, 2017). The technology around CE consists of three task-layers:

- Data collection (based on radio frequency identification (RFID) and lot/sensors)
- Data integration (relational databases and Product Lifecycle Management systems - PLM)
- Data analysis (big data + machine learning)

The environmental benefits of ICT application are summarized by Li and Found (2017) as follows:

- Simplifying/replacing of mechanical components by software
- Upgrade of physical products via software through remote control
- Replacing the on-side service by remote one
- Transport elimination and reduction (e.g. thanks to 3D print, routes optimization)
- Supply chain synchronization
- Shared product database stimulates renting, sharing, refurbishing etc.

The above list is not exhaustive. E.g. Product Lifecycle Management systems besides its typical function can be utilized for other purposes, in other situations too: PLM shares the product data across various stakeholders in the value chain and through different life cycles (Pagoropoulos et al, 2017). It can preserve product-related data that can be used in other lifecycles of product.

Bressanelli et al (2018b, p. 648) identified **eight specific functionalities** enabled by digital technologies (See Table 5) and investigated **how these functionalities affect three circular economy value drivers (increasing resource efficiency, extending lifespan, and closing the loop)**. Based on literature and a case study they developed a conceptual framework for utilizing such technologies in transition to CE business models, specifically in value drivers` development and support. For the purpose of the ReCiPSS project, the list of digital technology functionalities is inspiring, despite the fact that the list is not fully comprehensive and should be expanded by continuing literature reviews. Full conceptual Framework is not presented in this Deliverable, as there might be some limitations on its applicability for the project.

digital technology functionality	description
<i>Improving product design</i>	By collecting usage data through IoT and by analyzing them through appropriate analytics, companies may improve the design of their products to better respond to customers' needs
<i>Attracting target customers</i>	An elaboration of the information gathered from the products installed base (through IoT) regarding how customers are using products allows companies to improve marketing activities, with the aim to attract new and targeted customers.
<i>Monitoring and tracking products activity</i>	Through IoT, companies monitor product condition, status, location and usage. To enable product sharing between multiple users, this information must be collected and easily made available to each single user.
<i>Providing technical support</i>	Information collected through IoT helps companies and their field network to provide technical support and other services such as spare parts management, repair, etc.
<i>Providing preventive and predictive maintenance</i>	The analysis of Big Data collected through IoT by appropriate analytics entails the provision of preventive and predictive maintenance.
<i>Optimizing product usage</i>	By analysing with appropriate analytics the Big Data collected through IoT, companies may provide to their customer's personalized advice with the aim to optimize the usage phase, e.g. how the product should be used to reduce energy consumption.
<i>Upgrading the product</i>	When the product offered becomes smart, companies may upgrade only its digital elements, e.g. the product firmware, thus enhancing the feasibility of an upgrade
<i>Enhancing renovation and end-of-life activities</i>	Through the IoT technology, companies can access real-time product location and condition. This information may be used for better execution of end-of-life collection, refurbishment, remanufacturing, and recycling activities

Table 5: Digital technologies functionalities for CE

Lopes et Sousa Jabbour et al (2018) summarize core technologies of the Industry 4.0. These are: cyber-physical systems, cloud manufacturing (computing), internet of thing and additive manufacturing (mostly in the form of the 3D printing).

Antikainen et al (2018) exploratory qualitative study aims to detect what challenges and what opportunities of the digitalisation in the CE transformation exists. They categorize **knowledge flows when digital tools are employed into circular business models into: knowledge of the product location in real time; knowledge of product condition and knowledge of product availability**. Results from the workshop (empirical part of the paper) revealed several relevant points for circular business model within ReCiPSS:

1. For Channel and Stakeholder – especially Customers' relationships - **social media** is one of the major enablers in **consumer involvement and interactive relationships**.
2. For Channel and Stakeholder relationships and for Key activities and key Resources - **marketing** is - due to digitalization - becoming **more interactive and intelligent**.

circular business models

3. For Key resources, Cost structure, Revenues and probably also for Key partners In the context of business models - **developing ideas into successful business models, reframing and redefining business models, changing the mindset from product-oriented business towards service models, ensuring access to data and data ownership, sharing data between competitors, integration of big data owned by multiple actors, ensuring privacy and property rights, lack of needed data and management of information flows belong to the biggest challenges.**
4. For Key partners and Key resources - **organising collaboration between different partners, defining shared processes, finding suitable collaborators, combining different areas of expertise and harmonizing diverse perspectives** are also perceived as very big challenges.
5. For Key resources mainly - **ICT and sustainability-related competences and their combination** is the core issue and challenge as well
6. For circular business models functioning – **networking and co-creation** can be the most proper solution for the alignment with challenges.

Rajala et al (2018, p. 21) explore “*the ways in which the intelligence of goods influences closed-loop ecosystems*”...” This “**embedded intelligence**” enabled by information software and hardware transforms products into active nodes of new value-creating systems”. Authors introduce the concept “**material intelligence**” (which “*provides customers with personal and contextual information about the materials they use to meet their business needs (p. 23)*” – for the ReCiPSS project we can ask if provision can also be realized for other stakeholders who may need it). They further stress **the role of digital platforms** which help to foster collaboration within circular (close-loop) ecosystems because these platforms can work as the intelligence that will be holding together technologies like sensors, telematics, machine-to-machine (M2M), and others to create new value. “*Platforms create shared value and benefits for the participants through network effects*”. Rajala et al (2018) also alert that “*monetizing platforms is difficult because openness is what helps to grow the platform, but control is what helps the platform owner to capture profits*” (p. 30). Other examples are **distributed ledger technologies which enable to connect parties to jointly generate, maintain, and share any database on a fully distributed basis**. “*A distributed ledger is a key infrastructure element for a P2P network³ in which organizations can store, manage, and share information to form one data structure of any good....The participating organizations store, manage and share information in a joint fashion according to a tamper-resistant set of verifiable contract and business rules, backed up by hash functions and cryptographic algorithms.*” (p. 28).

To summarise, the smart products (IoT) are reshaping the industry and changing the relationships with customers that becomes continuous and open-ended (Porter and Heppelmann, 2015). IoT opens an opportunity for value creation in the following aspects:

- Shorter product development cycles (including smaller software updates)
- New business models – cloud-based solutions, models built on the access to user data,...
- User data enable for better service offerings (better product utilisation, advice on product usage,...)
- Tangible products become a part of the broader system (including sensors and software)
- Data analytics (Rymaszewska et al, 2017)

³ P2P (peer to peer) network is a group of the interconnected computers which acts as a node for sharing the files and is seen as one of the key aspects of blockchain technology

3.2.4.2 Internet of Things and product and behaviour tracking and traceability

Technologies grouped under the umbrella IoT typically include the following: radio frequency identification (RFID), wireless sensor networks (WSN), middleware, cloud computing, IoT application software (Lee and Lee, 2015) including cognitive computing (Tseng et al, 2018).

The link between IoT and CE is straightforward: IoT has the potential to make some CE-related processes viable. Specifically, the IoT platform helps to monitor and manage the products, which are at the customers, out of direct control of the producer (Spring and Araujo, 2017). In return, the reliable data about product usage and performance enable for a solid value proposition resulting in improved customer satisfaction (Rymaszewska et al, 2017).

Besides learning about customers' behaviour, the IoT also enables for the capturing of (individual) products biographies (Spring and Araujo, 2017), which has far-reaching conclusions for circularity.

Taylor, Reilly and Wren (2018) discussed the **potential of IoT to support customer relationship management, business intelligence and new product design**. Smart devices are often monitored or controlled from an application which may also serve as a communication channel. Besides of marketing new products and services, the communication through this channel can also cover customer support as for instance advising consumers on their product usage optimization. Analysing the data from embedded sensors as well as consumer-entered data further enables the manufacturer to identify usage patterns which can be useful for new product design. The data can be combined with socio-economic data to perform customer segmentation. Bressanelli et al. (2018b) examined **digital technologies as an enabler of circular economy. They point out that in addition to increasing resource efficiency by optimizing product usage, monitoring product activity can prevent users from wrong behaviour in usage and together with technical support and preventive and predictive maintenance helps to increase the product's lifespan. Information about product condition and location is useful to organize collection activities better and contributes to closing the loop. Additionally, In the case of smart products, companies can avert obsolescence by only upgrading digital components of the products which do not generate any material waste** (Bressanelli et al., 2018a). Collecting the data at an individual customer level allows for personalized pricing (Yerpude and Singhal, 2018) which is important for PSS.

Some users seem to be willing to exchange personal data for a certain level of convenience. (Williams, Nurse and Creese, 2016). In-depth interviews with early-adopters Coskun, Kaner and Bostan (2018) revealed that convenience, together with optimization, personalizing the home, having a peace of mind and impressing others are perceived as major benefits of smart devices. When asked to choose a single desired feature, most participants selected **autonomy. This feature was mainly preferred for washing machines and stoves**. At the same time, control was identified as a major concern. Although the participants wanted smart devices to take over their chores such as housekeeping, they did not want them to intrude in pleasurable activities like spending time with children or watching TV. Even if the participants preferred full automation of household chore, they still wanted to be able to change the decisions taken by autonomous appliances if needed. Falcone and Sapienza (2018) suggest that **the level of autonomy users are willing to grant the devices is proportional to the level of trust**. They proposed a model for users' acceptance of IoT systems focusing on users' interaction with those systems. By asking for users' feedback and modifying the work accordingly, the device can gradually gain their trust through positive experiences.

3.2.5 IoT and consumer/customer acceptance

Gao and Bai (2014) analyzed the factors influencing users' acceptance of IoT technologies based on an extended technology acceptance model. Their findings suggest that **the intention to adopt IoT technologies is influenced by perceived usefulness, ease of use, behavioural control, enjoyment and social influence** while usefulness is viewed as the most important. However, the authors acknowledge that the relative importance of these factors might depend on the type of usage environment (e.g. hedonic vs utilitarian). Mani and Chouk (2018) focused on barriers leading to consumer resistance to smart services. The results of their research indicate that **a major barrier to the acceptance of IoT services is their perceived complexity** since consumers may lack the necessary skills to understand these services and take advantage of them. Other barriers include **risks (e.g. fears about being hacked or theft of sensitive data), inertia and self-image congruence as some individuals perceive a gap between their image and the IoT services they consider as luxuries and nonessentials. Technology anxiety and technological dependence** are believed to have an indirect impact on resistance through scepticism towards IoT. Smart services rely on IoT devices able to perform activities autonomously. Interestingly, one of the barriers identified in this study was the **need for human interaction**

Digital revolution has the potential to alter all aspects of the business, including **supply chains**. The use of IoT in this area could make each individual item visible leading to a supply chain where the location and characteristics of all things could be seen any time (Haddud et al., 2017). Tu (2018) explored factors affecting firms adoption intention of IoT in their supply chain management. **Benefits** identified by the interviewed managers included **visibility of supply chain, supply chain efficiency and product tagging benefits** (e.g. the fact that data on RFID tags can be over-written repeatedly).

Perceived benefits can be lowered by uncertainties about the **trustworthiness of technology such as reliability of the IoT system, integration of supply chain information and system integration**. Other important concerns were related to **costs of organisational adjustment as well as IoT systems equipment, hardware and software**. The adoption intention towards IoT technology was also found to be influenced by **external forces** represented by customers and government.

Apart from the technological complexity and compatibility, costs, perceived effectiveness and government support in line with the above-mentioned study, they found that RFID adoption is further influenced by organisation size, trust between enterprises, management support and competitive pressure. Haddud et al. (2017) examined potential benefits and challenges of the adoption of IoT in organisational supply chain perceived by scholars focusing on individual organisations as well as the entire supply chain.

3.2.5.1 Cloud computing

The clouds (or cloud computing) makes storage and reprocessing of such a large-scale data affordable due to one of its elementary feature, which is the scalability – the clouds provide reconfigurable resources such as computers, networks, servers, storage, applications, services, software that the customers need not own, they can buy it (Infrastructure as a Service (IaaS), Platform as a Service (PaaS) or Software as a Service (SaaS)) (Lee and Lee, 2015). In this way, they could be an ideal platform for producers who need not invest too much in the necessary ICT infrastructure.

Basic characteristics that help to distinguish between the cloud manufacturing options are indicated in the following Figure (Labes, et al, 2013, p. 2).

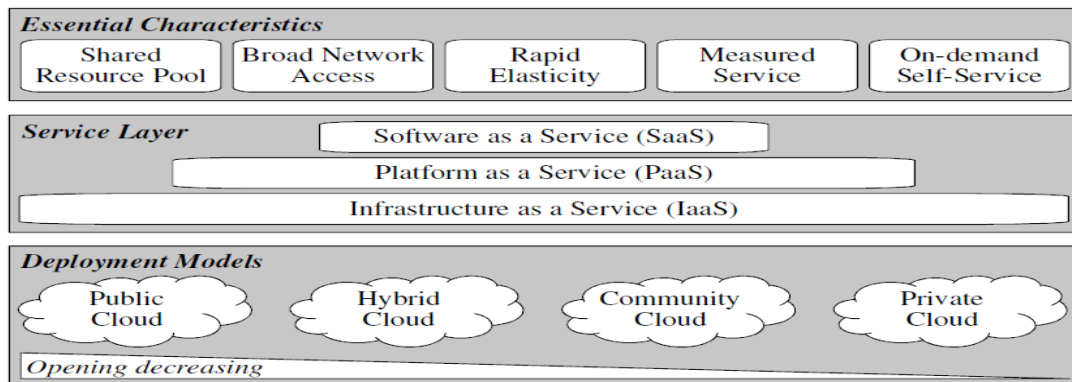


Figure 9: Basic characteristics of cloud manufacturing

3.2.5.2 Security, privacy and trust

As communication among IoT devices, other machines and humans is done through the Internet; the IoT applications will amplify the **security threats** of the Internet. At the same time, the traditional security and privacy solutions will be insufficient due to the scalability problem caused by the high number of interconnected devices (Sicari et al, 2015) and by the heterogeneity of the IoT networks (Li et al, 2015).

The Internet is not the only issue in IoT: In the IoT environment the devices are facing potential attacks from internal sources (elements of the particular network) and external (from other networks), so the security at all system levels is the most sensitive subject for IoT (Li et al, 2015).

The new need for IoT functionality in traditional companies could stimulate outsourcing initiatives, which increases the risk of data abuse/leakage in third parties (Sicari et al, 2015).

Data leakage represents the major threats in the personalised service specifically. The privacy together with security are two challenges for IoT, and the solution to privacy and security risks will require the adoption of available Internet standards for the interoperable protocol (Li et al, 2015). Ng and Wakenshaw (2017) point out that more research should focus on making the exchange and use of personal data beneficial for both the firms and the individuals as, for example, through personal data markets. At present, the company collecting the data has custodial right to it. However, the authors suggest that the current model of the data economy is about to change thanks to HAT,⁴ a personal data platform where the user has full custodial rights to his data. If having a HAT becomes a standard, customer relationship management will evolve into vendor relationship management with the customers being able to decide what can be done with their data (Ng and Wakenshaw, 2017). *Customers, in that case, will play the roles of suppliers.*

The main issues in IoT security are summarised by Tryfonas et al (2016) in the Figure 10:

⁴ <https://www.hubofallthings.com/>

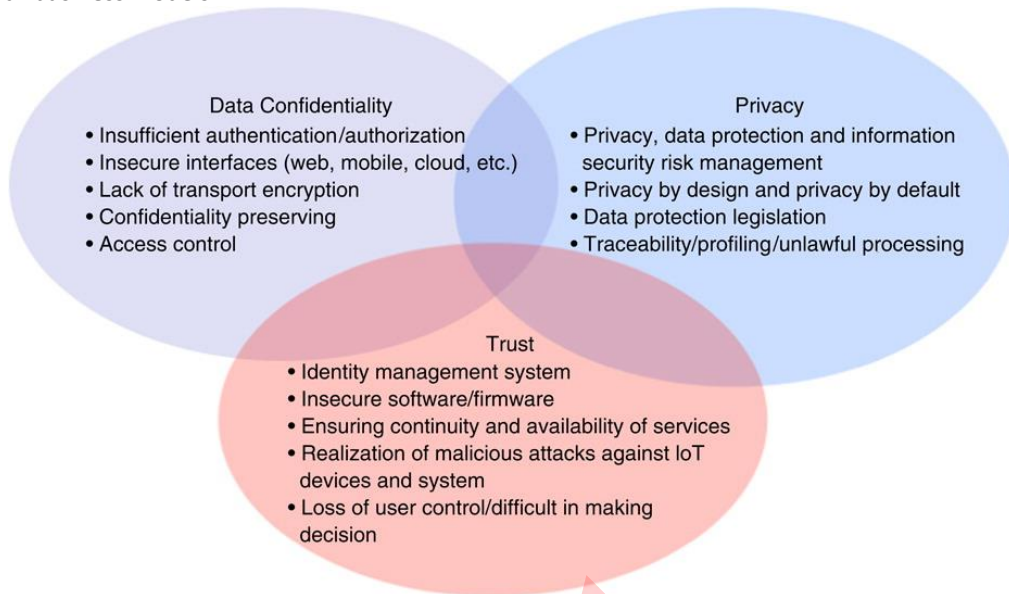


Figure 10: Security issues in IoT

Li et al (2015) call for the further development of **access control and trust management** in particular. It is the mutual interactions of IoT devices that raise the question of how to guarantee the access permission for the authorization process (Sicari et al, 2015). Trust as a concept is well developed in IS/ ICT research.

Trust is a higher-level concept, which extends dependability by adding individual and social behaviour, norms, and patterns to shape the Social Capital (Truong et al, 2017), see Figure below. The trust in the IoT environment, however, requires a special evaluation that differs to usual computer science approach due to the convergence of physical, cyber and social network layers: One of the **trust model** designed for (social) IoT specifically combines data and information covering the **three dimensions: Reputation (global opinions), Personal Experiences, and Knowledge (based on direct observation)** – REK model (Truong et al, 2017) – see Figure 11. The model separates the trust evaluation in humans and devices. Other approaches to trust evaluation utilize the **elements of honesty, cooperativeness, and community interest** (Sicari et al, 2015).

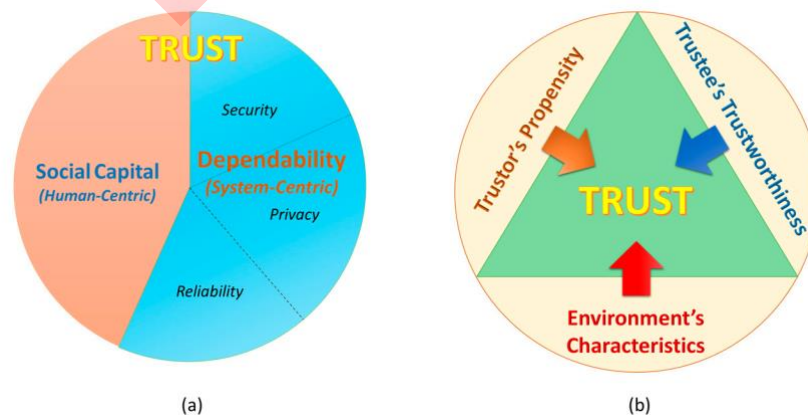


Figure 11: (a) Trust concept in relation to dependability and social capital; (b) Three main aspects of trust in the social IoT environment

Trust building tools and techniques

Trust can be classified into three dimensions: technical trust (e.g. data security, operability of platform), business/trading/community/network trust (e.g. image or credit), and human trust (perceived by individual human or group of members) (Lee, 2015). Suryanarayana and Taylor (2004) classify trust (in terms of trust management) into three types: *policy-based*, *reputation-based*, and *social network-based*. Trust could be also built and maintained along three dimensions: human-to-human trust; human-to-object trust and object-to-object trust. Trust mainly concerns beliefs, credentials, delegation, recommendation and reputation; however, it is interconnected with security issues (comprising confidentiality, integrity and authentication) as well as reliability, dependability and ability and finally also privacy (Lee, 2015). This means that building and maintaining trust must include also these aspects.

Trust building and maintenance starts with awareness of what helps to create and support trust and what may hamper or even destroy trust followed by understanding based on studying the facts (from the experience) and existing knowledge. Belief about trust (and its elements and linkages) is created afterwards and beliefs lead to some action (s).

There are several models, tools and techniques developed for the trust management for internet cloud platforms and IoT environment. Detailed information could be found for instance in Noor et al (2013) or in Noor and Sheng (2011), Lee (2015). From the management perspectives some ideas how to build a trusted cloud ecosystem are suggested by Ernst and Young company (EY, 2014). Such an ecosystem contains Trusted design (controls addressing key areas of risks); Trusted execution (controls execution) of cloud ecosystem and Trusted certification. Six cloud control domains exist in the ecosystem – organizational, technology, data, operational, Audit and compliance and Governance. Lee (2015) refers to the model developed within the EU 7th Framework Programme's project OPTET. The model covers relevant aspects of trust for software development and software operation life cycle, so not directly focused on cloud platform, however model can be inspiring for the ReCiPSS project.

Finding the right balance between providing and protecting the data is crucial, because undue data protection is counterproductive: without data, the companies are unable to provide "smart" services and achieve cost decrease by data-based optimizations (Lee and Lee, 2015).

Overrated data confidentiality can also eliminate the optimization opportunities of big data for sustainability enhancement, "which naturally leads to the question of whether emerging technologies can be used to provide the necessary environmental solutions (Tseng et al, 2018). For initiatives of reuse, remanufacture, recycle to be effective, the operational data needs to be disclosed within cross-industry networks of multiple supply chains (Tseng et al, 2018).

3.2.6 Existing general circular economy business models

Some scholars try to provide a framework that can be useful for CBM design, development or change of the linear model, drawing on the Osterwald and Pigneur's (O&P) Canvas Model. Here we present also sustainability-grounded models which might be inspiring for CBMs as well, one sharing economy canvas model and one IoT general canvas business model.

For example, Joyce and Paquin (2016) adapt the O&P Canvas model to include sustainability and suggest a BM Canvas with three layers, making more clearly the existence of different components of value creation, delivery and capture: economic, environmental and social. For this project, it is important to consider the environmental layer, which tries to capture "how the organization generates more environmental benefits than environmental impacts" (Joyce and Paquin, 2016, p. 1478). This layer, with nine building blocks that are interlinked with the 9

circular business models

building blocks of O&P canvas, can provide useful insights into the design of CBM. Figure 12 presents the framework suggested by the author for the environmental layer.

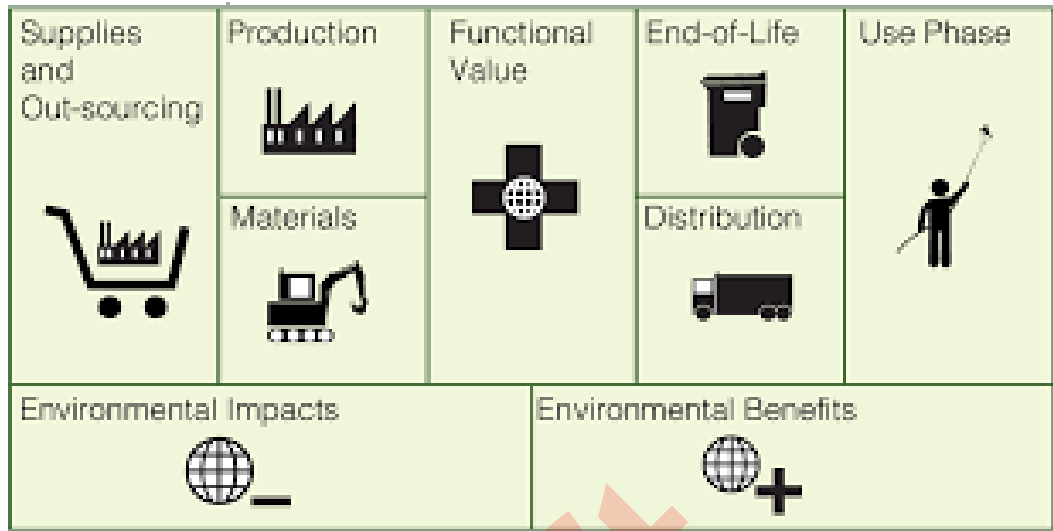


Figure 12: Environmental layer of the Triple Layer Business Model Canvas

Sempels and Hoffmann (2013, p. 39) add shared costs, costs for society and the environment, shared benefits and benefits for society and the environment as the new components into the canvas and adapted value proposition into the sustainable value proposition in their view on a sustainable business model (see Figure 13).

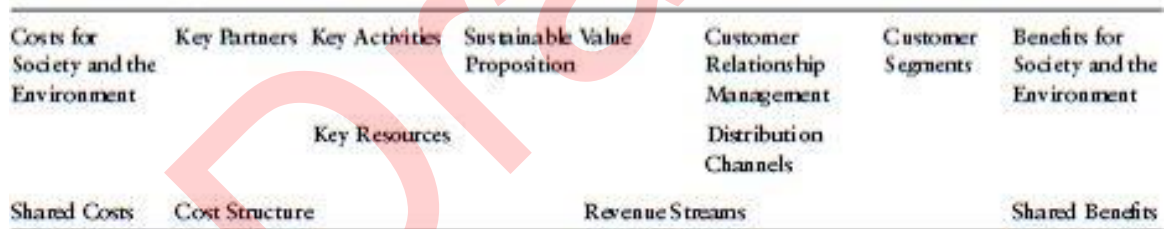


Figure 13: Sustainable business model canvas

Bocken et al (2018, p. 82) suggest the adapted sustainable business model canvas containing value proposition not only for customers but also for the planet, systemic view stressed in some elements of the model, reverse logistics in key stakeholders and possibilities to retrieve products within the channel (Figure 14).

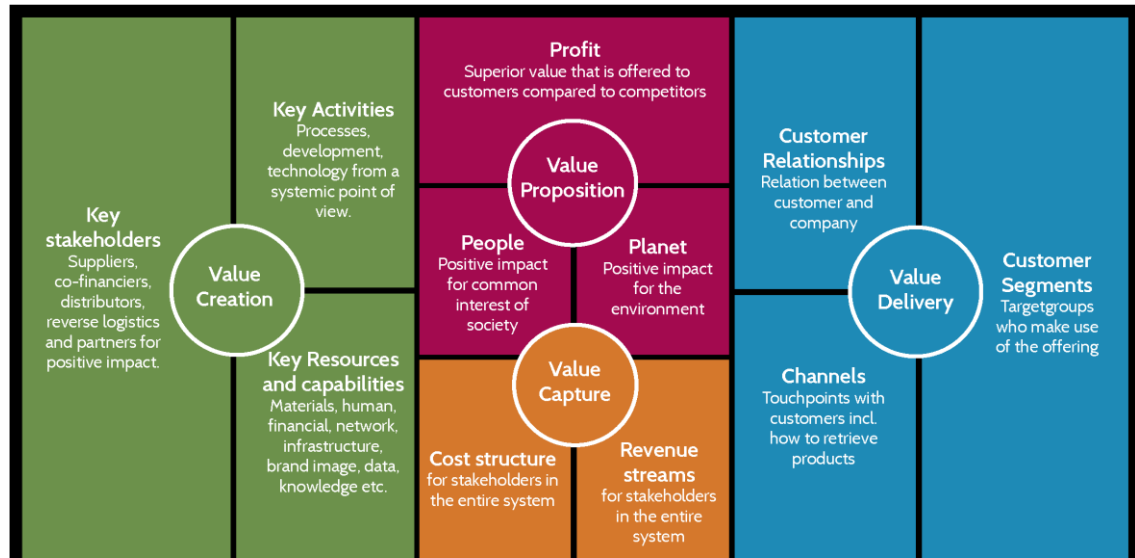


Figure 14: Adapted sustainable business model canvas

Hoffmann et al (2017, p. 174) suggest **C3 Business model canvas** (see Figure 15), where **C3 stands for the three integrated ecological, social and economic dimensions of sustainable development within the circular economy**. There are several problems with this model. First, the authors redefined logic, structure and elements of the original BCM (as they confess) without any argument why and what the redefinition of logic and structure means for whole model architecture. Second, from the text, it is not clear how much do they know about stakeholders, the real meaning of costs and key resources, network relationships or channels as these components are much more complicated to understanding and trying to nest them into the general model. Third, as with other circular business models, the circularity is not visible from the canvas at all.

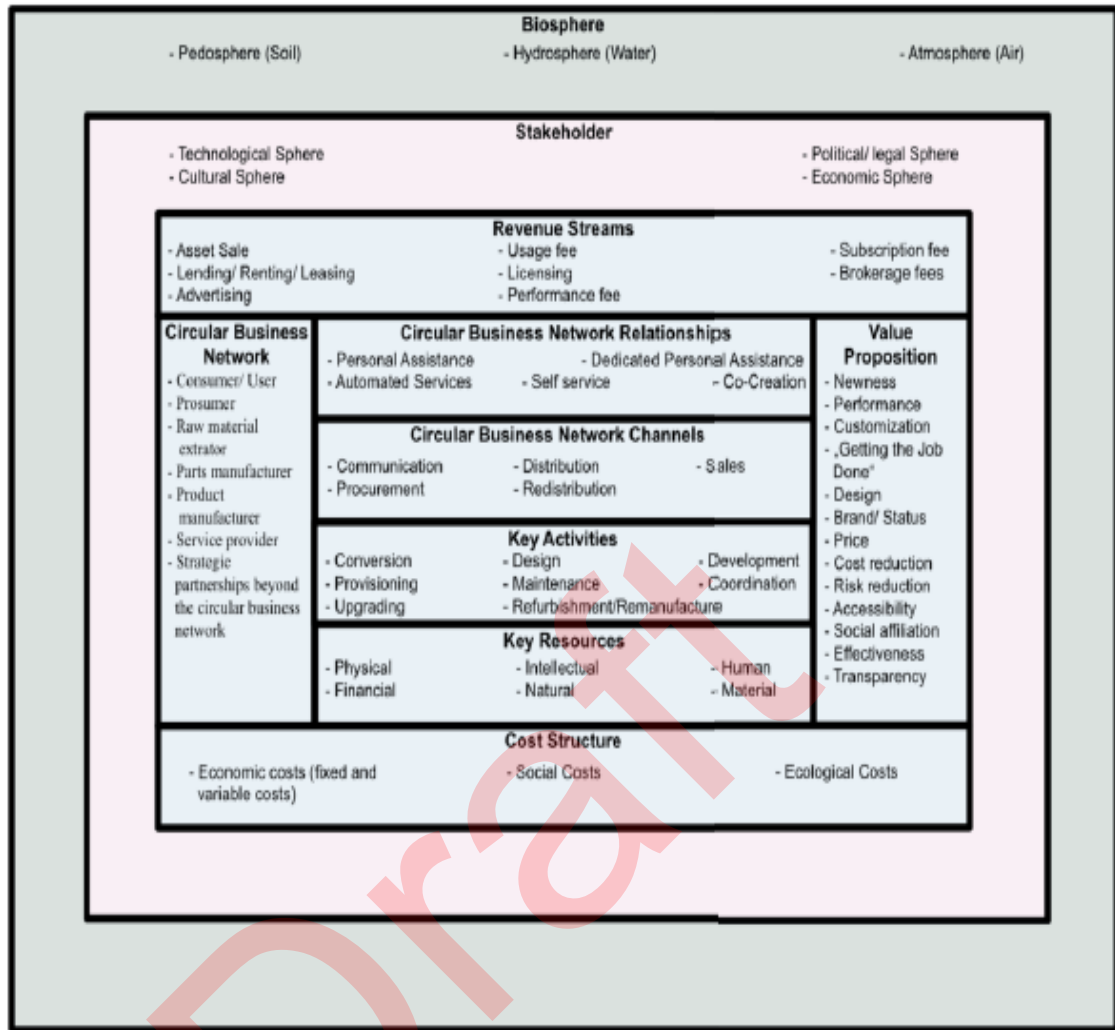


Figure 15: C3 Business model canvas

Barquet et al (2013) also provide some useful insights for this project, by providing an application of the O&P Canvas for product–service systems (Figure 16). These are related to the changes in the ownership model mentioned previously, and to the shift “a new business orientation that considers functionalities and benefits delivered through products and services” (Barquet et al, 2013, p. 693).

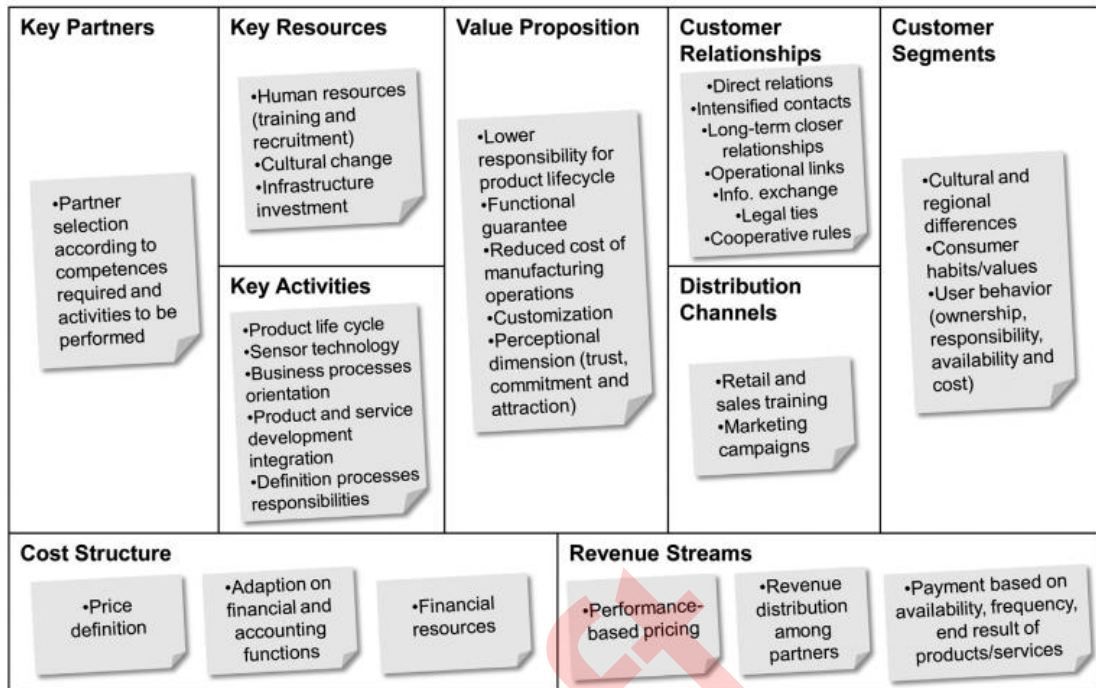


Figure 16: Product-services systems and the O&P canvas

Lewandowski (2016, p. 21) proposed the extension of the O&P Canvas two including 2 extra building blocks (Figure 17): the take-back system and the adoption factors for his understanding of a circular business model.

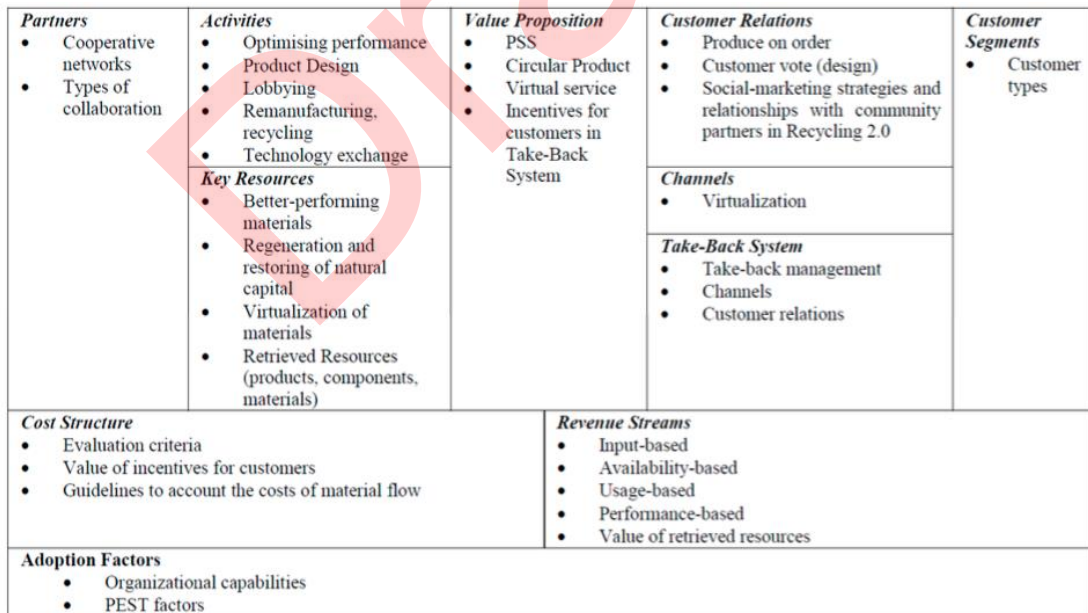


Figure 17: CBM canvas

Muñoz and Cohen (2017) identified seven distinct dimensions of sharing business models: 1) platforms for collaboration 2) under-utilized resources, 3) peer-to-peer interactions, 4) collaborative governance, 5) mission-driven, 6) alternative funding, and 7) technology reliance.

circular business models

IoT technologies present an opportunity to establish innovative business models or to create new solutions for existing ones (Lo and Campos, 2018). Dijkman et al. (2015, p. 676) developed a framework for IoT business models and identified types for the building blocks (Figure 18).

Key Partners Hardware producers Software developers Other suppliers Data interpretation Launching customers Distributors Logistics Service partners	Key Activities Customer development Product development Implementation; Service Marketing; Sales Platform development Software development Partner management Logistics	Value Propositions Newness Performance Customization „Getting the job done“ Design Brand/status Price Cost reduction Risk reduction Accessibility Convenience/usability Comfort Possibility for updates	Customer Relationships Personal assistance Dedicated assistance Self-service Automated service Communities Co-creation	Customer Segments Mass market Niche market Segmented Diversified Multi-sided platforms
	Key Resources Physical resources Intellectual property Employee capabilities Financial resources Software Relations		Channels Sales force Web sales Own stores Partner stores Wholesaler	
Cost Structure Product development cost IT cost Personnel cost Hardware/production cost		Revenue Streams Asset sale Usage fee Subscription fees Lending/renting/leasing Licensing Brokerage fees Advertising Startup fees Installation fees		

Figure 18: Framework for IoT business models

Based on interviews and a survey among IoT professionals, they concluded that value proposition is the most important building block in IoT business models while convenience, getting the job done, performance, comfort and possibility for updates are viewed as the most important types within this block. High importance was also attributed to key partnerships and customer relationships.

4 Systematic literature review. Circular business models and innovative tools

4.1 Circular business models and innovative tools

Deliverable D2.1 should identify existing “tools” (this term will be used for the simplification in the text when dealing with the purpose of the SLR) that may help companies (and specifically both demonstrators) in their move towards (more) circular business model. As Geissdoerfer et al (2017) in their comparison of sustainability and circular economy debate, no clear and unified opinion on some clear dividing line between these two approaches exist, nevertheless this report concentrates on the tools that were invented, developed and created primarily for the circular economy. Such an approach enables focusing on the potential specificities of tools; however, it also can eliminate some important and beneficial approaches that have not been presented as more general or applicable also for the circular economy.

Not only “tool” is reviewed in this systematic review, we have also searched for the concepts that can be understood as the synonyms to the core idea. This means that also frameworks, methods, models and modelling approaches, strategies, schemes, patterns and roadmaps entered the review. We are fully aware of the fact that probably other synonyms could be added to the list as well (e.g. tactics, ways, procedures, mechanisms, practices), but several attempts did not help to enlarge the already found results.

Very common situation is with the expression of the use of the methods. We involved innovation and change as well as the transformation and transition and shift and adaptation in the search to cover as many as possible terms that cover the process from the existing business model to the circular one or to the more circular one. We omitted the term “improvement” which – despite its importance – does not reflect the real procedural need of both demonstrators. Though, improvement is a natural part of most of the tools we detected. For the simplification, the term “transition” represents all possible synonyms in the following text.

All synonyms have been taken into account during the documents review.

There are several arguments why the SLR on the “tools” for the move of companies towards CE is needed. First, “tools” available for the changes or innovation of the linear business models may have limited value for the far more complex solutions in CE (Nußholz, 2017b). Second, even the most recent literature, points to and stress that “tools” are missing. These tools can either support particularly large and traditional manufacturing businesses to increase their understanding regarding consequences of CE business model transitions (Lieder et al, 2017) or enable and accelerate transition as well as identify and tap potentials of transition both on company, inter-company and/or whole network level (Lieder and Rashid, 2016; Leising et al, 2018).

Body of knowledge of “tools” for the business models transition towards circularity is immature, mostly conceptual and covers individual company business models, mostly the niche market pioneers, but rarely (if at all) the mass-market incumbents and relevant network stakeholders of the whole ecosystem (Diaz Lopez et al, 2019; Parida and Wincent, 2019). Parida and Wincent (2019) also highlight that most of the existing research focuses on the business model per se rather than on the process of transformation and offers a static view of a reality, which is actually very complex and dynamic. Supporting argument may be that the existing literature on the circular economy has been developed in the domains outside the management and

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organizational theory (Lahti et al, 2018). However, management and organizational theory is built largely on the investigation of the practice (of the management processes, managerial mindset, cognitive schemes and the conceptual representations), but only very few companies have managed the transformation towards the circular business yet (Lieder and Rashid, 2016; Lahti et al, 2018; Parida and Wincent, 2019).

Finally, until now, no SLR mapping the “tools” for the transition, transformation or adaptation of business models for circular economy exists.

Table 6 shows strings used for the search in three databases (Web of Science – WoS, Scopus and Proquest), types of documents and results.

	Search strings	Interpretation
Web of Science	<p>(TS = ("business model" AND "circular economy" AND ("tool*" OR "method*" OR "approach" OR "strateg*" OR "model*" OR "framework" OR "scheme" OR "roadmap" OR "pattern*" OR "mechanism" OR "practice*")) AND ("trans*" OR "innov*" OR "chang*" OR "shift" OR "adapt*")) AND LANGUAGE: (English)</p> <p>DOCUMENT TYPES: (Article OR Book OR Book Chapter OR Proceedings Paper)</p> <p>LANGUAGE: English</p> <p>Indexes=SSCI, CPCI-SSH, BKCI-SSH, ESCI</p>	<p>The documents were checked for the presence of keywords in the search string in Topics (encompassing titles, keywords and abstracts) (“TS=” operator).</p> <p>This query generated 87 hits.</p>
Scopus	<p>TITLE-ABS-KEY ("business model" AND "circular economy" AND ("tool*" OR "method*" OR "approach" OR "strateg*" OR "model*" OR "framework" OR "scheme" OR "roadmap" OR "pattern*")) AND ("trans*" OR "innov*" OR "chang*" OR "shift" OR "adapt*")</p> <p>DOCUMENT TYPES: (Article OR Book OR Book OR Book Chapter OR Conference Paper OR Review OR Article in Press)</p> <p>LANGUAGE: English</p>	<p>The query had identical structure/function as above.</p> <p>This query generated 196 hits.</p>

	<p>ft("business model" AND "circular economy" AND ("tool*" OR "method*" OR "approach" OR "strateg*" OR "model*" OR "framework" OR "scheme" OR "roadmap" OR "pattern*" OR "mechanism" OR "practice*") AND ("trans*" OR "innov*" OR "chang*" OR "shift" OR "adapt*"))</p> <p>DOCUMENT TYPES: Scholarly journals OR Conference Papers&Proceedings</p> <p>LANGUAGE: English</p>	<p>250</p>
	<p><i>From 87 document found in Web of Science and 196 documents found in Scopus 70 pieces are the same. Proquest detected 64 new documents. This means that 269 documents in total from both databases entered the first screening.</i></p> <p><i>"trans*" aims to search for both transition and transformation processes towards circular business models;</i></p> <p><i>"innov*" aims to search for the innovative (...) or innovation in the endeavour of companies to cope with the CE challenges;</i></p> <p><i>"chang*" aims to search for changing and/or changes in and "adapt*" for adaptation of parts or of a whole current business model; the same logic is also with the "shift" search keyword.</i></p>	

Table 6: SLR on tools for business models innovation - search queries for two databases

The same search string was also used in Google Scholar. The search revealed 47 000 documents (in this database only first 100 documents were analysed for the purpose of this review).

The first screening was based on the titles, abstracts and keywords to assess the compliance with the research aim and research question. 85 documents from WoS and Scopus remained for further analysis, but 8 documents had to be excluded because the text was not available. In the next step, 77 documents were subjected to the content analysis of the full text.

From Proquest 22 unique documents enrich the outputs of the initial review of titles, keywords and abstracts and from this number 12 document were added into the sample for the next step. Google Scholar search generated 11 documents; however, after the abstract scanning, only 6 of them remained for the whole text review.

During the review of the documents, also a snowball technique was adopted and through the citations made by the authors, additional 9 documents were included in the final sample. Theses and tools designed by some organizations and institutions fell into this number.

Finally, 104 documents were examined thoroughly according in harmony with the research purpose. Reading helped to exclude additional 69 documents which – despite promising abstracts, titles and keywords - were irrelevant for the purpose of the SLR – either because they did not contain any “tool” for the “transition”, or their quality was rather low, or their character was too speculative and reasoning not sufficiently relevant or the tools were extremely simple. In the end, only 35 documents and almost all of the academic articles comprise, to some level the relevant tools. This finding confirms conclusions from the literature about big deficiency in the methodological support for the CE transition.

During the SLR also some article which contains a review of existing “tools” that were found in the literature for designing circular business models have been found. The aims of the articles and the perspectives are substantially different as the purpose of the SLR for the ReCiPSS

project. However, the overview of this information could also be inspiring. The next subchapter introduces this overview briefly.

4.1.1 Existing reviews on circular business models and tools for the transition

Comprehensive review aiming to systematize the state-of-the-art of available approaches supporting circular-oriented or sustainability-oriented business model innovation process has been elaborated by Pieroni et al (2019). The approaches are systematized in three streams. First, based on the Teece’ dynamic capabilities-based view into three categories: (1) Sensing: approaches that help to identify opportunities and generate new BM ideas; (2) Seizing: approaches that systematically design and test new BM concepts or configurations; and (3) Transforming: approaches that help to build new competencies and implement organizational renewal. Second, based on three BMI characteristics: boundaries of analysis (organizational, inter-organizational and societal), abstraction level (aggregated, moderated aggregated and details) and time-related view (static and dynamic). And third, based on the approach type: conceptual framework, guideline manuals, process model, cards/serious game, visualization tool and simulator/software. Some of the articles analysed by the authors constitute a part of the SLR for ReCIPSS project and will be presented in the following subchapter.

Singh et al (2019) identified 145 best practices or approaches to resource efficiency and the circular economy in order to reduce energy and material demand in the product sectors. Approaches include durable product design, enhanced repair and upgrade services, and product take-back models and provide important insights into planning more circular business to resource efficiency.

Lieder and Rashid (2016, pp. 40-42) summarize outcomes of their review of CE categorized according to the three perspectives: “resource scarcity”, “environmental impact” and “economic benefits”. Frameworks, tools, models and methods for decision-making according to these perspectives and selected based on the possible applicability for the transition and shift towards the circular economy, in general, are introduced in Table 7. As can be seen, they differ in depth and breadth, focus and areas of interest and range from very general and probably rather abstract to very narrow and specific.

resource scarcity	<ul style="list-style-type: none"> • approach for multi-scale integrated analysis of societal metabolism • multiobjective pinch analysis eco-industrial park assessment • promotion of a generic CE concept
environmental impact	<ul style="list-style-type: none"> • sustainable supply chain networks as a suitable means of designing closed-loop production systems • the model that allows for the analysis of the flow of Waste Electrical and Electronic Equipment (WEEE) through the reverse chain from the point of collection through to final disposal
economic benefits	<ul style="list-style-type: none"> • combination of substance flow analysis approach with resource productivity indicator • the theoretical framework of corporate sustainability development (CSD) drivers • stocks and flows model for the dynamic assessment of material demands resulting from infrastructure transitions • indicator for “reuse potential” to help both material and waste managers sort out decisions about the technical feasibility of reusing discards • unified CE index System under the condition and trend of green supply chain management • physical input and monetary output model for industrial symbiosis evaluation • hybrid material and energy flow analysis approach at the company level • extended economy-wide material flow analysis model • extended lifecycle assessment (LCA) tool for resource efficiency and more specifically waste management at the end of life products • a discontinuous three-stage model of industrial symbiosis drawing on biological, ecological, organizational and systems theory

	<ul style="list-style-type: none"> • CE indicator system • exploration of methodological issues encountered in the application of LCA to various research questions arising from industrial symbiosis • model for CE evaluation • implementation framework for CE • three-level education framework to meet the theoretical and technological needs of CE implementation • a new approach called Ecological Sanitation
The intersection of the three perspectives	<ul style="list-style-type: none"> • a methodological framework to measure target and planned resource-conserving and environmental-friendly development • analysis of emerging integration of business value and environmental returns in the context of China's CE • approach to prevent waste and other global impacts based on precycling, CE policy and recycling insurance

Table 7: Frameworks, tools, models and methods for decision-making in CE

Pieroni et al (2018b) conducted a comprehensive review of the literature with the purpose to explore the existing methods, which aim to support the development of circular business models and their level of the consideration of and/or integration with product design processes. They identified 10 methods that fulfil more or less the integration of circular business models development and product design. As the authors conclude, weaknesses of the methods from the list reside in their relatively high level of abstractions, missing “how-to” guidance or methodological support and they also lack a more holistic perspective and the connection to commercialisation and operationalization. Despite the authors’ evaluation, some of them are on the list of “tools” as beneficial for the ReCiPSS.

4.1.2 Results of SLR

Results from SLR have been systematized according to several groups of criteria: business model content, i.e. components or elements of BM; ReSOLVE framework combined with 6 business strategies for slowing and closing loops suggested by Bocken et al (2016) and the strategy for narrowing the loops; Pieroni et al (2019) extended boundaries of analysis and adapted approach types and type of work.

Classification according to the BM components [value proposition (VP), customer –stakeholder segment (C/SS), customer/stakeholder relationships (C/SR), channels (CH), key processes (KP), key resources (KR), key partners (KP), cost structure and negative impacts (CS+ NI), revenue streams and positive impacts (RS+PI)] or whole model (WM) helps to understand the importance of the specific features of the components and the ways how they can be evaluated, changed or created, designed or developed as the new ones into the circular model with the concrete tool for CBM innovation.

ReSOLVE framework, circular loops and business strategies help to classify “tools” to be adopted as suitable for the specific circular business target or orientation. Following abbreviations will be used in the text: Regenerate (R), Share (S), Optimize (O), Loop (L), Virtualize (V) and Exchange (E); and slowing and specific strategies/value recovery processes for slowing (SI –xxx), closing (C –xxx) and narrowing (N).

The extended boundaries represent specific business functions (BF), organization (O), network (N), (eco)system (eS) and society (S) and assigning the “tool” to some of these categories enables to see the level of complexity regarding to the organization of processes within circular business.

The last approach types are adapted into the:



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conceptual framework (CF), conceptual method (CM), guideline (G), process (P), process model/method (PM), game (Gm), visualization tool (VT), software simulation (SS) and (statistical) mathematical modelling (MM). The role of this categorization is only in offering a better overview and for the evaluation of the applicability in the concrete situations (considering for instance time, competencies, or other resources available).

Type of work means purely theoretical (conceptual) (T), theoretical and tested in “laboratory conditions” (TTL), theoretical and tested or verified in a real environment (TTR). No purely empirical “tool” was found in the literature.

The last criterion evaluates the maturity of the “tool” based on the practical application and verification. We use a scale from 1-5 from the least mature (1) to the most mature “tool” (5) being fully aware of the very subjective evaluation.

If the abbreviations are in the brackets in the Table 8 below, this means that their indication is not of 100% value.

Whole circular business model (WM)		
<p>Framework for sustainable circular business model innovation</p> <p>(Antikainen and Valkokari, 2016)</p>	<p>The framework may be suitable for the evaluation of the transition towards circularity – it considers macro, meso and micro environment</p>	<p>R, S, O, L, V, E SI, C, N O, N, eS, S CF, VT TTR 1-2</p>
<p>Circular business experiment cycle</p> <p>Bocken et al (2018)</p>	<p>The purpose of the Cycle is to help in designing or redesigning for any sustainability-oriented business model that utilize IoT strategies.</p> <p>The framework combines a level of control between product and user, sustainable design strategies, IoT strategies (capabilities) and the other strategies.</p>	<p>R, S, O, L, V, E SI, C, N O, N, eS, S CF, P, VT TT(R) 2-3</p>
<p>The Ecology of Business Models Experimentation map</p> <p>(Bocken et al, 2019a)</p>	<p>A relatively comprehensive tool for designing new and redesigning existing business model – both for sustainability and circularity. Comprehensiveness lies in many aspects the model involves and in the mutual linkages.</p>	<p>R, S, O, L, V, E SI, C, N BF, O, N, eS, S CF, P, PM, VT TTR 3-4</p>
<p>A framework to support PSS design to encourage sustainable behaviour using IoT strategies</p> <p>(Bocken e al, 2019b)</p>	<p>The framework combines 4 IoT strategies (monitoring, control, optimization and autonomy) connected to/focused on either user or product and other non-IoT strategies (not listed) with 7 sustainable design strategies (considering the level of control (if with the user or product)</p>	<p>(R), (S), O, L, V, (E) SI, C, N BF, O, N, eS CF, VT TT(L) 2-3</p>

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<p>A roadmap for circular business model transformation</p> <p>(Frishamar and Parida, 2019)</p>	<p>The roadmap contains 4 phases with the individual objectives for every phase, a checklist for the important issues in every phase, checklist of the Key activities and the expected outcome</p>	<p>R, S, O, L, V, E SI, C, N O, N, eS, S CF, P, PM (TTR) created on the empirical research 2-3</p>
<p>The use-it-wisely (UIW) approach</p> <p>(Granholm, G. and Grösser, 2017)</p>	<p>The UIW-framework is used as a template for system implementations of practices to develop a Product service system and for support of a systematic adaptation to changing needs by developing business models and technologies to support collaborative efforts.</p>	<p>R, S, O, L, V, E SI, C, N N, eS CF, P, PM TTR 3</p>
<p>Tool for Orchestrating Value Networks</p> <p>(Janssen and Stel, 2017)</p>	<p>Proposal of a conceptual framework for the circular business network “governance” – with some roots in the Balanced Scorecard method</p>	<p>R, S, O, L, V, E SI, C, N BF, O, N, eS, S CF, (P) T(L) (R)? 1 (some potential)</p>
<p>Cascade use methodology</p> <p>(Kalverkamp et al, 2017)</p>	<p>Brief proposal to use cascading of materials in product life management</p>	<p>R, S, O, L, V, E SI, C, N BF, O, N, eS, S CM, (P) T(L) (R)? 1 (some potential)</p>
<p>Collaboration tool for CE</p> <p>(Leising et al, 2018)</p>	<p>Tool or framework consists of the following building blocks: visions, actor learning, network dynamics and business model innovation. Tool is suitable for managing Key processes and activities, Key partners’ relationships and mutual value creation, delivery and capture in inter-organizational, network or whole social system setting.</p>	<p>R, S, O, L, V, E SI, C, N BF, O, N, eS, S CF, P, PM TTR 2-3</p>
<p>Agent-based modelling approach</p>	<p>Model and tool help to identify proper marketing and pricing strategies to obtain best fit demand behaviour. The approach integrates socio-demographic and buying behaviour factors of customers (relative preferences of</p>	<p>S, O, V BF, O, N SS, MM</p>

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(Lieder and Rashid, 2017)	product attributes price, environmental friendliness and service-orientation), product utility functions, social network structures and inter-agent marketing communication in order to comprehensively describe behavior on individual customer level.	TTL 3
BECE framework (Mendoza et al, 2017)	BECE (Backcasting and eco-design for the circular economy) framework is also a method and methodology that integrates strategic planning approach Backcasting with the process design in the framework of a circular economy. This means that 3 CE principles, ReSOLVE framework with added action IMPLEMENT and developed individual actions with so-called iReSOLVE and finally 4 basic CE frameworks create the playground to develop circular business model.	R, S, O, L, V, E SI, C, N BF, O, N, eS, S CF, CM, P, PM, VT TTL -(R) 4
Business cycle canvas (Mentink, 2014)	Method and methodology to develop circular business model	R, S, O, L, V, E SI, C, N BF, O, N, eS, S CF, P, PM, G, (Gm), VT TTL -(R) 2-3
Circular business model mapping tool (Nußholz, 2018)	Tool can help a) identify which interventions are used and which not and a holistic overview on possible interventions could indicate opportunities to potentially capture more of the embedded value and organise value-adding activities; b) helps examine whether the configuration of business model elements is suitable for efficiently supporting the additional cycles, such as whether <i>value propositions</i> are compelling for users in additional cycles or whether <i>key resources and capabilities</i> are present to manage the different cycles; c) can potentially unravel a larger variety of phenomena compared to the traditional business model canvas, e.g. <i>key partners, costs and revenues</i> for each cycle; d) could help show interdependencies between the interventions and how shaping business model elements in one intervention enables value creation from other interventions.	R, S, O, L, V, E SI, C, N BF, O, N, eS, S CF, P, PM TTR 2-3
Process model of ecosystem transformation toward a circular economy paradigm (Parida et al, 2019)	Process model contains 2 steps with the individual activities – ecosystem readiness assessment and ecosystem orchestration mechanisms	R, S, O, L, V, E SI, C, N BF, O, N, eS, S CF, P, PM TTR 3-4
Evaluation tool “Value-Circle”	Methodology including the Evaluation tool for five different values created (and captured) in CBM, Visual tool and the Value metric checklist. <i>“The value circle evaluation</i>	R, S, O, L, V, E SI, C, N

(Ritika, 2017)	<i>scheme assists companies in operating their CBM through an improved understanding of their potential to create value, from a multi-stakeholder perspective”.</i>	BF, O, N, eS, S CF, CM, P, PM, VT TTR 3-4
Value proposition (VP)		
“Checklist” (and a design tool) of the main factors influencing the perception and acceptance of circular solutions (Camacho-Otero et al, 2018)	main drivers (main factors which influence behaviour of three CE solutions) can serve as a checklist for the design of value proposition of the access-based PSS and for the consumer segmentation	S, O, V SI BF, O, N CF TTL 2-3
Emotional Durability Design Nine (Haines-Gadd et al, 2018)	Framework that can be applied at multiple points during the designing new product <i>“to increase the likelihood that ‘emotion building’ features are integrated into an end product”</i> , and so to support prolonging the life of products instead of promoting or being passive within a throwaway society. With nine themes the authors developed also 38 strategies incorporate into the product design	S, O, L SI, (C), (N) BF, O, N, eS, S CF, CM, P, PM, VT, (Gm) TT(R) 4
Conjoint analysis <i>(general statistical method)</i> (Lieder et al. 2018)	<i>“As choice-based method conjoint analysis is beneficial to break down CE value propositions and to identify to what extent particular service-related attributes and product-related attributes contribute to overall customer utility”</i>	O (SI) BF, O, N, S MM TTR 4-5
Framework “design for circular behavior” (Wastling et al, 2017)	Framework which enables to design products and services to encourage desired circular behaviours based on Design for behavior change and Behavior Change Wheel	R, S, O, L, V, E SI, C, N BF, O, N, eS, S CF, CM, P, PM, VT TT(R) 2-3
Customer/stakeholder segment (C/SS)		

<p>“Checklist” of the main factors influencing the perception and acceptance of circular solutions</p> <p>(Camacho-Otero et al, 2018)</p>	<p>See above</p> <p>main drivers (main factors which influence behaviour of three CE solutions) can serve as a checklist for the consumer segmentation</p>	<p>S, O, V</p> <p>SI</p> <p>BF, O, N</p> <p>CF</p> <p>TTL</p> <p>2-3</p>
<p>Emotional Durability Design Nine</p> <p>(Haines-Gadd et al, 2018)</p>	<p>See above with Value proposition</p> <p>Applicable for characterising segments</p>	<p>S, O, L</p> <p>SI, (C), (N)</p> <p>BF, O, N, eS, S</p> <p>CF, CM, P, PM, VT, (G)</p> <p>TT(R)</p> <p>4</p>
<p>Customer/stakeholder relationship (C/SR)</p>		
<p>“Checklist” of the main factors influencing the perception and acceptance of circular solutions</p> <p>(Camacho-Otero et al, 2018)</p>	<p>See above</p> <p>Checklist can also be used for the evaluation of the promises fulfilment and relationship maintenance with consumers in CE (especially in the access-base PSS).</p>	<p>S, O, V</p> <p>SI</p> <p>BF, O, N</p> <p>CF</p> <p>TTL</p> <p>2-3</p>
<p>Emotional Durability Design Nine</p> <p>(Haines-Gadd et al, 2018)</p>	<p>See above with Value proposition</p> <p>Applicable for building and maintaining the relationships</p>	<p>S, O, L</p> <p>SI, (C), (N)</p> <p>BF, O, N, eS, S</p> <p>CF, CM, P, PM, VT, (G)</p> <p>TT(R)</p> <p>4</p>
<p>the Pro-Circular Change Model (P-CCM)</p> <p>(Muranko et al, 2018)</p>	<p>Model may identify and influence “pro-circular behaviours” of customers</p>	<p>(R), (S), (O), L</p> <p>SI, C, N</p> <p>BF, O, N, S</p> <p>CF, VT</p> <p>T</p> <p>1</p>

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<p>Consumer Intervention Mapping (CIM) Tool</p> <p>(Sinclair et al, 2018)</p>	<p>Tool for creating future product strategies for CE PSS. The tool visualises the points within a product’s lifecycle where stakeholders are able to intervene in the product’s expected journey. CIM contains concentric rings that enable to indicate the degree to which an organisation is able to control consumer interventions, with decreasing ability moving away from the centre of the map. At the narrowest level of detail, CIM offers 18 discrete phases of the interventions. The tool can also be used for portraying how a particular product lifecycle moves in and out of an organisation’s control.</p>	<p>(R), S, O, L, V, E SI, C BF, O, N CF, CM, VT TTL 2</p>
<p>Key resources (KR)</p>		
<p>ICT infrastructure for PSS</p> <p>(Asif et al, 2018)</p>	<p>Proposed infrastructure for access-based PSS for the washing machine which incorporates various features and properties (e.g. predictive maintenance, ticketing etc.)</p>	<p>S, O, L, V SI, C BF, O, N CM, P T 2- 3</p>
<p>conceptual framework for mapping functionalities of digital technologies to enable CE transition</p> <p>(Bressanelli et al, 2018)</p>	<p>simple framework/checklist for evaluating two categories of digital technologies (IoT and big data and analytics) as the enablers of increasing resource efficiencies, extending lifespan and closing the loop.</p>	<p>R, S, O, L, V, E SI, C, N BF, O, N, eS, (S) CF TT(R) 1-2 (potential)</p>
<p>Circular Material Library</p> <p>(Virtanen et al, 2017)</p>	<p>the Circular Material Library should work as a tool to support industrial symbiosis, open to the different stakeholders and to promote the use of recycled materials.</p>	<p>S, O, L, V SI BF, O, N, eS, S CM, P T 2- 3</p>
<p>Key processes (KP)</p>		
<p>Predictive maintenance model</p> <p>(Franciosi et al, 2017)</p>	<p>Periodic preventive maintenance model establishes the optimal maintenance period for each system component, which minimizes conventional, environmental, and social costs generated by maintenance interventions and enables to choose the most suitable parts from the sustainability perspective</p>	<p>S, O, (L), V, (E) SI, C, (N) BF, O, N, eS, S CM, MM TTR 3-4</p>

<p>“Checklist” for key processes (strategies) enabling closing and slowing the loops</p> <p>(Mestre and Cooper, 2017)</p>	<p>Simple checklist with the summarized key processes enabling closing and slowing the loops (and to some extent also narrowing the loops)</p>	<p>R, S, O, L, V, E SI, C, (N) BF, O, N, eS, S CF, P, VT TT(R) 1-2</p>
<p>“Typology of upgrades” and “checklist of practices” for the upgradable PSS</p> <p>(Pialot et al, 2017)</p>	<p>Proposal of hybrid systems called “Upgradable Product-Service System (Up-PSS)” which combine upgradability with optimised maintenance, valorisation of end-of-life parts and with the servitisation of the offer. The system can be used as a checklist for practices within PSS when upgrading is needed and as a typology of upgrades</p>	<p>S, O, L, V, E SI, C, N BF, O, N, (eS) CF, P, PM TTR 2-3</p>
<p>Cost structure and negative impacts (CS+ NI)</p> <p>Tools for the assessment and measurement and evaluation of performance, costs and negative impacts</p>		
<p>Environmentally extended input–output analysis (EEIOA) for circularity interventions</p> <p>(Aguilar-Hernández et al, 2018)</p>	<p>Explanation of the main benefits and problems with the input-output analysis for four circularity scenario and presentation of the process how to use this method for CE</p>	<p>R, S, O, L, V, E SI, C, (N) BF, O, N, eS, S PM, MM TT(R) 4</p>
<p>Multi-method simulation technique for the economic and environmental performance of the circular product system</p> <p>(Asif et al, 2016)</p>	<p>Comprehensive agent-based model and multi-method-based simulation technique which incorporates various categories of inputs from the external and internal environment, causalities and inter-dependencies to measure and evaluate different economic and environmental dimensions of the circular product service system performance</p>	<p>S, O, L, (V) (E) SI, C, (N) BF, O, N, (eS) CF, CM, P, PM, SS, MM T 4</p>
<p>Guidelines for Life Cycle Assessment of Product Service Systems</p> <p>(Kjaer et al, 2018)</p>	<p>Guidelines for the process of LCA considering specificities of 3 different PSS. Guidelines reflect relatively detailed inputs and different requirements from the actors.</p>	<p>R, S, O, L, V, E SI, C, N eS CF TTL 3-4</p>
<p>Analytical calculation-based tool for assessment of the two BM ways of value capture</p>	<p>A simple analytical tool allowing manufacturers to quickly evaluate and compare the potential attractiveness of a circular business model – selling and leasing. “The tool shows which parameters drive profit and TCO and permits an easy sensitivity analysis”</p>	<p>S, O SI BF, O, N</p>

(van Loon et al, 2017)		CM, MM TTL 3-4
Framework for evaluating the environmental value propositions of CE business models (Manninen et al, 2018)	- Framework consists of an environmental value propositions table (EVPT) and a step-by-step approach towards an evaluation process - Framework can be used both for planning and designing new CE business models or for the assessment of the environmental benefits and for the assessment of the contribution to sustainability - Framework, content of the EVPT and approach has been tested with one recycling company and two renting companies (one is Homie)	R, S, O, L, V, E SI, C, N eS CF TTR 3
List of several methods and tools for measurement of the impacts on the environment (Pajula et al, 2017)	- Life Cycle Assessment (LCA) - Carbon Footprint measurement and tracking of greenhouse gas (GHG) emissions - Water footprint = tool for the assessment of potential water-specific environmental impacts of water use associated with a product, process or organisation - Handprint - a measurement of the positive changes of actions and the beneficial impacts created within the life cycle of products, services, processes, companies, organizations or individuals	R, S, O, L, V, E SI, C, N BF, O, N, eS, S CF, CM, PM T 3
Retention streams, benefits, positive impacts		
Environmentally extended input-output analysis (EEIOA) for circularity interventions (Aguilar-Hernández et al, 2018)	See above Possible to apply also for revenue streams and benefits	R, S, O, L, V, E SI, C, (N) BF, O, N, eS, S PM, MM TT(R) 4
Two-stage dismantling planning method for value recovery (Cong et al, 2017)	Two-stage dismantling planning method that considers both preservation of functional value of components and increasing profitability by applying suitable dismantling technologies. In this paper, disassembly is defined to be preservative disassembly, which means that components are kept intact during disassembly	S, O, L, E SI, C, N BF, O, N, eS, S CM, SS, MM T, TTL 3

Table 8: SLR results - tools for the BMI for CE

Most of the existing “tools” are conceptual and they exist in the form of a proposal, despite the fact that some of them have been tested in “laboratory” environment or during the interviews with practitioners. Only a few were tested in the more complex form. “Tools” for the revenue streams or benefits are almost non-existent. This might be due to the early stage of existing circular businesses or due to the conscious or unknown problems with capturing intangible benefits (probably more typical for circular business in the early period. The same situation is with segments (either customers or other relevant stakeholders). Only two tools fall into that

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component. “Soft tools” prevail. This is not negative, as transformation or transition of the social system as a business, requires soft tools. Nevertheless, softness could be in more harmony with more complex elaboration. As evident from the Table 8, frameworks represent the majority of “tools” and very big share of them are really only outlines of real frameworks.

The case studies through which some or most of the “tools” were tested show that the authors are probably cautious or those few bigger companies which turn their attention toward CE are either not known to the authors or they want to take care for the transition themselves. In most cases, small companies and/or start-ups cooperated in the research.

The overview also shows that from the ReSOLVE framework principles “Regenerate” and “Exchange” are not often equipped with the tools. There are basically no guidelines and only few process models or methods exist. One comment should be added here – despite the existence of several tools and toolkits in the form of games (and online games), these are only sporadic studied in the literature. What is almost missing are the tools, which could be used for the IoT or cloud manufacturing, and IT platform based business models.

Based on the review, several tools seem to be appropriate for both demonstrators. **Experimentation** (Bocken and her co-authors) with relatively mature methodology is very effective for building and maintenance of the organizational and inter-organizational culture and procircular commitment and enthusiasm. Experimentation and other “tool” that involve more stakeholders and support sharing, and mutuality of goals, views, and open the space for mutual strategies play a pivotal role in any change management. **BECE framework, a process model for ecosystem transformation** and **Emotional Durability Design Nine** can also be very beneficial for such social movement. The only problem is that both demonstrators are from global mass-market manufacturing and existing experimentation and other tools that help to connect different stakeholders in a one-time window are very challenging if not even impossible to apply. Simulation (mathematical or statistical) tools are from the other end of the spectrum, but for large global enterprises with mass production are necessary. Another example is visualisation, especially in the case of a complex and dynamic environment. Visualisation tools are helpful in any case and the same can be written about any form of the Lifecycle analyses. This is why we recommend using for instance Kjaer et al’ **Guidelines for Life Cycle Assessment of Product Service Systems**.

SLR did not detect any special tool for one of the demonstrators and their business, although some of tools seem to be focused on consumers and mass consumer goods. Somehow surprising is the scarcity of “tools” for logistics and supply chains and for the digital infrastructure management. A Balanced Scorecard (BSC) method, which exists also in the adapted version for sustainability oriented business and is broadly accepted by managers for both strategy development, strategy deployment and resulted performance evaluation, is surprisingly not reflected in circular business models at all except one paper (involved in the SLR, however the method is not well applied). BSC offers well elaborated methodology, it is enough flexible and open method to encompass and reflect also CE aspects and principles and managers are familiar with the method.

5 Environmental scanning and market analysis – Bosch

The circularity of products is not a new idea for Robert Bosch GmbH since this company belongs according to the Persistence Market research (PMR, 2018) among key players at the global automotive parts remanufacturing market:

- BORG Automotive A/S
- Detroit Diesel Corporation
- Caterpillar Inc.
- Jasper Engines and Transmissions
- Motorcar Parts of America, Inc.
- Marshall Engines
- **Robert Bosch GmbH**

However, circularity in the automotive aftermarket – as will be shown in the following text – has substantially non-circular character. This situation is the result of the forward and reverse supply chains character which is far from circular. In most of the practice, the flows of products coming back for remanufacturing (or for other reasons, e.g. warranties) take the linear path and usually copy the forward route. This situation has a very long tradition which is accompanied with the long-term build and maintained relationships between the trade levels with the aim to deliver the product to the final customer with the best quality of service (right product to the final local destination as fast as possible at the best price). Trends that have emerged in the automotive manufacturing and automotive aftermarkets recently offer the chance to change such patterns. The aim of the Bosch is to streamline the reverse logistics process with the help of the internet cloud-based platform.

It is important to consider the lifecycle of passenger cars since this is relevant for the management of the automotive aftermarket business. The Capgemini's automotive passenger car lifecycle model (Capgemini Consulting & University of St. Gallen, 2010), which describes the usage patterns of end customers in their consumption of parts and services and considers the average use of an automotive passenger over a period of 13 years⁵, splits the lifecycle into three phases. The first phase runs from one to four years of the car's age, and mainly corresponds to the warranty period of the car. Phase two describes the years from four to seven. Finally, the third phase describes the years from seven to typically 13. Typically, the older the car gets, the more sales of parts at OEM-owned retail and franchised dealerships to decrease in favour of independent retailers. OEMs are continually seeking solutions to minimize this situation as the parts business offers attractive margins. (Capgemini Consulting & University of St. Gallen, 2010).

Aftermarket industry contains all activities related to maintaining a car after its initial sale and until the end of its lifecycle (Capgemini Consulting & University of St. Gallen, 2010). It represents an important share of the whole automotive industry revenues, representing around 20% (Breitschwerdt et al, 2017, Koggersbøl et al, 2018). It also exhibits higher profitability than most of the other subsectors of the industry (Breitschwerdt et al, 2017).

The global value for the automotive aftermarket, in 2015, was of approximately USD 760 bn, with North America representing 35%, Europe 31% and China 10%. (Breitschwerdt et al, 2017). Globally, the market is growing (Capgemini Consulting & University of St. Gallen, 2010), driven

⁵ In the EU countries the average age of passenger cars in 2018 was 10,5 years (ACEA report, 2018), while in the USA the age is increasing and in 2018 it was 11,8 (Szatkowski, 2019).

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by a growing car park and new sales, longer vehicle lifetime and, finally, new digital products and services (Koggersbøl et al, 2018), although there are differences in growth rates across regions: North America and Western Europe are quite mature markets and will exhibit a slower growth, compared to Eastern Europe and Asia (Breitschwerdt et al, 2017; Koggersbøl et al, 2018). In Europe, towards 2025, the aftermarket is projected to grow at 2.4% in Western Europe and 5.0% in Eastern Europe annually, and it is expected to reach EUR 161 billion by 2025 (Koggersbøl et al, 2018).

The aftermarket is becoming increasingly important to the automotive industry compared to new car sales (Capgemini Consulting & University of St. Gallen, 2010). Considering the total revenue stream of a typical 13-year car lifetime, in Western Europe only 37% of the total revenue stems from the new car sale. The aftermarket business accounts for the remaining 63% (Capgemini Consulting & University of St. Gallen, 2010).

The automotive aftermarket includes both the service business (maintenance and repair of the vehicle) and the parts business. In Europe, the service business generates about 45% of total aftermarket revenues in Europe, while retail and wholesale of vehicle parts make up the remaining 55% (Breitschwerdt et al, 2017). The European automotive parts aftermarket was witnessing a rapid growth (ReportBuyer, 2018) and was estimated at EUR 123 billion in 2017 (Koggersbøl et al, 2018).

In terms of business growth, there is a difference between Western and Eastern European countries, which is reflected in the firms' strategies. Because of slow growth and intense competition of the Western European aftermarket, marketing and sales activities concentrate on promoting customer loyalty to dealers and repair shops across the car lifecycle. Eastern Europe aftermarket is growing faster and has a relatively moderate competitive intensity. Here, most companies are mainly confronted with the need to improve activities across marketing and sales, sourcing, distribution, planning and reverse-logistics processes. (Capgemini Consulting & University of St. Gallen, 2010).

Despite the growth of the market and the increased business opportunities, the aftermarket is surprisingly inefficient, due to the excess of infrastructure and inventory (FTI Consulting, 2017). To solve inefficiency problem, it is necessary to find the balance between costs and customer proximity, developing a more cost-efficient distribution network, leading potentially to a reduction in the density of warehouse locations, wholesalers and workshops (Capgemini Consulting & University of St. Gallen, 2010).

There are two distribution channels within the automotive parts sector, these being original equipment (OE) sales of the original equipment manufacturers' (OEMs) products and the independent aftermarket (IAM). OEM products flow to the markets through both OEM distribution network(s) and via the IAM players (see Figure 19) (Breitschwerdt et al, 2017, p. 9). Each of these distribution channels has around 50 % of the market at the consumer level. Three main players exist: OEMs that are usually multinationals, independent operators that are mainly SMEs, and parts manufacturers that can be both multinationals or SMEs. Vehicle manufacturers are themselves usually OEMs only in respect of their unique intellectual property, typically the engine and transmission systems (Parker et al., 2015).

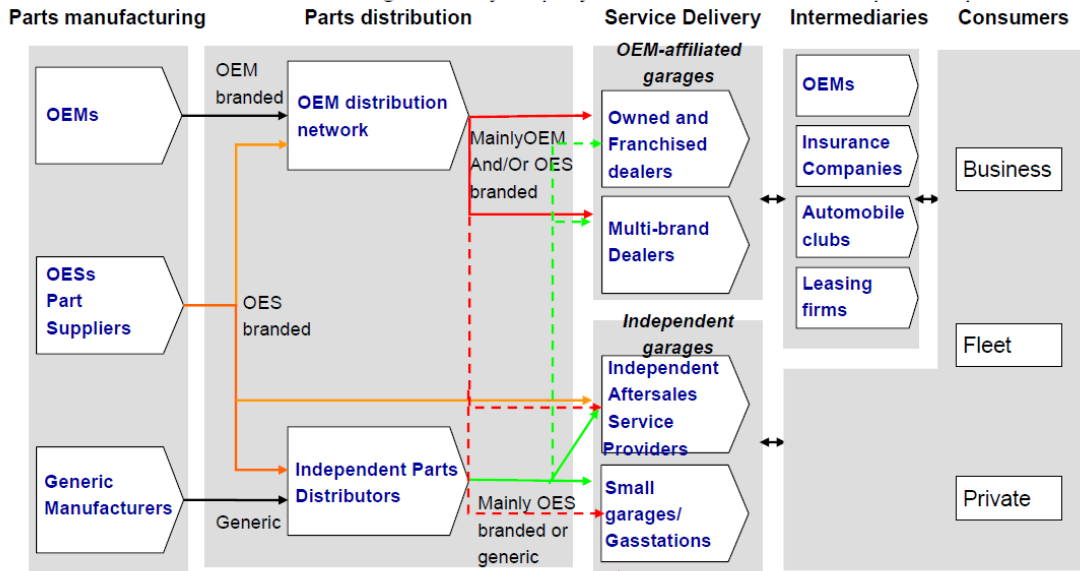


Figure 19: Distribution channels for parts forward delivery

Europe is home to some of the leading Original Equipment Suppliers (OES), but vehicle manufacturers produce only about 20% of the components themselves (FIGIEFA, 2019). The rest of the parts is produced by parts manufacturers, i.e. first equipment suppliers and independent parts producers who supply the independent aftermarket exclusively.

The automotive industry is one with the longest tradition in remanufacturing and the world’s largest remanufacturing sector (Linde et al, 2014; Matsumoto et al, 2016). Remanufacturing is a very complex process which begins with collecting the core (or more precisely in designing products suitable for remanufacturing). Operating in the aftermarket entails a significant number of services and parts activities, and the set-up of crucial supply chains. It is necessary to excel in a wide range of activities like sourcing, planning, marketing and sales, distribution, and reverse logistics. It is also necessary to develop inter-firm collaboration with a large set of stakeholders, both in the supply chain and in distribution chains, namely suppliers, wholesalers, distributors and dealers/repair shops, covering all partner relationships. (Capgemini Consulting & University of St. Gallen, 2010)

This complex process becomes more interesting and challenging recently due to the higher consciousness of environmental issues and directives from the European Union such as the end-of-life vehicles (ELV) directive and due to the increasing average age of the existing vehicles fleet globally. (Lind et al, 2014). There are many reasons of such complexity, for instance because of the existence of very complex aftermarket forward supply chains through several trading levels (TL), very complex products as cars are and even because of very complex suppliers base of the automotive manufacturers – Olugu e al (2010) report that in a typical automobile manufacturer, there exist between 200 and 300 suppliers. However, automotive aftermarket (AA) is extremely important for sustainable business. As CapGamini study (2010) reports, from the total revenue stream of a typical 13- year car lifetime, only 37% of the total revenue stems from the new car sale. The markets with the highest growth of the remanufactured spare parts demand in the future are APAC (Asia Pacific countries) (McKinsey&Company, 2017; PMR, 2018).

The complexity of automotive aftermarket reflects the situation in the forward supply chain. According to the Deloitte (2014) report, the automotive industry’s supply chains are among the world’s most complicated. As the car as a product is getting more complex, it is accompanied by

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a growing number of stock-keeping units (SKUs). Forward (and reverse) supply chains have several levels (see Figure 29 as an example for the European market – the picture is very simplified as every country has its specific structure) and this has an impact on the physical, financial, and information flows which are of course also increasingly complex and difficult to manage. Also, the price of such a mass product as the cars are is extremely high – again, this issue is reflected in both forward and reverse flows complexity.

Due to this complexity and to the strong interdependence between stakeholders, information technology is a key business enabler and is essential to manage activities, namely for coordinating and supporting the processes, to transparency increase within the supply chain, and to better control and realization of end-to-end decisions. (Capgemini Consulting & University of St. Gallen, 2010)

In Europe, there is an increased complexity source, related to national differences in their buyer preferences, trading practices, income levels, demographic structures and tax systems (Brenner et al, 2018). There is a marked difference between countries in terms of characteristics of the car parks (vehicle age and price segment), in the needs and expectations of repair shops and their customers, and in warranty arrangements (Brenner et al, 2018). This diversity hinders the scaling up of business models across Europe. Picture visualizing the structure of the automotive aftermarket in Europe in simplified form is available as Figure 20 (Wolk after sales experts, 2018)

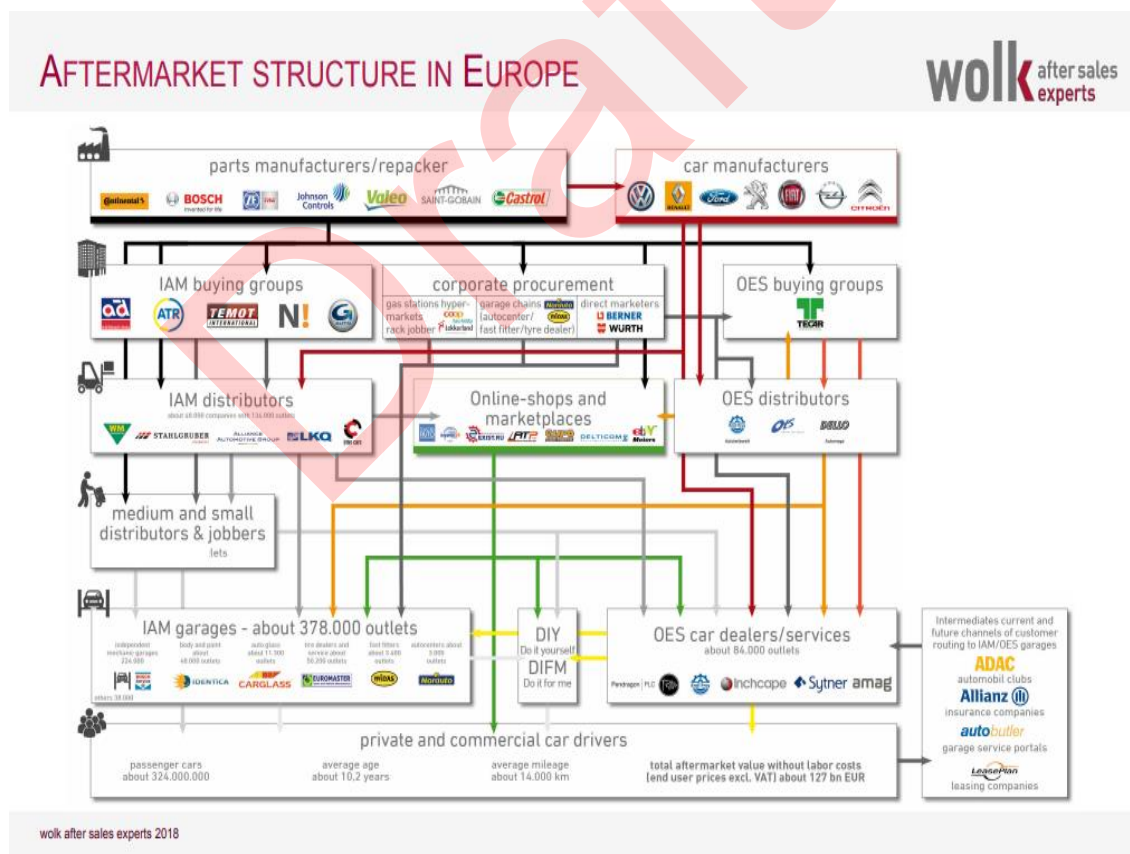


Figure 20: Aftermarket structure in Europe

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More information about the roles of the major actors is depicted in the following Figure 21 (Kalverkaamp and Raabe, 2018, p. 120):

Group of actors	Basic business activities	Role in the remanufacturing market
OE remanufacturing		
Original equipment manufacturers (OEMs)	Production of new cars (and some components for those cars)	Remanufacturing of particular (OEM) components
First-tier suppliers (of OEMs)	Production of new components for OEMs and car services (repair shops)	Remanufacturing of particular supplier components
Independent remanufacturers	Remanufacturing	Remanufacturing of types of components from different OEMs/first-tier suppliers
Authorized repair shops	Service for cars of corresponding OEM brands or a first-tier supplier brand	Customer for parts (new or remanufactured parts; rarely copies) and provider of cores
Repair shops	Service for vehicles of all brands (or a range of brands)	Customer for parts (new and remanufactured parts or copies) and provider of cores
Scrap yards (including dismantlers)	Treatment/preparation of end-of-life vehicles (ELVs) for reuse of components and for material recycling/recovery	Provider of cores
Core dealers	Trade with used car components (cores)	Intermediary: consolidation, sorting and allocation of cores
Wholesalers	Trade with spare parts (components)	Intermediary: Consolidating spare parts for (authorized) repair shops
Integrated wholesalers	Trade with spare parts and used parts (cores) and remanufacturing (can be outsourced)	Intermediary: consolidating cores (like a core dealer) and spare parts (for repair shops) at the same time

Figure 21: Groups of Actors in the Automotive Remanufacturing Marketing System

Remanufacturing and reman cores business create a substantial part of the aftermarket business. The agreed definition⁶ of a reman part⁷ and a core⁸ requires fulfilment of some preconditions, as for instance: logistically mature country enabling the core collection process; reman plant close to target market; economics of core collection; close-loop from core collection to sales; legal issues: authorization of reman products and processes in different countries, legislation to support remanufacturing and circular economy (Bosch, 2015).

All existing consultancy studies mention that the European automotive aftermarket is in the midst of profound structural change, affecting stakeholders’ positions as strategies. We can find relevant changes in several areas.

⁶ Agreement was made between The European Association of Automotive Suppliers (CLEPA), Motor & Equipment Remanufacturers Association (MERA), Automotive Parts Remanufacturers Association (APRA), Automotive Parts Remanufacturers National Association (ANRAP), European Organization for the Engine Remanufacture (FIRM) and Remanufacture Committee of China Association of Automobile Manufactures (CPRA)

⁷ “A remanufactured part fulfils a function which is at least equivalent compared to the original part. It is restored from an existing part (CORE), using standardized industrial processes in line with specific technical specifications. A remanufactured part is given the same warranty as a new part and it clearly identifies the part as a remanufactured part and states the remanufacturer.” (available at: <https://www.mera.org/news/remanufacturing-associations-agree-international-industry-definition-0>)

⁸ “A core is a previously sold, worn or non-functional product or part, intended for the remanufacturing process. During reverse logistics, a core is protected, handled and identified for remanufacturing to avoid damage and to preserve its value. A core is not waste or scrap and is not intended to be reused before remanufacturing” (available at: <https://www.mera.org/news/remanufacturing-associations-agree-international-industry-definition-0>)

Deloitte report presents four key challenges for this industry (p. 3):

- High refurbish and disposal costs
- Lack of accountability for returned goods
- A high percentage of “no warranty found” claims
- Limited visibility into reasons for returns.

Challenges regard especially the collection of cores and influence – unfortunately negatively - efficiency and effectiveness of remanufacturing and sale of remanufactured spare parts (Matsumoto et al, 2016). There are several issues linked to the challenges presented above:

1. the need for service parts increases with the age of the car;
2. the need to have spare parts for older cars due to a legislation-based time period;
3. small-scale new production for the aftermarket is expensive.

Owing to the rather complicated and complex forward supply chain, a lack of the control regarding the potential flow of returned products, their quantity, quality and timing as well as of directions of the returned products exist. To achieve a steady flow of cores or to achieve a flow of cores when needed with the right quantity and quality (so-called delivery performance) is the biggest challenge for remanufacturers in the automotive aftermarket (Lind et al, 2014). This is also supported in the report of the European Remanufacturing Network) where one of the study participants from the automotive aftermarket expressed this situation as: *“Not always are certain cores available on the market and therefore it is needed to buy certain cores no matter if they are currently required”* (ERN report, 2016, p. 57).

According to McKinsey&Company market study (2017), about half of the revenues come currently from wear-and-tear parts, followed by crash-relevant parts, diagnostics products, services, and other parts. Going forward, it is expected that the growth of wear-and-tear parts will slow down due to increasing part quality, e-mobility or e-cars, and price pressure.

The lack of control is caused by: a) *“reflection of the uncertain life of a product; b) product life cycle stage and the rate of technological change and c) the dispose behaviour, which results in a stochastic return pattern”* (Sundin and Dunbäck, 2013, p. 2) and due to the fact that the demand for cores is greater than the supply (Lind et al, 2014). The **dispose behavior, which makes problems with the steady and right quantity and quality flow of cores means that there is sometimes a lack of awareness of the value of the cores (even if the deposit for return is used as the incentive) and that the quality of a core is unknown. Such a situation may lead to the potential scrapping of cores** which may have value for remanufacturing (Lind et al, 2014).

The uncertainties in the supply and demand make problems for remanufacturing companies with balancing supply and demand which means to try to **balance between the risk of building up excessive amounts of inventory or low levels of customer service** (Sundin and Dunbäck, 2013).

The bargaining power of the players - suppliers in the automotive aftermarket - regards to the reverse logistics processes shows that especially in sorting and cleaning the power is higher with suppliers as the demand for cores is much greater than supply. As Lind et al (2014) conclude, *“remanufacturer must surrender to the suppliers’ wishes, and therefore, there are no incentives for the supplier to sort out bad cores before supplying the remanufacturers. A further positive aspect for the supplier to send the cores unsorted is that it is possible that the remanufacturer lets a bad core ‘go through’ the sorting process, and the supplier will therefore get paid for a useless core. The suppliers to the remanufacturers are thus in a favourable situation, where they*

circular business models

can avoid the sorting cost and also earn more money by selling bad cores.” (pp. 11-12). This leads to the situation that the remanufacturers normally cannot remanufacture 20% to 40% of the cores that they purchase; however, they do not consider this to be a major problem (according to the findings of Lind et al, 2014).

Core logistics is central to get the right cores. Remanufacturers can procure cores from several sources; namely, they own products, warranty returns, from other manufacturers or from core dealers (Kemény Boehme & Company & ReMaTec, 2017). Figure 22 below (Kemény Boehme & Company & ReMaTec, 2017) illustrates how different stakeholders use these options, knowing that the choice depends on the type of business and on the access to the end consumer.

HOW DID YOU GET BACK OLD PARTS/CORES?¹⁾
MAIN SOURCES

Source	OEM/OES	IAM	Tier-n	Others
my own products (sales w/o warranty)	41%	29%	17%	0%
warranty return products	28%	5%	50%	67%
second/third party products	10%	24%	17%	0%
core/part dealers	21%	43%	17%	33%

Figure 22: Sources for cores

Five different types of core suppliers can be identified:

- Original equipment manufacturer (OEM),
- Independent car dealerships (ICDS),
- Core dealers (brokers),
- Scrap yards,
- Workshops (Lind et al, 2014)

Östlin et al (2008, p. 3) identified seven categories of relationships within a closed-loop supply chain in the automotive aftermarket – based on the relationship focus and core control level:

- **Ownership-based:** this type of relationship is common when the product is owned by the manufacturer and operated by the customer, as for example in a rental, lease or product-service offer. Here, the control of the installed base is high and often regulated by contracts.
- **Service-contract:** this type of relationship is based on a service contract between a manufacturer and a customer that includes remanufacturing.
- **Direct-order:** the customer returns the used product to the remanufacturer, the product is remanufactured, and the customer gets the same product back (if it is possible to perform a remanufacturing operation).

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- **Deposit-based**: *this type of relationship is common in the automotive industry. When the customers buy a remanufactured product, they are obligated to return a similar used product, thus also acting as a supplier to the remanufacturer.*
- **Credit-based**: *when the customers return a used product they receive a specific number of credits for the returned product. These credits are then used as a discount when buying a remanufactured product.*
- **Buy-back**: *the remanufacturer simply buys the wanted used products from a supplier that can be the end user, a scrap yard or similar, or a core dealer.*
- **Voluntary-based**: *the supplier gives the used products to the remanufacturer. The supplier can also be a customer but do not have to be.”*

Bosch applies a deposit-based relationship.

Problems with the cores:

A core could travel several ways back into the closed-loop supply chain. One way could be that the end customer chooses to go to a licensed or independent repair shop, and from there, the core is delivered to the remanufacturer. Another way could be from scrapping, where the core could be sent directly from the scrap yard to the remanufacturer or pass through a core broker (Sundin and Dunbäck, 2013). The major problem is that despite the deposit existence there is no guarantee that the core will take the same route back as with the car in the forward flow. What is even worse, it is not sure at all that the core will arrive at the right remanufacturer (OEM = remanufacturer as in the case of Bosch). Some of the reasons were presented above, among some others, for instance, the lack of time of people working in workshops, bad (or no) evidence of spare parts, zero or low commitment to the distributor/seller and also some calculations exist. Workshops are always sure they will get some money for the core returned. And the evidence and tracking of the core today are not as perfect as it would be needed. This is also one of the major findings from the survey of CLEPA⁹ and FIGIEFA¹⁰ from 2017:

“In the large majority of the participants”, the information shared by OEMs with the IAM participants has to be manually compiled for their catalogues on a one-to-one basis, resulting in significant time spent for complete review/update of their catalogues. None of the respondents could report that the shared information included a full set of Vehicle Identification Numbers (VINs) and related OE part numbers to ensure unequivocal parts identification. The large majority of the respondents (>70%) expect the issues around parts identification and the development of IAM catalogues to worsen over the next 5 years mainly due to the increase in complexity of vehicles and the lack of parts identification information provided by OEMs.” (Löhr et al, 2017, p. 2).

Also, research by Kalverkamp (2017) focused on the problems with cores, the role of core-brokers and comparison of the procurement strategies and e-procurement competencies between the U.S. and European market confirms existing gap and reveals potential progress.

With such a core and information leakage connected to the return routes of cores, there are also other problems.

⁹ CLEPA is the European Association of Automotive Suppliers (further information available at: <https://clepa.eu>)

¹⁰ FIGIEFA is the European Federation and political representative in the EU of the independent wholesalers and retailers of automotive replacement parts and their associated repair chains (further information available at <https://www.figiefa.eu>)

Lower as the needed quality of cores that are coming back is also associated with the information value. Bosch as every remanufacturer would need more information regards the core – e.g. condition of using the car, level of care for the car etc. Many information is not possible to keep with core or to engage into the core now. **Low-quality cores**, if accepted in the previous step(s) represent lost money in deposit and money extra for the core that must be scrapped as a waste (often with part of hazardous waste).

It is of utmost importance to get the right (appropriate, good quality) cores, since they are the raw material for the next remanufacturing cycle. Cores are usually obtained through a reverse logistics and deposit system in the automotive distribution chain or from specialized core dealers (APRA Europe & ReMaTec, 2018). In fact, the continuous access to cores for reman is heavily dependent on the provision of financial incentives for core return. These can work differently for different stakeholders as illustrated in the Figure 23 below (Kemény Boehme & Company & ReMaTec, 2017).

HOW DID YOU GET BACK OLD PARTS/CORES?
 TYPES OF INCENTIVES FOR CORE RETURN & GOOD CORE QUOTA




incentive	OEM/OES	IAM	Tier-n	Others
 deposits	75%	56%	25%	0%
 adjustment surcharges	25%	44%	75%	100%
 good core quota	69%	54%	38%	23%

Figure 23: Incentives for the core sourcing and returns

Summary of the problems with the cores in return flows in general (also reflected in Bosch and C-ECO business):

1. Time (longer routes back);
2. Wrong “destination” – lack of cores (not right quantity) and risk of “losing the know-how” to some extent;
3. **Demand and supply of the cores are not in balance, especially if a certain type of core is needed in a specific period in the market where the actors do their business;**
4. **Scrapping of the cores considered to be of low quality despite the fact that they could be remanufactured;**
5. Bad or insufficient quality of cores detected in the final phase before remanufacturing processes;

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6. Leakage of information about cores;
7. Sometimes lower profit (if the “deposit surplus” stated by the TL is lower than the potential margin from the sale of reman product);
8. Extra money, time and effort costs associated with handling the cores within return processes – individual TLs;
9. Extra costs for scrapping useless core at the C-ECO partners or Bosch as remanufacturer.
10. Lower profit due to the need to buy a new parts for the core – Bosch as remanufacturer.
11. More money, time and effort costs associated with active purchasing of cores out of the forward supply chain for Bosch as remanufacturer.
12. Unused capacity and fluctuation of capacity utilization of Bosch remanufacturing.
13. Lower satisfaction of Bosch customers if the supply does not cover demand for reman parts due to the shortage of cores – the price of the new spare parts is higher.

Market trends

McKinsey&Company market study also revealed **six trends** that are expected to disrupt the automotive aftermarket (highlighted in Figure 24). Most, resp. all of them will have an impact on Bosch and C-ECO circular business model.

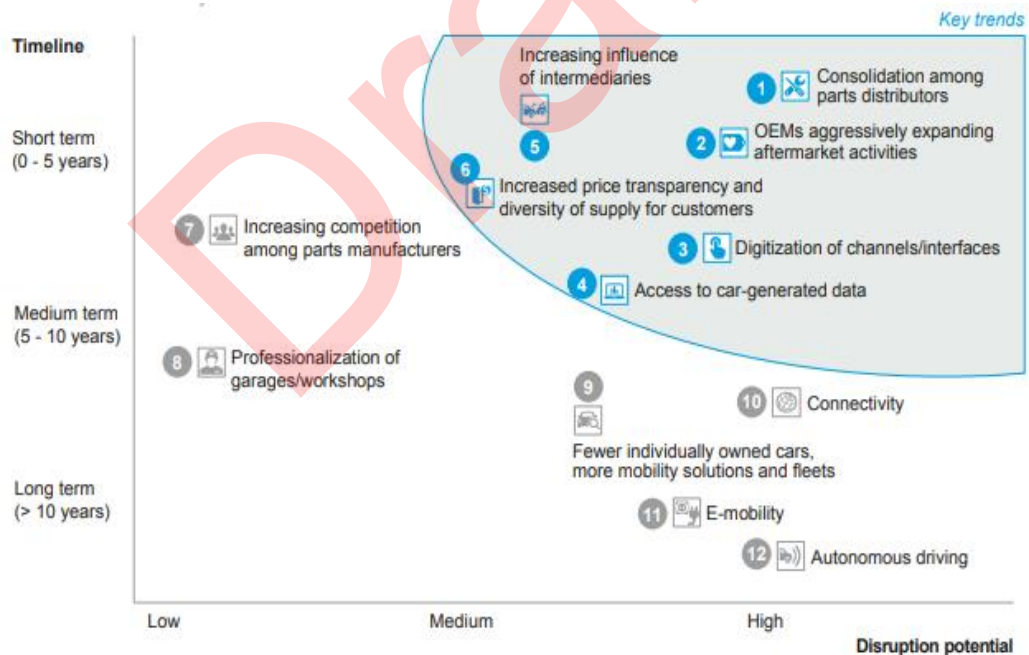


Figure 24: 6 trends specific to automotive suppliers with a high potential for disruption

1. Consolidation among parts distributors.

According to the study of McKinsey, the consolidation, especially in the European market has started already and this market is - through the M&A (mergers and acquisitions) - approaching the US market with only four big wholesalers having more than 40% share. In 2018 in Europe,

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the three leading players together accounted for around 15% of the market (Brenner et al, 2018). M&As in Europe have been more expressive in the UK, Germany and the Netherlands. They involve American and Canadian firms wishing to exploit the European market (e.g. LKQ Corporation (USA), Genuine Parts Company (USA), Uni-Select Inc. (Canada)), but also European player, namely German, trying to reinforce their market position through acquisitions (e.g. Hess Group Wessels+ Müller, Stahlgruber) (Breitschwerdt et al, 2017; Brenner et al, 2018). This consolidation crusade enables to exploit economies of scale, with cost-savings in parts procurement, logistics and warehousing, as well other strategic motives like expanding the global procurement network, diversifying product portfolio and gaining immediate access to more customers (Brenner et al, 2018). Consolidation is accompanied by the growing closing of some businesses. In Germany, the Federal Statistical Office recorded 638 insolvencies in the vehicle repair trade in 2017, 9% more than in the previous year. Distributors of car parts and accessories are in particular trouble: 105 filed for insolvency protection that year, one-third up on 2016 (Brenner et al, 2018).

Consolidation can be an advantage and opportunity for Bosch and C-ECO as it is easier to handle and do forward and reverse business with fewer big players, but on the other side also some threat due to the growing bargaining power of these wholesalers regards the prices for instance. There is also a clear trend toward larger and more professionalized workshops to cope with increasing vehicle complexity. The increasing complexity of car parts will rise towards the production of the more complete vehicle subsystems. Authors of McKinsey&Company 2018 study argue that this will help suppliers establish their own touch points with the end customer to capture further aftermarket spend.

2. OEMs aggressively expanding their aftermarket activities.

These activities are more obvious in markets with higher average age, but the trend can be seen everywhere. The increased penetration OEMs into aftermarket activities (Breitschwerdt et al, 2017; Global Market Insights, 2018; Koggersbøl et al, 2018) is primarily driven by superior access of OEMs to in-vehicle data, which increases the share of vehicles in fleets under OEM control and facilitates new service offerings to customers Koggersbøl et al (2018).

Several practices exist - OEMs are starting to occupy some parts of the aftermarket value chain by, for example, creating their own networks of non-car brand-specific repair shops. They also try to “automate” decision making related to service and repair through the offer of special services to create a customer experience, for instance with leveraging vehicle connectivity and so to localize them. Good relationships with OEMs can utilize such a trend as an opportunity for Bosch and C-ECO.

3. Digitization of channels and interfaces

It is expected that the e-commerce share of parts sales will increase to 20 to 30% by 2035. *“Currently, traditional distributors dominate sales to workshops: while about 85 to 95% of workshop orders are placed on B2B platforms or physical channels of traditional distributors across analysed markets, less than 5% of the orders are placed through specialized online players or mass merchandisers in Germany, the UK, and France and only 10 to 15% in Poland and Russia.”* (p. 21). The value chain will shorten as some of the trade levels will not be able to reach the critical mass and leverage economies of scale. Opportunity can be seen if the intermediaries will be able to connect customers and services.

4. Access to car-generated data.

Capabilities and competencies to work with big data and advanced analytics also in the automotive aftermarket are considered to be an indispensable asset in the future. As this trend

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is very fast, most automotive aftermarket players are not adequately prepared. This can be seen as a **big competitive advantage of Bosch and C-ECO** and should be turned into the value proposition for the cores business. The same advantage is with the fact that **the car is becoming a platform for software and applications** and so profit might shift to tech giants (as Bosch is) or new software entrants (McKinsey&Company, 2018). Study of McKinsey&Company from 2018 points to the one important fact and questions behind this trend – digital connectivity potentially opens the car as a system to aftermarket players. However, the question is: Who will own customer contact in the future? According to the research realized by McKinsey&Company (2018) OEMs will be the key players. But the degree to which various players will control data and customer interfaces will highly depend on future regulatory guidelines. Car data and new IT and ICT technologies give rise to the new market “Diagnostics 2.0” that might be captured by the OEMs (Breitschwerdt et al., 2017).

5. Increasing influence of (digital) intermediaries.

There is a trend towards the entrance of new players in the market, namely (digital) intermediaries. They provide specific solutions like telematics, fleet management systems and professional logistics. (Breitschwerdt et al, 2017).

Another important trend which probably will change current playground for the automotive aftermarket is the **fleet management** (in business as well as in a customer fleet context). *“The rise of car sharing users and professional fleets opens up new opportunities to steer and optimize maintenance and repair services. Partnerships will likely emerge between intermediaries and workshop chains, and the workflow and parts logistics can be fully automatized.”* (p. 20). Study of McKinsey&Company from 2018 even stresses the growth of the share of business customers and points to the other associated trend - service management of B2B customer’s fleet will become more centralized with professionalized purchasing processes and service operations. This means that the total cost of ownership shifts into focus and needs to be considered in service offerings and pricing policy. However, big B2B end customers are easier to approach for the sale of parts, sale of service and for collection of cores, especially if they search for high-quality products and services with a strong brand.

6. Higher price transparency and greater diversity of supply for customers.

E-commerce growth in the spare parts market is also associated with the expanding cross-border trade within Europe. This trade is also fuelled with the possibility to compare prices for spare parts and non-existing barriers for purchasing online at the EU market. However, for suppliers of spare parts, the effect of price transparency might mean a decrease in price and greater price transparency through e-commerce and big data might challenge the current margins. *“Online could be an opportunity for suppliers to start their own online presence or partner with successful platforms. Some players have already set up their own online channels, e.g., Hella. Finally, a digital sales model may be the key to a shorter, leaner value chain that benefits suppliers. By eliminating the need for intermediaries and streamlining the distributor layer, suppliers may see bigger margins and savings they may decide to pass on to their customers.”* (p. 21)

Big hopes are connected to the use of blockchain technology for tracking and tracing spare parts. For instance, just recently Mera published in the News from November 19th, 2018 that Daimler Trucks North America (DTNA) has completed the project testing the use of blockchain technology for aftermarket remanufacturing operations with the goal to improve its commercial vehicle maintenance program by automating and streamlining remanufacturing through a partnership with Filament, the blockchain solutions provider. A USB device and software called Blocklet will *“interface with DTNA’s legacy systems to digitize supply chain ledgers to trace, track*

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and also verify shipping and transaction data in the parts remanufacturing process” and so to facilitate data capture. Blocklet TVA (Trusted Vehicle Applications) connected vehicle blockchain platform “includes a chipset that plugs into a passenger vehicle’s OBD-II port or commercial vehicle’s J1939 port to capture and record data such as that coming from the engine’s electronic control unit. The system also has environmental sensors that can detect temperature, humidity, and more and a motion sensor that can track things like acceleration, G-forces, and incline. Built-in and dedicated GPS adds coordinates and location info”. (Mera, 2018). Unfortunately, there are only a few published works (e.g. Drescher, 2017 or Rajkov, 2018) which offer some pieces of information about the technical features of this technology for tracking the parts and identifying challenges (both technical, relationship and legal).

Based on the forecast of a digital future for the automotive aftermarket KPMG study (KPMG, 2017, p. 11) proposes a strategic approach to reverse logistics (see Figure 25):

Traditional versus Strategic approach

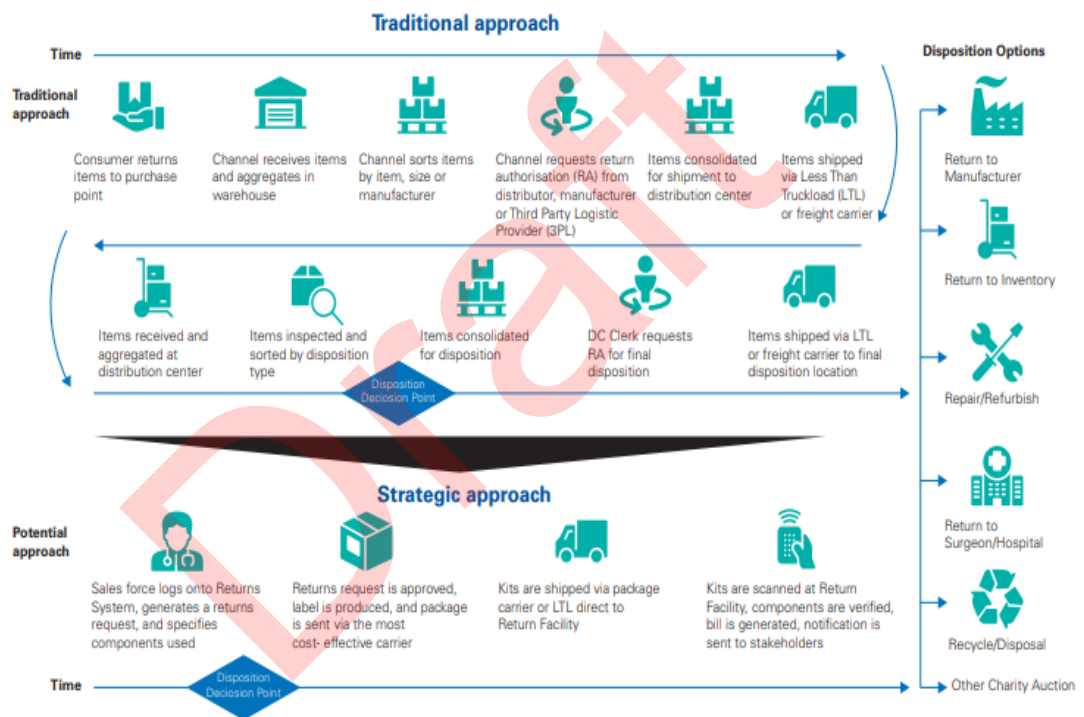


Figure 25: Traditional versus strategic approach to reverse logistics

Although some legislation favours the reman business, there are also some barriers that are driven by institutional changes. Two examples can be found: i) the eCall regulation may undermine the regulation for the aftermarket for parts and services by allowing OEMs to adapt vehicles for OEM-specific telematics, favouring OEMs and shifting maintenance and repair away from independent aftermarket(Parker et al, 2015); .ii) car scrappage schemes that have been introduced in some EU countries during the last financial crisis (Austria, France, Germany, Italy, Portugal and Spain) have encouraged consumers to purchase new vehicles to generate growth in the sector, to the detriment of repair (Parker et al, 2015).

Another trend that can negatively affect the remanufacturers business is the increasing competition from imports of low-cost new products or of repaired or reconditioned (i.e. not fully remanufactured) parts, predominantly from the Far East (Parker et al, 2015).

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Simultaneously, the aftermarket players are changing their business models. (Breitschwerdt et al, 2017). New business models like eCommerce, digital platforms and service aggregation are gaining momentum (ReportBuyer, 2018).

Currently, online trade represents a very small part of the sales channel (around 5%) and online platforms are considered immature due to insufficient product range and availability as well as an inability to assist workshops in identifying right parts. Despite this small figure, multiple platforms for online parts sales exist already in several levels of the value chain: Suppliers, OEMs, distributors, and workshop chains (Breitschwerdt et al, 2017). The numbers should increase, reaching 20 to 30% by 2035, either by the increased use of the existing platforms and by launching new online trade platforms (Breitschwerdt et al, 2017). The online channels will not have the same importance in all parts: logistically demanding parts, e.g., windshields and airbags, which are difficult to transport or part of complex workshop processes, will continue mainly being sold via the traditional OEM or IAM wholesale channels (Breitschwerdt et al, 2017).

This trend can have different meanings for different stakeholders: Traditional parts manufacturers, distributors, and workshops can face increased competitive pressure as OEMs, intermediaries, and online providers may attempt to increase their influence on end customers, shrinking the margins of players accustomed to having the full attention of end customers (Breitschwerdt et al, 2017).

Digital technologies will not have an impact on sales channels. Digital platforms can become true game change in the articulation of actors throughout the value chain (Koggersbøl et al, 2018).

In terms of aggregation, there is evidence that regional part distributors in Europe are likely to shift focus from just mechanical parts to a mix of both collision parts and electro-components (ReportBuyer, 2018).

5.1 In-depth interviews with trade levels

In total 22 in-depth interviews were realized in Germany and France (11 in Germany and 11 in France).

In Germany 9 companies belong to the biggest IAM distributors at the market, 1 company is buying group and 1 company is a core-broker (with the sales volume and turnover also ranks to the big players). Most of the German companies deal with purchase and sale of cars and spare parts, provide repairs of cars and also leasing of cars. This means, that these companies are not only distributors but provide also workshop services (garages). Three companies (from the IAM distributors) are the wholesalers and retailers only for the 1 car manufacturer (Daimler-Benz, Opel), the others are independent and work for many suppliers.

In France 1 company (IAM distributor) deals also with recycling cars, 2 are core-brokers and IAM distributors. Only the one third of the companies provide also repair, most of the companies, purchase, sale and/ or dismantle the cars. About half of companies are independent and the other half is a member of some buying group. No company is directly connected to any car manufacturer. French companies are on average much smaller in size, but some of them do business globally (what is not the case of German companies which mostly do their business locally or regionally).

No only-garage-business (workshops) has been interviewed as the majority of garages do also some purchase and sale and even some wholesale. There are only a few buying groups in both countries due to the high level of concentration and it is extremely difficult to find contacts. The

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end-garages could be easily approached locally during the demonstration, however their pain points, awareness, experience, expectations are very likely to be the same as in the case of IAM wholesalers.

Some companies (IAM wholesalers) has their own system for tracking the cores (and spare parts), some use the information system of the supplier (or even more information systems if different suppliers use different systems and these suppliers have a strong bargaining power to press companies (IAM wholesalers) to use their systems). These companies are very dependent on decision making regarding the software made by the suppliers. Some companies (working both as IAM wholesalers and workshops) also use to have their own software and information system (developed solely for the company) for many years (even more than 20 years). On average, they are satisfied, but some problems were detected (see below). No one company has real experience with cloud manufacturing or cloud services for the operations and even not enough knowledge.

One buying group (the purchase is their only activity) has no pain points in the core return and in the purchase of parts and reman parts.

Usually, suppliers do quality checking and the other reverse logistics processes. Interviewed companies provide only simple visual quality control and pack and store the cores. They see no big problems with these operations – however, again also with this issue some pain points could be found. No capacity barriers for stock keeping exist. There are almost no outsourced processes except transport in some cases. Managers cannot imagine what activities could be worth of outsourcing – either they do a minimum of reverse logistics processes (and externalize them), or they consider them as their core activities and they do not want to lose business and take jobs from the employees.

Summary of pain points and “typical” categories of representants introducing the pain:

- Different information systems used for different operations – purchase of parts, evidence of cores – and to some extent also for different suppliers and customers (depends on the volume of the core business and on the dependency with the supplier (manufacturer, buying group) – IAM distributor;
- Some data needs to be manually entered into the systems due to non-existing compatibility – time-consuming and potential loss of data or mistake made – IAM distributor;
- Time – waiting for the decision making about the quality of cores and deposit return (more than 2 weeks or even more than 2 months) – IAM distributor;
- Loss of the cores returned to wholesalers and the necessity to keep evidence tracking and to remind yourself for the deposit reimbursement – IAM distributor;
- Money in the system – the circularity of spare parts and cores if dependent on deposit and time for return represents lost opportunity and problems with the cash flow – IAM distributor;
- Transparency of the reimbursement process is rather low – companies often do not know why the sum of the deposit is as it is – they would prefer clear information connected to every piece of core. This is special problem in the case when the share of cores in the business is rather high and the volume as well – IAM distributor.
- Lack of tools for diagnosis of the new spare parts especially for the electric and hybrid cars and lack of knowledge of the correct evaluation of quality – IAM distributor;

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- Quality or state of a core not correctly evaluated for the acceptance of the supplier (lack of knowledge, skills and diagnosis equipment), which leads to lower or no pay back of deposit – IAM distributor;
- The same pain as above, which results in a loss of deposit if the spare parts is evaluated to be scrapped – IAM distributor, core-broker and also remanufacturer;
- Time – waiting until the number of cores is sufficient – this is related with the need to store the cores and provide some minimal handling (internal transport, evidence keeping etc.) – IAM distributors, wholesalers, core-brokers and remanufacturers;
- Not enough cores on the stock – demand cannot be satisfied at the right time (depends on the frequency of deliveries in the forward flows and on the intensity of work provided by the supplier) – IAM distributors, core-broker and remanufacturer;
- Cores not enough clean for acceptance by supplier – IAM distributors;
- Risk of cloud-based infrastructures – data confidentiality (maybe because of the insufficient knowledge of how clouds work) – IAM distributors, wholesalers, core-brokers and remanufacturers;
- Image of the cloud services provider is crucial – IAM distributors, wholesalers, core-brokers and remanufacturers;
- Chinese competition is growing with cheap and low-quality spare parts – this trend makes a problem for business – mostly core-brokers or those IAM distributors with high share of reman parts for sale.

5.2 Internal environment

The Automotive Aftermarket division of Robert Bosch GmbH is a part of the Mobility Solutions business sector, one of the four sectors of the company. The division offers a comprehensive range of automotive spare parts (both new and reconditioned) and repair, diagnostic and repair-shop solutions for the aftermarket and for repair shops worldwide. Spare parts and solutions are delivered to more than 16,500 Bosch certified car service garages (with more than 90 years long history) globally within the market of Bosch Car Service and AutoCrew, two independent repair-shop franchises under the Bosch Service Network. Spare parts are distributed to Bosch customers (automotive manufacturers' headquarters, dealerships networks, mostly wholesalers and to licensed workshops) from Karlsruhe, Germany to 150 different countries – approx. 25000 items per day in approx. 150 trucks daily. The division also manages a further 24 warehouses around the world. (Bosch annual report, 2017, p. 26; Bosch Automotive Aftermarket online and Bosch History Blog online).

Through special Bosch eXchange program, an extensive range of exchange parts 30 different product groups and around 11,000 order numbers can be offered to the workshops. Bosch processes the core return with the core return service provider CoremanNet – an independent brand of C-ECO. CoremanNet runs the world's largest reverse logistics service network for the return of automotive spare parts for remanufacturing. Solutions for other sectors are being developed. CoremanNet has today a well-established network with more than 20 collection points globally. C-ECO is logistics services and solutions provider for Bosch, but also for other companies which demand the reverse logistics services. These services are realized through the network of contract partners.

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Franchise Bosch Car Service provides all-around solution scheme. The concept has several branding advantages: Global largest automotive aftermarket service brand; Quality car parts supply; Car diagnosis, service technology and management support; Systematic talent training plan and Service activity with the target at car owners. Besides spare parts and diagnosis equipment, professional car repair knowledge and services under the technical and service training system are provided to franchisors together with strong marketing and management development support. (Franchise Bosch car service, 2015).

Major strengths of Bosch are not only in the sustainable and globally competitive market(s) position and financial resources, but also in research and development capabilities and IT and ICT competencies among all other intangible capital categories.

Draft

6 Environmental scanning and market analysis - Gorenje

The ambition related to the new circular business model for washing machines is in line with strategic aims of Gorenje in two areas: to help minimise the environmental impact of both Gorenje's production and products and to strengthen the Gorenje's position as an innovative and premium producer. In 2017, the revenue share of innovative products and premium brands reached nearly 30 per cent (Gorenje group, annual report, 2017). This chapter will first discuss the main facts, environmental forces and trends that will affect washing machine and laundry business in the four markets (Austria, Denmark, Netherlands and Slovenia)¹¹ that are relevant for the ReCiPSS project. It further presents the results from the empirical survey realized in these countries.

6.1 External environment

As in other industries/markets, the competition in the washing machine (WM) market is tough. Besides traditional producers, the companies focusing on lower segments by low price strategy have strengthened their position by remarkable production quality improvement and as such they became relevant actors on the mid-range market for WM. In other words, the price/value ratio they offer is a clear order winner for potential customers.

In this situation, the smart households' equipment seems to be a promising segment: According to the GfK research (GfK, 2018), the market for smart washing machines (in Europe) was growing over-proportionally thanks to the connectivity factor, which enables a surcharge of 50 per cent compared to conventional products.

Smart appliances can provide additional value to their consumers in many ways – due to the sensors and the Internet connectivity new functions can be provided as well as new business models, which includes sharing or renting/leasing¹²/pay-per-use. The alternative ownership models can appeal to heterogeneous consumer groups, with specific motivation and requirements.

Based on business experience, the consumers, in general, assess the renting and leasing by economic criteria in the first place. The purely altruistic motives are of lesser impact, despite what consumers sometimes claim. More realistic view on decision criteria (excluding the price) are as follows: environmental and health effect on consumer's family and consumer him/herself, direct economic effect (lower water and energy consumption), and the altruistic/societal effects as least important. The order of decision criteria may reflect the consumers' real understanding of the eco-products in general.

At the same time, it is risky to perceive consumers as a single homogenous group. For instance, the cross-cultural differences are apparent: In Europe alone, the business models need to take the fact into account that the ownership prevails dominantly in southern European countries as

¹¹ Data and information about the four markets freely available come from different sources and have different structure and character.

¹² In this report both concepts – renting and leasing – are used due to the fact that the innovative business model of Gorenje with the pay per use (wash) solution can be a part of both approaches. According to the [www.businessdictionary.com](http://www.businessdictionary.com/article/1063/lease-vs-rent-d1412/) (<http://www.businessdictionary.com/article/1063/lease-vs-rent-d1412/>) renting in comparison to leasing involves a shorter time period and a less formal agreement and is preferred by customers usually for the temporary needs.

circular business models

apparent in high rates of houses/flats ownership compared to the north countries. Another difficulty related to consumer understanding: the consumer behaviour concerning washing machines is very different from other household equipment such as kitchen appliances and that knowledge cannot be applied in the context of washing machines mechanically.

The consumers who consider a washing machine renting/leasing instead of the ownership, expect more than just an access to the machine: the renting/leasing of a tangible product needs to be supplemented by some additional services for consumers. From the business point of view, such value-added service constitutes the order winners.

As customers change the washing machine on very special occasions only (such as fatal breakdowns, residence change, or during a complete upgrade of the kitchen/bathroom), their requirements on the product quality have increased; at the same time this means the higher demand for longer-lasting products (the average length of WM usage is around 10 years according to GFK study).

There is also a rationale behind that: the purchasing cost makes smaller part of total cost of ownership for the consumer, so higher purchasing (forefront cost) are compensated by lower operating cost in the future (Sacconi et al., 2017). The longer product life should be accompanied by longer warranties.

The focus on longer lasting WM makes sense also from the technical side: In this case, the production costs are higher by approx. 70 %, but the duration of use is extended by (far) more than 70%.

The aspects outlined above raise the question of product remanufacturing as a viable strategy.

Remanufacturing (and other reprocessing options) will probably play a more important role shortly because of the raw material scarcity, which is and which will further be reflected in increasing prices. The implementation of remanufacturing into the production represents a complex change, as it relates to diverse aspects of business processes and relationships. It includes among others:

- Technical aspects (adjustments to product design, redesign of reverse logistics/closing the loop in supply chain...),
- Legislation issues (diverse approach to waste across countries, technical requirements/norms – e.g. to sell products in 90 countries, Gorenje needs the approx. 200 certificates now).
- Consumer perception: remanufacturing raises concerns for user safety of the used/remanufactured product. Product exterior cannot be demerged on visible parts (scratches...) or be smelly (which indicates cleanness in consumers' perception).

At the same time, some technical burdens for remanufacturing and for renting/leasing business models are eased by recent ICT technology advances (wireless sensors, the blockchain,...).

Competition and renting/leasing and pay per use models

The four markets in which the demonstration of the new PSS model will be implemented are very different in terms of the market development and/or a “product life cycle” when talking about renting/leasing as such and pay per wash (pay per use, or access-based models).

The most mature market with both models (renting/leasing-based or fixed fee model without pay per wash and a purely pay per wash model) is the Netherlands. Three start-ups offering one

circular business models

or both of these models serve the market and one big retailer with brick-and-mortar shop and e-shop offers solely leasing (probably more retailers do the same). These companies differ in many aspects. The first company in the market (established in 2014) – Bundles – with both the pay per wash model and renting/leasing/fixed fee is substantially supported by Miele company (the washing machines are Miele) and by an accelerator programme funding. Bundles offer its products across the whole Netherlands. Two other start-up companies were established both in 2017. BlueMovement is supported by Bosch GmbH and (so Bosch washing machines are serviced). Homie is a spinoff of the TU Delft and works with Zanussi brand. CoolBlue is a big retailer. In addition to the differences in founders and supporters or owners, year of beginning the business, market coverage, and brands they work with, these companies also differ in their product range. Homie has only 1 type of washing machine and solely offers a pay per wash model, while Bundles provides 2 types of washing machines with two types of product/services packages. The premium washing machine (Premium) is offered only with an auto-dose and includes detergent. A basic machine (Basic) is provided without auto-dose and detergent. Both machines are offered as fixed fee or a combination of fixed fee and pay per wash. BlueMovement offers 3 types of washing machines, however only leasing and no pay per wash model. In their subscription-based models, CoolBlue offers only leasing and 2 types of washing machines. Companies have very different systems of deposits, times for contract and conditions for deposit return and of course in other payments. For instance, Homie does not require any monthly fees (and probably even no deposit, but this information is not available at their webpage which is the only channel for the entry information), while the competitor Bundles requires monthly fees also in the case of pay per wash. Bundles offers a discount price if customers rent 2 or more appliances. BlueMovement enables to use discount coupons and also up to 35 euro cashback via <https://www.cashbackxl.nl>. Differences are also in delivery times. Bundles communicates in Dutch, English and German, Homie in Dutch and English, while BlueMovement only in Dutch, CoolBlue Dutch and English. To give a little bit broader picture regards the market position of the start-ups (CoolBlue is not evaluated), numbers of Facebook followers and likes are introduced (30th April 2019): Bundles - 2652 likes and 2699 followers, BlueMovement - 2652 likes and 2699 followers and Homie – 145 likes and 150 followers.

Austrian and Danish markets are rather well developed in case of subscription (renting/leasing) of home appliances (washing machines included) – many retailers or special service organizations offer this possibility. No business with pay per wash (or use) was detected. The least mature market is Slovenia.

Even though the French market is not involved in ReCiPSS project, one case is relevant. Company Lokéo, established already in 2009 is the leading player with very broad product portfolio which business is only in renting home appliances and other products. They have 59 different types of several different brands of the washing machine in their offer. However, no pay per wash model is offered.

6.1.1 Austria

GOVERNMENT

There has been a living public discussion about circular economy issues in Austria under the umbrella term of Kreislaufwirtschaft for many years, yet the term of the circular economy is a present in the discourse too. An overview of successful Austrian projects was summarised in 2016's document: Regionale Kreislaufwirtschaft - Inputpapier für die Implementierung von RESET2020 (RepaNet, 2016), which suggested several circular model solutions that could be applied on regional level by different actors: for the enterprises the most promising approaches

circular business models

included the slowing down of product loops, cascading principle, renting and repairing among others.

Generally, the Austrians position in circulatory initiatives and achievements is very good. In a recent ranking of the EU-countries, Austria took a 9-th position in countries circularity, but with mixed results – whereas it excels in food waste, recycling and trading of recyclable raw materials, it is behind the EU average in private investment into circularity and in patents (Hervey, 2018).

Austria belongs to countries that applied the pay as you throw the system (usage-pricing; payment for the waste according to its weight). Such a system is running in 17 EU-countries, but in three of them only it is applied in all municipalities and Austria belongs to them (Circular Future (n.d.). The EU's 2020 municipal waste recycling target has been already reached (European Commission, 2019), which confirm good position of the country in terms of waste management and recycling also due to government initiatives such as imposing the Austrian Recycled Construction Materials Regulation and starting the waste prevention program (Bundes-Abfallwirtschaftsplan) (European Commission, 2017).

According to The Environmental Implementation Review, Austria focuses on reuse activities in its transition towards a circular economy. In 2018 also an Austria's Circular Futures Platform was launched.

ECONOMY

In the Austrian economy, the proportion of secondary raw materials in processed materials amount to 8.5% and the share of recycled materials in interim outputs made 16.8% (Jacobi et al., 2018). Some facts suggest that the waste separation is not enough for circular economy transition: out of the material pre-processed by industry, 9 per cent is recycled, the rest 91 per cent are virgin materials. The environment is encumbered with 10 tons of waste per person per year. The recycling is based on rather simple technologies (Initiative Wachstum im Wandel, 2019).

The Eurostat data for Computer and personal and household goods repair suggest that repair activities are less frequent than in Austria compared to other EU-countries (it should be noted. However, that the economic impact of repair activities is marginal even in the states that dominate in this statistic – in Croatia or in the Czech Republic it makes 0.3 % of economic value added without financial sector) (Eurostat, 2018).

On the other hand, Austria is a front-runner when it comes to product reuse – Austrian government-supported network is well developed and offers a second-hand product of high-quality (European Environment Agency, 2017).

CUSTOMERS – smart home and washing

The Austrians belong to the IoT fans: in 2016 surveyed GfK market research agency, Austria ranked on 14-th position worldwide in so-called the Connected consumer index. This index measures the extent to which the consumers are connected to the Internet through various appliances. The extent of smart home appliances in Austria is eight times greater than the global average and three times than the West Europe average (GfK, 2018).

Austrians' attitude to a smart home is positive (52 % compared to 14.6% of negative responses); however, it does not mean the positive perception is shared among all groups equally. Males and the younger generation are more positive about smart homes. In terms of smart product risks, the consumers are afraid of the collection of private data and hackers' attacks.

When it comes to washing machines, the findings are a bit contradictory: Out of 15 product groups listed in the consumer survey, the smart washing machine took the fourth position

circular business models

among the most frequently used smart products (after TV, motion sensors, and smoke sensor) (Marktmeinungsmensch,2017). However, when being asked about smart product purchase intention (during the next three years), the washing machine took 13th position only with 5.8 % consumers intending the purchase.

The average lifespan of a washing machine in Austrian household is 8.3 years, but it has a decreasing tendency, as the span was 11.9 in a survey conducted four years earlier. Speaking about consumers’ view on home appliances lifespan/durability in general, the satisfaction prevails (45 per cent against 30 per cent of unsatisfied) (Wieser and Tröger, 2015).

The market research also indicates a higher preference of Austrians towards larger-capacity appliances (although the most common ones are medium-sized washing machines with a capacity of 6.0- 8 kg (Euromonitor, 2019a). The price per wash is decreasing as a result of cheaper laundry care products (due to private labels and frequent sales promotions) (Euromonitor, 2019b).

In a typical Austrian household, the washing is males’ responsibility (Nielsen, 2017). Even if women see washing in a more positive light than men, it is not an entertaining activity for any gender (Marktmeinungsmensch, 2018).

Preferences of washing machines features and functions are depicted in the following Figure 26 (Euromonitor International Analyst Pulse Survey, 2015).

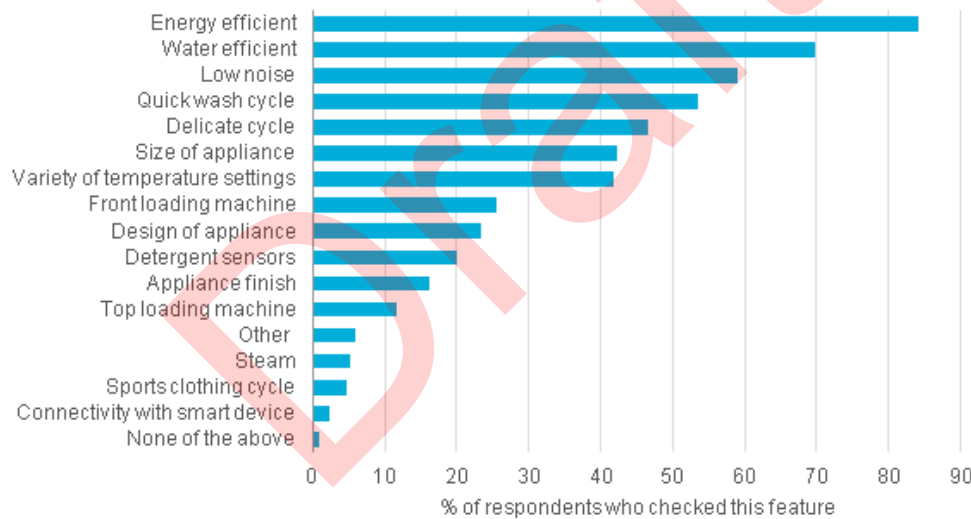


Figure 26: Preferences of washing machines features and functions

6.1.2 Denmark

GOVERNMENT

Danish government initiatives toward a circular economy

To accelerates the transition towards the circular economy last year Danish government launched the new strategy, which follows the recommendations (formulated in four main areas: the circular value chain, design, and production, consumption and recycling) of the government’s Advisory Board on circular economy (State of Green, 2019). To help companies to accelerate their circular progress, the Danish government has set aside **EUR 16 million with six focus areas and 15 initiatives** (e.g., strengthen the companies as the motivating force for the circular transition; support the circular economy through data and digitalisation; enhance the

circular business models

circular economy through design; change consumption patterns through circular economy; create a well-functioning market for waste and reused goods; generate more value from buildings and biomass) (Food nation, 2019; MFVM, 2019).

All those initiatives have stemmed from results of case study on Denmark, conducted by the Ellen MacArthur Foundation, which showed that introducing the circular economic principles to the Danish economy would:

- Increase GDP by 0.8 – 1.4 %
- Reduce consumption of selected resources by up to 50 %
- Reduce the Danish carbon footprint by 3-7 %
- Create 7 000 – 13 000 jobs by 2035

Moreover, according to DAKOFA¹³ (2019) more and more companies are becoming aware of the significant growth opportunities in the circular economy. Danish companies are developing pioneering circular economy solutions that benefit the environment, climate and economy. In 2015, Denmark was even awarded the World Economic Forum's Young Global Leaders award 'The Circulars' for being a global front-runner in exploiting the potential for a circular economy (Copcap, 2015).

All these initiatives indicate that there is huge potential for companies to implement a circular business model

Danish government and digitalization

According to Digital Economy and Society Index (DESI) Denmark continues to occupy the position as EU's most digital country. Since Denmark government is aware of the huge potential of the tech ecosystem, in 2018 it allocated 134 million EUR to initiatives running until 2025 as a part of a new "**Digital Growth Strategy.**" The strategy contains 38 concrete initiatives, which aim to secure and enhance Denmark's position as an attractive digital hub by providing a boost to the Danish tech ecosystem and improve conditions for businesses to be able to utilize the full benefits of new technologies. In this context, Brian Mikkelsen (Danish Minister of Industry, Business and Financial Affairs) states that: *"The government wants Denmark as a digital frontrunner, where all Danes get a share of the benefits of digitalization. The new technologies can make us richer as a nation and has the potential to improve our environment, healthcare, and lives in many ways. We have to utilize that opportunity and bring Denmark into the digital future."* (Christensen, 2018a; Christensen, 2018b).

As regards comparison with 2017, Denmark has experienced a growth in the percentage of ICT specialists and Denmark continues to be on the forefront when it comes to the use of technology by businesses. Danish businesses are increasingly embracing digital technologies, such as cloud computing (38%) and social media (29 %) (Christensen, 2018).

In the context of the **circular economy**, researchers at DTU¹⁴ have developed a new digital tool that can help manufacturing companies in their transition to a circular economy. This tool is targeted at manufacturing firms from all industries without a difference in size. Thanks to sharing strengths and opportunities and benchmark against other companies from the same or other industries, Danish companies may be able to optimize their circular economy initiatives and thus better utilize their raw materials or residual products (Frederiksen, 2018). To digitally enhance SMEs, Danish EPA has launched a website to help small- and medium-sized companies

¹³ Waste and Resource Network Denmark

¹⁴ Technical University of Denmark

circular business models

to participate in the circular economy. It is supposed to provide information on greener production and how this can be used in marketing a business (CW Research, 2019).

ECONOMY

Danish economy and future forecast

Denmark has a prosperous economy, which stems from economic results. In 2018, the country recorded a GDP growth of 2% according to IMF estimates, with forecasts of 1.9% and 1.8% for 2019 and 2020, respectively. The national Ministry of Finance and FocusEconomics analysts are however slightly more conservative and expect growth of 1.7% in 2019, which is down 0.1 percentage points from last month's forecast, and 1.6% in 2020 (FocusEconomics, 2019; Nordea, 2019).

Although, it is expected that in total the economy should strengthen this year - driven by still-solid domestic demand amid a tight labour market and robust wage gains, uncertainty regarding this year's election can pose big risks. According to the latest polls suggest the Social Democrats—headed by Mette Frederiksen—hold a commanding lead ahead of general elections which must be held by 17 June, and the centre-left bloc is on course for a parliamentary majority. A centre-left victory is unlikely to change the current prudent fiscal stance significantly and will likely have a minimal impact on growth prospects this year (FocusEconomics, 2019).

Danish business scene

According to the World Competitive Yearbook 2018, Denmark ranks 6th in the top most competitive business nations and is considered to be one of the greenest countries in the world. This is confirmed by the latest moves on the Danish business scene also reveal another key strength: the eagerness of local start-ups to embrace **the circular economy model**. Moreover, apart from public recycling programs, the preference for a waste-free future can also be seen in recent business practices (Young Upstarts, 2019).

In 2017, the Danish Environmental Protection Agency conducted a survey and based on responses from 610 small and medium-sized companies state that:

- 9 out of 10 small and medium-sized companies think the circular economy is beneficial and want to be part of the change.
- 56% of the companies are already focusing on reducing their use of raw materials and the production of waste.
- 88% of companies have a positive attitude towards a circular economy.
- 51% of the companies feel that their knowledge of a circular economy is inadequate.
- 53% believe that there is business potential in a circular economy (State of Green, 2017).

Danish market with washing machines

Since the Danish housing market continues to prosper and increase between 2017 and 2018 by 0.6 %, the market with washing machines is also growing. Thanks to this the home laundry appliances have become the particularly competitive category in Denmark. Moreover, between two main factors influencing purchasing decisions in 2018 belong price and energy efficiency.

Since Denmark put a lot of attention to new technologies, it is not surprising that connected home laundry appliances have started to become a topic of conversation in 2018. Moreover, the results of Euromonitor's survey show that more than half of the respondents knew about the connectivity features between washing machines and smartphones. This suggests a clear increase compared to 2017, especially among older age groups (Euromonitor, 2019).

Denmark’s washing machine competitors:

The majority position is held by **Samsung**, who belongs between the first movers implementing the latest technological advancements in home laundry appliances. They recently launched the new Quickdrive range which perfectly fits with current customers’ trends: The washing time is half that of the average, which is a big plus in the hectic lifestyles of Danish consumers and it also resonates with the convenience trend. Moreover, **BSH’s Siemens brand** put emphasis on technology and connectivity when it comes to marketing its home laundry appliances. Its Home Connect app puts full control of its connected consumer appliances in the hands of tech-savvy customers through their smartphones.

CUSTOMERS

Danish consumers

Denmark has enjoyed a relatively steady growth in population; however, in recent years it has been increasing. That is the consequence of the higher number of not only births but also immigrants (make up 13.3 % of the population). In 2019, Denmark has an estimated population of 5.78 million, according to the latest census figures and another growth is expected in the future. According to the forecast, there will be roughly over 6 million people living in Denmark by 2028. As regards population density, it is 136 per Km2, which ranks 86th in the world (World Population Review, 2018).

The Figure 27 shows the development of the total population in Denmark by age. In 2018, people from 20 to 39 years old (1,46 million) formed the two the largest groups among Danish inhabitants, followed by age group 0 to 19 years old (1.31 million). The median age of the population is of 42.2 years. Thanks to a nearly equal number of the old and young Danish population, the same distribution is also expected for the future (Statista, 2019).

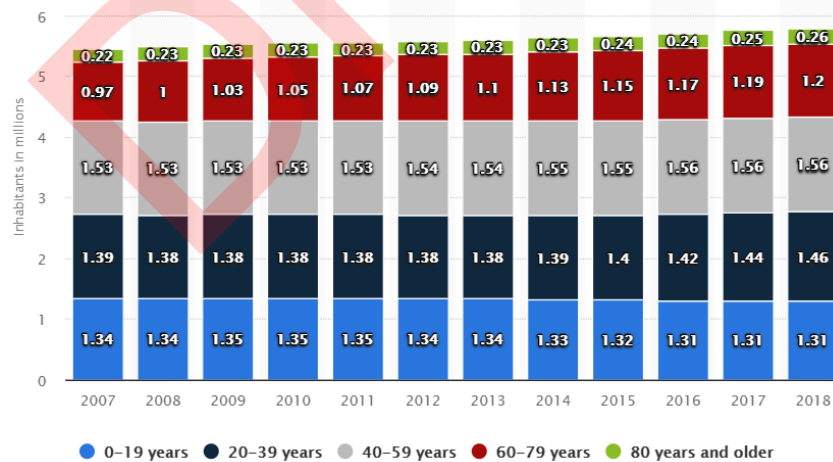


Figure 27: Total population in Denmark from 2007 to 2018, by age group (in millions)

It is not surprising that Denmark, as the most digital country in EU, has one of the most advanced information societies in the world. Danish consumers quickly adopt new technologies and high-tech products, which stems from their openness to change and risks. They are also considered to be highly-skilled customers with innovating and critique point of view. With regards to purchasing behaviour, despite the fact that Danish consumers are opened to change and risks, when they are buying a product, they are rather conservative. They favour products from companies that have been operating in the country for a long time, which speaks for well and

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long-established companies. Danish consumers also have high expectation, especially in the case of product quality (the highest rate in Europe). Moreover, they put a lot of attention on health, the environment, ethics towards animals and taste (Banco Santander, 2019).

Despite a high level of income tax, Danish consumers generally enjoy one of the best qualities of life in the world - high connectivity with modern infrastructure. This also reflects consumers purchasing power. According to the latest analysis, on average, Danish households enjoy a disposable income of about USD 65 000 a year, 70% of which is used for consumption. Based on this, it may be said, that the average Danish consumer is relatively well-off. Moreover, Danes had also been repaying their mortgages at the fastest pace in a decade. Thanks to this, their Research&Development and innovative capabilities, production, quality management have large amounts of discretionary income to consumption (Euromonitor, 2018). According to the latest available data, in the fourth quarter of 2018, consumers spending counted 233101 DKK Million, and until 2020 it is expected its growth to 248152.00 DKK Million (Trading economics, 2019).

Positive forecasts on the Danish market in case of consumer spending are also supported by consumers' confidence. Despite the fact that the consumer confidence index went down slightly to 3.7 points from 3.8 points in March 2019, Danish consumers are still optimistic. According to Burke (2019) April's dip was mainly driven by consumers' less positive view of their personal financial situation over the next 12 months. Moreover, consumers grew increasingly pessimistic about making major purchases. Since the purchase of a washing machine is not considered to be such a large purchase, the washing machine market can be expected to be unaffected.

Widespread use of technologies in Denmark is also supported by the internet access. Culpin (2018) estimates that there are about 5.4 million Internet users in Denmark, which represent 97% of the total population. Latest available data show that over two-thirds of these regularly use the internet for shopping, meaning there is a large potential for selling product through e-shop.

Consumers and renting

Denmark is rated as one of the most "livable" locations in the world, where every month over 1000 people move into the Greater Copenhagen region alone. Since the cities are no growing so fast the removers are facing problems with finding a place for living. And thus, it is then no wonder that rent is one of the most discussed subjects in Denmark. Charlies Roof (2019) even describes the Danish rental market as incredibly complex, competitive and completely crazy.

Since people rent both type of houses - furnished as well as unfurnished, there is a big potential for renting household appliances such as washing machines, dryers, dishwashers, etc., which new removers will need.

Consumers and the sharing economy

According to Marton (2018), there is 10% of the population being participated in the sharing economy in some form in Denmark. The small participation in the Danish sharing economy also confirms survey conducted by NS Gallup for Nordea Denmark, which shows that only very small percentage of the population engages in sharing economy transactions by providing their own assets and services and using other people's assets and services (Fjalland, and Landbo, 2017). This result is surprising because as similar to other EU's countries, in Denmark are widespread platforms such as Airbnb, UberPop, BlaBlacar, Deliveroo, GoMore, DriveNow and Resecond, through them consumers share private homes, cars, clothes, and so on.

circular business models

Since the government realized the great potential of sharing economy when it comes to securing a better use of resources and giving consumers opportunities, the Danish government announced a sharing economy strategy according to Levring and Wienberg (2017). Denmark wants to bring the so-called sharing economy into its legal codex so that companies like Uber and Airbnb can be absorbed into the Scandinavian welfare model. In this context business Minister Brian Mikkelsen said: *“If you want people to understand the prospects, in terms of new jobs and new technology, then it also has to contribute to the financing of the welfare society we live in.”*

Consumers and IoT

Martin Lobel, CEO of Teracom, said: *“The interest for IoT solutions and the demand for Internet-of-things connectivity is growing dramatically in Denmark”* (Ryan (2019). This also confirms the latest statistic which shows that the Internet is the only media platform whose share of daily users is increasing. In 2017 the Internet was even more by most Danes on a daily basis (88% of the population aged 16-89) (EPRA, 2018).

As regards smart devices, Danish consumers prefer the electronics offering convenience and connectivity, such as wireless products, and wearables and novelty products at a reasonable price. The new attention is paid to the electronics goods that are more connected and to be able to merge as many services as possible into one device such as wireless speakers and smartphones (Euromonitor, 2019). The importance of smartphones also confirms the latest statistic, according to them, Denmark has the highest penetration of smartphones in the world - with 77% of the population using a smartphone. This is reflected in the e-commerce industry, with one in four online purchases in Denmark made using a cell phone. This pointed out that the seller website, especially e-shops should be adapted to the mobile interface as well (Ecommerce News, 2019).

Consumer interest in connected home devices does not remain behind. Danish consumers more and more own a home camera, surveillance system or smart home appliance (Statistica, 2019).

6.1.3 Netherlands

GOVERNMENT

Netherlands government initiatives toward a circular economy

Netherlands government is taking various measures (fostering legislation and regulations, intelligent market incentives, financing, knowledge and innovation, international cooperation) to encourage the transition to a circular economy (for more information read Government of Netherlands, 2019a).

Government:

- seeks to develop further the legislation and regulations that encourage innovation, which includes rules promoting a sharing economy.
- encourages producers to use raw materials that can be reused more often.
- invests in entrepreneurs who are active in the fields of renewable energy, energy saving and reducing CO2 emissions.
- stimulates the creation of knowledge networks and different ways of exchanging knowledge.

circular business models

- works with other countries as much as possible, in the European Union and also in the United Nations.

In September 2016 the Netherlands government launched wide programme for a Circular Economy. It has selected five economic sectors and value chains that will be the first to switch to a circular economy. These sectors (biomass and food, plastics, manufacturing industry, construction sector, consumer goods) are important to the Dutch economy and have a big impact on the environment. As regards the **manufacturing industry**, the government wants to make the business community more aware of the vulnerability of natural resources. By 2050 many critical materials will have to be reused and recycled, including scarce raw materials like 'rare earth' metals (Government of Netherlands, 2019b).

Netherlands government and digitalization

According to "*Dutch Digitalisation Strategy*" report the Netherlands is in an excellent position to capitalise on the economic and social opportunities created by digitalization. They have a world-class digital infrastructure. Wi-Fi and Bluetooth were invented in the Netherlands. The AMS-IX, one of the most important internet exchange points in the world, is located in the Netherlands. Moreover, the Netherlands has a highly educated workforce at an international level, and Dutch consumers often lead the way in embracing new digital applications (Government of Netherlands, 2019c).

ECONOMY

Netherlands economy and future forecast

Dutch economy grows at a dynamic pace: growth was estimated at 2.8% of GDP in 2018 driven primarily by domestic demand, but the pace of expansion is expected to ease from 2.6% and 2.3% in the next couple of years mainly due to slowing private consumption and investment (IMF).

Since the external environment becomes more challenging, defined by lingering global trade tensions and Brexit-related uncertainties, it is expected that economic growth will moderate and grow by 1.7% in 2019 and 1.6% in 2020 (FocusEconomics, 2019a).

Services sector account for over 70.3% of national revenue and employ 81.4% of the workforce. The services sector is focused mainly on transportation, distribution, logistics, banking and insurance, water engineering and new technologies (Nordea, 2019).

Dutch market with washing machines

As the focus is now on energy efficiency in most appliances (reflecting consumers' demand), there was a shift also towards energy efficient automatic dryers, automatic washing machines, and automatic washer dryers.

In 2018 there were price reductions, especially for automatic washing machines where volume sales were declining, and manufacturers were trying to push volumes using attractive prices (Euromonitor, 2019).

Nederland's washing machine main competitors:

1) Whirlpool Nederland

- In 2018 it registered disappointing results in home laundry appliances, with volume sales declining. The company seems unable to stabilize after its restructuring in 2015.

2) Samsung Nederland BV

- the fastest growing player in home laundry appliances in 2018 in the Netherlands
- the leading player in automatic washer dryers and offers a wide range of models to choose

3) Electrolux Home Products

- enjoyed marginal retail volume growth in 2018 partly because of its focus on the greater specific value offered by AEG-Electrolux and less on the economic Zanussi-Electrolux.

4) Miele

- It is the only remaining manufacturer that uses 100% reusable or recyclable materials.

New trends in the laundry market

The rapid development of digital technology has been unlocking better and longer use of the product. The idea of an 'Internet of Things' (IoT) has captured public attention and permeates the mainstream tech and business media. Dutch start-up, Bundles, is demonstrating the benefits of a holistic view by applying IoT technology to the laundry (Ellen MacArthur Foundation, 2019). Laundry leaders such as P&G, Unilever and Henkel are not staying behind. They are responding to consumer's changing needs and demands and aiming to save consumers time with pre-measured or all-in-one offerings. Moreover, they are using collaboration with start-ups, who deliver soap to consumers' homes or who create new mobile apps offering additional services to customers (Geller, 2018). A similar approach is also used by Bundles, however, as regards coffee machines - customers subscribe to the use of a high-quality coffee machine and automatic delivery of coffee beans, based on personal preferences and amount of coffee usage.

⇒ ***Future potential:***

Since the consumer demands products which save their time and are environmentally sustainable, it is worthy of considering this market-niche. A consumer might subscribe to the use of high-quality washing machine and delivery of laundry detergent, based on their preferences (aroma, type – gel/powder, type of cloths – white/black/color, for sensitive skin, for babies, etc.).

Moreover, members of the Board for Washing Excellence have created a whitepaper of what can be expected through 2030 looking at four categories in the laundry cleaning process. There are stated only examples (for review see Hydrofinity, 2018).

- 1) Mechanical action - Smart Laundry Technology
- 2) Chemical action - A Different Approach to Detergent
- 3) Temperature effect - Reducing the Use of Resources
- 4) Time savings - Reducing the Use of Resources

CUSTOMERS**Dutch consumers**

The Netherlands is one of the world's most densely populated nations and similar to most western European countries has an ageing population. Figure 28 captures the household

circular business models

composition from 2016 to 2060 (Statista, 2019). The forecast indicates that composition will change very slightly in the following years. As regards population density, in 2018 it was reported at 506 sq. Km (StatisticsTimes, 2019).

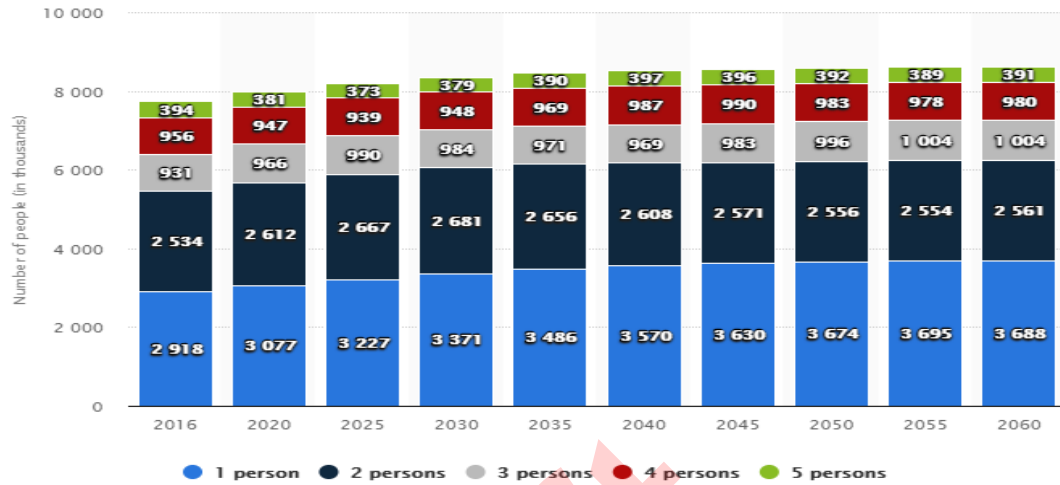


Figure 28: Forecast of the household composition in the Netherlands from 2016 to 2060, by number of people in the household (in 1,000s)

The Dutch population has been found to be among the happiest in the world. Dutch consumers are enjoying a comfortable standard of living, with a buoyant economy, low unemployment and a generous pensions system, which helps to maintain demand for a range of discretionary products and services (Euromonitor, 2018). Despite this general positivism, last year has brought a pessimistic especially as regards households’ financial situation, which lasts until this year. Customer sentiment index dropped further in March of this year, which resulted in a decrease in consumers’ willingness to buy. On the other hand, private consumption is expanding at 1.6% in 2019, which is unchanged from last month’s estimate. In 2020, the panel expects private consumption to grow 1.7% (FocusEconomics, 2019b).

Dutch consumers are characterized by caution and are very sensitive to prices and special offers. Also, quality is also an important factor influencing their purchase behaviour. Therefore, they are willing to pay a premium price for a product of higher quality. Dutch customers prefer practical, healthy and sustainable products, which reflect their greater interest in social responsibility. Moreover, younger consumers are embracing mindfulness and betterment, which may be reflected in their buying habits. Interesting enough, consumers of all ages are questioning ownership as flexible, minimalist living gains popularity (Angus, 2018).

Dutch consumers are also highly connected online and social relationships are extremely important to them. This new trend lasts, which confirms also Rene Djuricek, Owner of Netherlands-based Meesterslijpers, who says, "The days of customers using only email and telephone to contact businesses are over. Customers want to contact a business the same way they contact their friends and family." (Metselaar, 2019). Thus, technology has become critical to consumer behaviour changes, especially mobile technologies and internet access (NVC, 2019). This also results in the way how Dutch businesses do customer service. They started to incorporate new customer service tools, improve customer care overall, and forge more human relationships with customers on channels, which the customers prefer. Interestingly enough, the channels like chat, Twitter and WhatsApp will grow significantly. Through chat, firms can connect with potential customers it would not connect with otherwise (Metselaar, 2019).

Consumers and renting



circular business models

Consumer habits are changing quite often nowadays. Following on from the house, apartment and vehicle rentals, the rental business has now spread to household goods such as electrical appliances, DIY tools, and even clothing. Although the older generations were more reluctant about renting things, the need to balance household budgets, greater geographical mobility, and new consumer habits are all reasons why nowadays many people prefer not to invest long term in equipment for the home. Moreover, renting brings many benefits, because in addition to saving on the cost of installation and any necessary repairs, renting a home appliance can enable the consumer to obtain a tailored service (Frontière, 2014).

There are currently several successful business models such as NeoSquat (Startup rents out furniture) or Bundles (Startup rents out washing machines), home appliance renting which seems to indicate that this is a promising business with numerous advantages.

Consumers and the sharing economy

There are numerous sharing economy initiatives across the Netherlands. For example, Amsterdam has created dozens of new digital platforms encouraging citizens to participate in the sharing economy. In addition, the digital application contributes to concerted effort to reduce waste and remove one per cent of all cars from roads in Europe.

Sharing is popular in many services like food and drink, accommodation, renting cars, etc. From the public sector's point of view, sharing and collaboration are valuable tools in the drive towards achieving a sustainable and friendly city. Nanette Schippers¹⁵ in the context of sharing economy said: "Everything indicates that people continue sharing because of a whole bunch of other reasons such as a sustainable society. Now, we know who is willing to share – those between the ages of 20 and 45 are more likely to share. But our role is to expand this group to include low-income groups and the elderly. We want a pro-active, open attitude which understands the sharing initiative and helps everyone." (Apolitical, 2019).

Consumers and IoT

- The European IoT market is still growing – in 2018, there are around 11 billion connected 'things,' where 60-65% are consumer devices.

The Netherlands is one of the leaders in capability and initiatives within Europe. According to Statistics Netherlands report, smartphones (85 % of all households) and laptops (78 % of all households) were the most frequently used internet devices used by households in 2017. Dutch older adults are increasingly active in using smart devices, which indicate the potential of a IoT market in the Netherlands. On the other hand, GfK research pointed out that the interest in adopting smart home solutions was declining in 2018 compared to 2017 (less than 50% of the people claim to be interested). Between benefits associated with smart home solutions for the Dutch consumers belong the ability to save energy and the convenience of being able to control your devices from anywhere. And, the barriers preventing people from adopting the trend are cost and privacy issues (Siliconcanals, 2018)

¹⁵ Program manager, sharing economy for innovation office, at the government of Amsterdam

circular business models

Therefore, to promote IoT services, CBI¹⁶ (2019) highlights that good communication between customer and service provider is essential. Unclear communication may cause misunderstandings and disagreements, which can lead to disputes.

Customers and laundry

Recent launched Unilever’s market research shows, that generation of millennials (age 22-37 years), who earn more than a quarter of the world’s income, have a different approach to laundry than other age groups. They are less loyal to traditional brands and have new demands, including those products, save time and be environmentally sustainable. Moreover, many young customers want to spend as little time as possible on laundry. In this context, 36-year-old Olivia Tusinski said that “washing too often wears your clothes out faster” and that she doesn’t like to waste water or energy (Geller, 2018).

Additionally, the majority of millennials consists of students, who are living in rented houses and do not consider buying white goods (such as washing machine) but rent it along with the home. An example is Splash Lease, who rents/leases out washing machines, dryers, etc. (included delivery and repairs) to students and student houses all over the Netherlands from € 9,- per month (Splash Lease, 2019).

With regards to customer preferences when choosing a washing machine, a recent survey conducted by Euromonitor International (Figure 29) revealed that the most important features for consumers were energy and water efficiency, which were followed by features that increased convenience, such as time-saving features, while design and appearance features and other more technological advances interested consumers less (Euromonitor International Analyst Pulse Survey, 2015). Therefore, it is important to highlight to consumers’ needs and not only promote technological prowess (Baus, 2015).

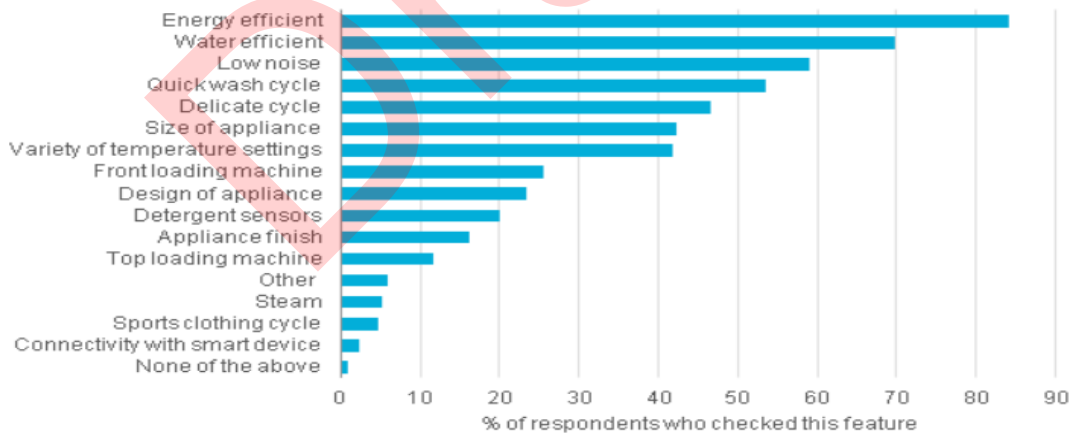


Figure 29: What features do consumers consider most important in washing machines?

6.1.4 Slovenia

GOVERNMENT and ECONOMY

For the further development in Slovenia, the Circular Economy Roadmap of Slovenia that was officially launched in May 2018, is of high relevance. The Roadmap is based on principles of

¹⁶ We are part of the Netherlands Enterprise Agency and are funded by the Netherlands Ministry of Foreign Affairs.

circular business models

collaboration and co-creation among different stakeholders. Potential ways of transition in Slovenia include product-service systems, sharing, or switching from consumers to users' approach. Digitization, including blockchain technologies, is seen among key enablers in the roadmap.

To assess the readiness of Slovenia for circulatory transition, two rankings are of relevance: Slovenia reached the 6th position in the EU Eco-innovation Index for 2017 (the European Commission, 2017) as *“the Slovenian Government significantly strengthened its support and activities related with circular change”*. Slovenia also took 7th position in circularity among 28 EU-countries, although the results are mixed: Slovenia over performs other countries in food waste processing, recycling and trading of recyclable raw materials, but it lacks in private investment into circularity and in patents (Hervey, 2018).

The latest achievements of Slovenia in circularity transition was summarized by The Environmental Implementation Review as follows:

- “Slovenia has adopted new spatial planning legislation (the Spatial Planning Act and the Construction Act) to become fully compliant with EU law on environmental assessment and access to justice.
- On nature conservation, Slovenia has made good progress in mapping and assessing its ecosystem services.
- Slovenia has strengthened its economic instruments to increase the budget available for residual waste treatment.” (European Commission, 2019).

Slovenian institutions are also partnering European projects promoting CE, such as MOVECO (Mobilising Institutional Learning for Better Exploitation of Research and Innovation for the Circular Economy) in the Danube region.

Nevertheless, some problems and barriers still exist. A recent study focused on the view and readiness of Slovenian small and medium enterprises. The SMEs complained about the inadequate fiscal policy set by the government, and they also felt a lack of interest and readiness among consumers' payment of higher prices associated with pro-circular products. Other barriers relate to little information and knowledge of circularity among all groups of stakeholders (Širec et al., 2018).

The understanding the CE itself is rather limited: In a pilot survey, 68% of companies claimed to have heard about the CE, but they did not know what means while 20% of the Slovenian companies have heard of the circular economy and know the concept well (Baggia, 2017).

CUSTOMERS

In the adoption of smart home appliance, the Slovenian consumer are fans of IoT technologies: the presence of smart home products in their households is above the average for Central Europe, it is even higher than it is in the typical or average west-European household, but, e.g. Austrians adopted the smart home appliances three times more often than Slovenians (GfK, 2018) however; in older survey, Slovenians expressed more willingness for smart home appliances than Austrians (Mert et al., 2009).

Besides digitization, the sharing economy is another circularity enabler that is established in Slovenia – in the form of small online platforms that are extremely popular. “The issue has been a “hot topic” in the media since 2015 when the government intensified its efforts to start the debate on legal reforms to accommodate foreign sharing economy companies in Slovenia” (Cost Association, 2019). The legislation in Slovenia is a burden for sharing economy services in accommodations, especially (Grifoni et al, 2018).

circular business models

Some data suggest that environmental awareness is limited: Majority of Slovenian consumers consider material composition when buying apparel, while only a small percentage consider ecolabels and the environmental impact (Žurga and Forte Tavčer, 2014). The willingness to buy green electricity showed to be moderated by age and education, and environmental awareness too, but the most powerful factor is the income (Zoric and Hrovatin, 2012). The value system of Slovenians is quite traditional; thus, the environment (e.g. the value of clean air) is important, but some other environmental-awareness related factors are of lesser importance (such as social cohesion, equality, green food) (Redek et al, 2012).

6.2 The results of pilot surveys in Austria, Denmark, the Netherlands, and Slovenia

6.2.1 The sample description

The quantitative study presented in this section serves as pilot research to supplement the secondary data about market readiness for circular business models. The data collected from consumers in four countries provide inputs for business model design in terms of motivation and barriers for renting of washing machines, participation in collaborative consumption, usage of remanufactured washing machines, and idea about the ideal washing machine. One section of the survey included the inputs for conjoint analysis, which tested preferences for four product attributes.

The online questionnaire was distributed through professional research agency in the first week of April 2019. Quota sampling was employed, **the final sample size amounted to 659 cases representing the four countries equally** (see the Figure 30).

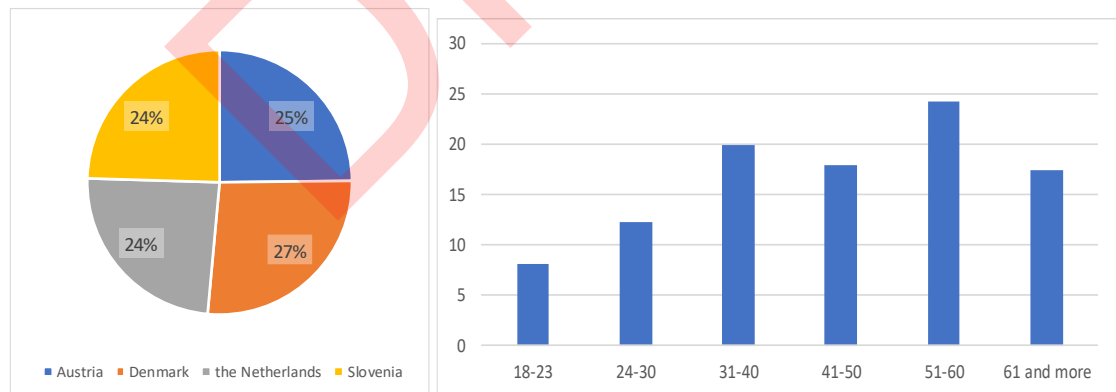


Figure 30: The respondents' nationality and the age structure

The number of women slightly outweighed men (52 vs 48 per cent). **The average age was 44 years** (49 years for men and 41 years for women) and did not differ across countries as tested by ANOVA ($f = 274.4$, $df = 3$, $p = 0.433$). The high school is the most frequent education level; in Austria and the Netherlands, more than 50 per cent of respondents belong to this group. There is no significant difference in education level between males and females across countries (see Figures below).

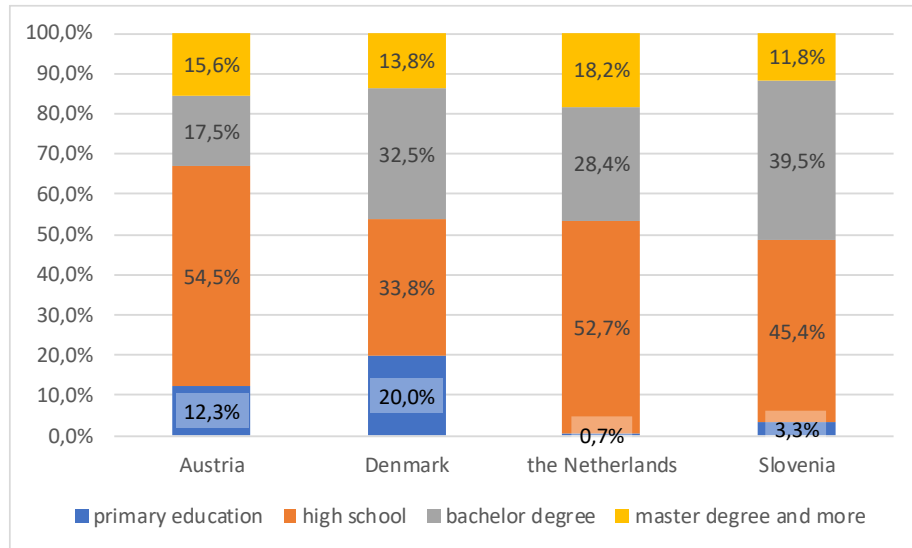


Figure 31: Education

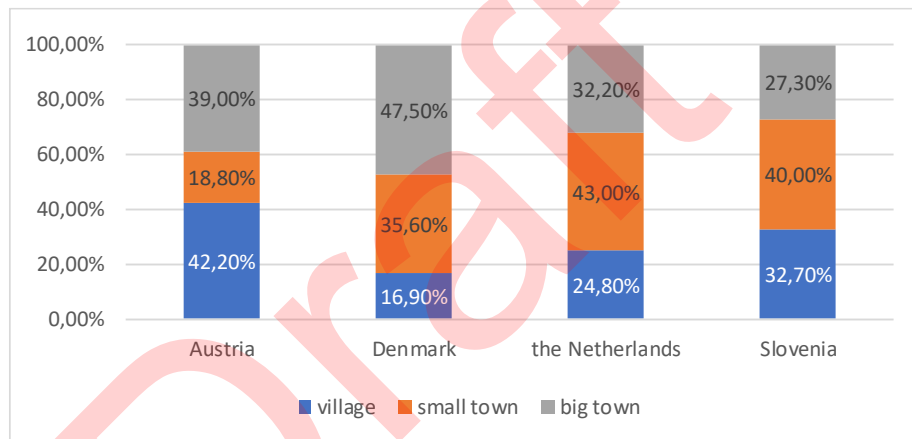


Figure 32: Settlement structure

Most respondents live in private house/cottage except for Austria, where the apartments are significantly more frequent (64%) since the apartments also dominate in small towns in Austria. In other countries, the apartments are typical for big towns only, whereas in villages the share of the private houses makes over 80% (Table 9: Living conditions Table 9 and Figure 33).

	Austria	Denmark	the Netherlands	Slovenia	Total
private house/cottage	34.60%	52.20%	57.00%	56.00%	49.90%
the apartment	64.10%	42.20%	39.60%	42.00%	47.00%
other	1.30%	5.60%	3.40%	2.00%	3.10%

Table 9: Living conditions

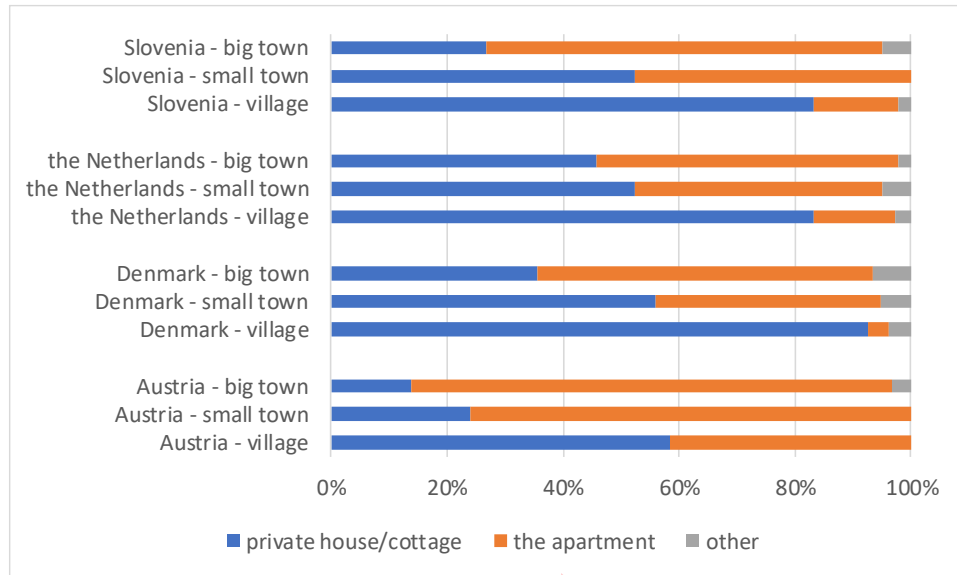


Figure 33: Living condition related to the settlement

The data about income per person was collected by the closed-ended question, which response categories were set as quintiles – the intervals in national currencies taken from public Eurostat data. As apparent from Figure 34, the most representative sample from this point of view comes from the Netherlands as all the five groups are of similar size.

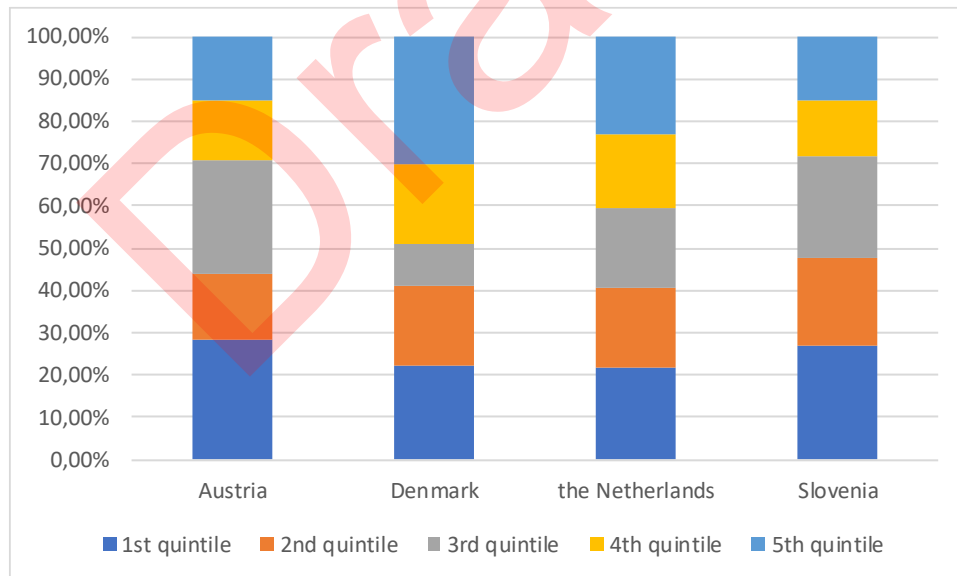


Figure 34: Income per person

The majority of respondents live in a household with a partner without children (34%) or with one or two children (25%). Living alone is three and a half times more often in Denmark (36%) compared to Slovenia (10%). For Slovenia, living with parents or grandparents in one household is more common than in other countries (Figure 35).

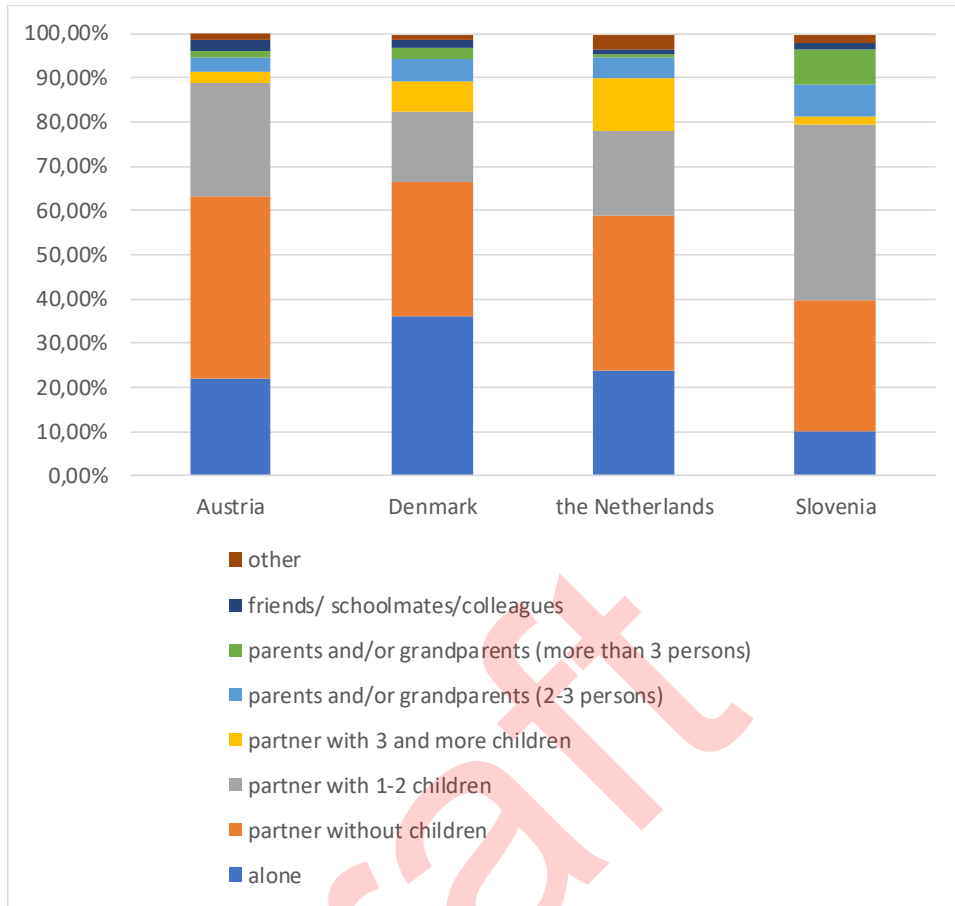


Figure 35: Structure of households

In terms of acceptance of new products and new trends, there is a slight difference with Danish respondents, as they perceive themselves more often as a late majority – at the same time, the early adopters are underrepresented there. Slovenian and Dutch people are more innovative when compared with the other two countries (Figure 36).

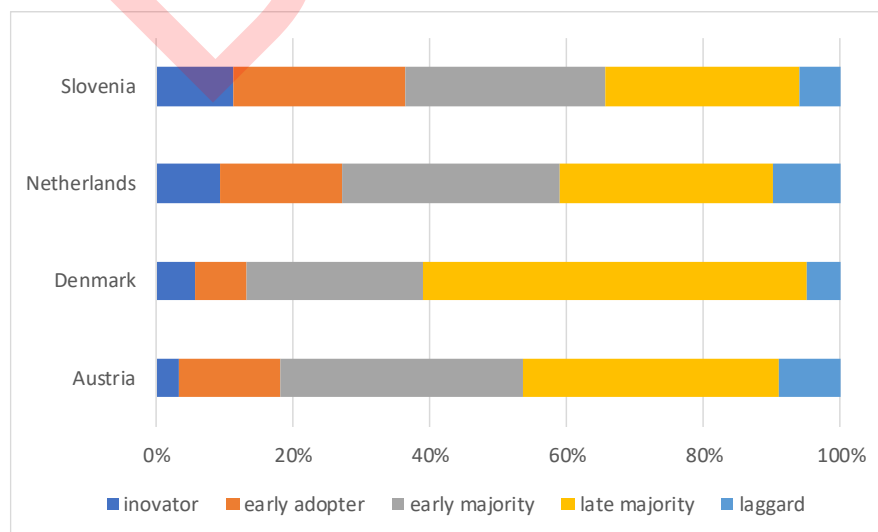


Figure 36: Technology adoption life cycle

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Majority of consumers are “eco-friends” or neutral concerning the environmental issues, in Slovenia the proportion of consumers profiling themselves as neutral to friendly is higher substantially (Figure 37).

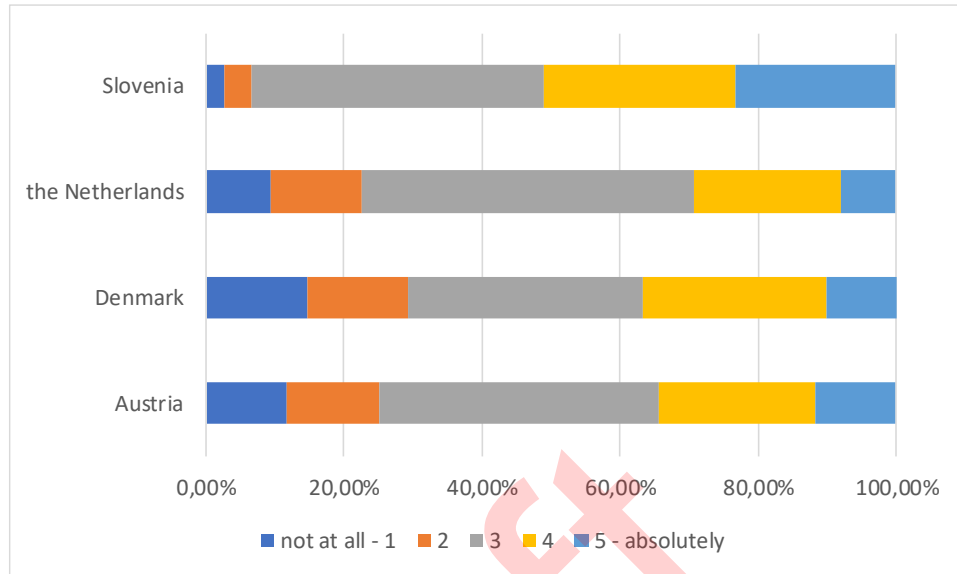


Figure 37: Eco-friend/fan/campaigner

Three-quarters of households own the washing machine; other three quite frequent types include collaborative consumption (sharing the WM with other flats in the house of flats), leasing/ bought on credit, and landlords’ ownership, each amounting to 6 per cent of the share. Speaking about countries specificities, **less ownership in favour of the collaborative consumption and using the landlords’ WM is typical for Denmark. More owning and less collaborative consumption is characteristic for Slovenia, whereas renting is more common in the Netherlands** (Figure 38 and Table 10).

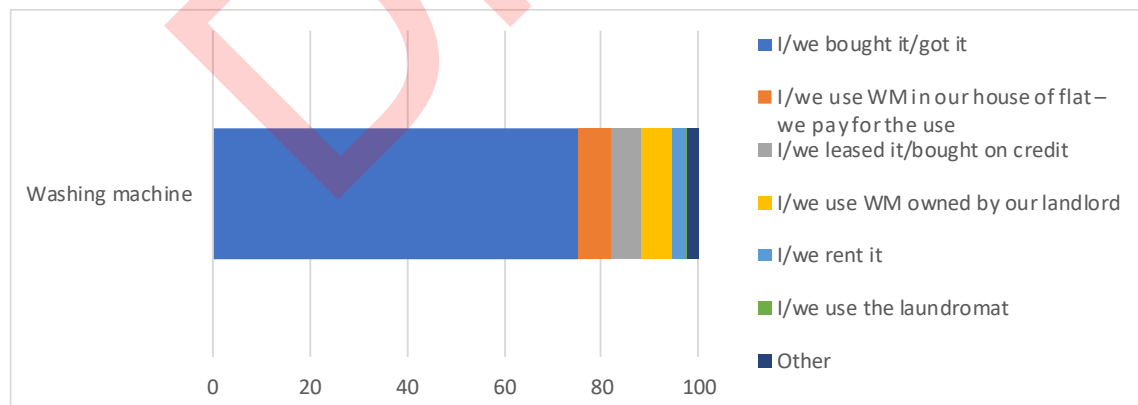


Figure 38: Status of washing machine (in %)

	Austria	Denmark	The Netherlands	Slovenia	Total
I/we bought it/got it	81.3%	62.3%	72.2%	85.4%	75.2%
I/we use WM in our house of flat – we pay for the use	3.9%	16.4%	5.3%	0.7%	6.7%
I/we leased it/bought on credit	6.5%	6.3%	6.0%	6.6%	6.3%
I/we use WM owned by our landlord	3.2%	10.1%	6.6%	5.3%	6.3%
I/we rent it	3.2%	1.9%	5.3%	0.7%	2.8%
I/we use the laundromat	0.6%	0.0%	0.7%	0.0%	0.3%
Other	1.3%	3.1%	4.0%	1.3%	2.4%

Table 10: Status of the washing machine in the cross-country comparison

43 per cent of respondents wash once or twice a week, three or four times a week is a typical frequency for 27 per cent. In this aspect, the Danish respondents show less frequent washing; however, this is probably due to the higher number of Danish singles in the sample (Figure 39).

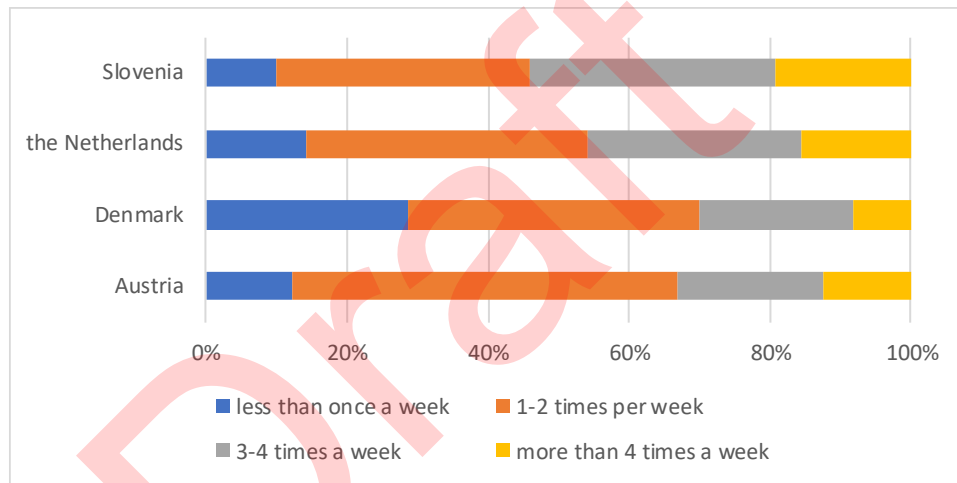


Figure 39: Frequency of washing

6.2.2 The main results of statistical analysis

This analytical part covers several areas of consumers` approach to washing: their experience, motivation and barriers related to different kinds of access-based consumption are explored. Additionally, the desired features of the washing machine are investigated in the end. Each topic is presented in the form of frequency counts for the whole research sample, followed by a bi-variate analysis which uncovers meaningful and statistically significant differences and strength of associations for countries or consumers` socio-demographic and behavioural characteristics.¹⁷

6.2.2.1 Experience with access-based consumption

The consumers are rather inexperienced when it comes to access-based consumption; among the three types inquired, **the renting is the most common way with almost 47 per cent** of consumers who rented something at least once. **The renting experience is similar across the**

¹⁷ Several methods of bivariate analysis have been applied, namely measures of Association (Cramer`s V, Spearman rank correlation, ANOVA)

circular business models

countries. The Austrians have less experience with both pay per use and collaborative consumption. In Slovenia, there are more people who tried pay per use once or twice (see the appendix for exact data).

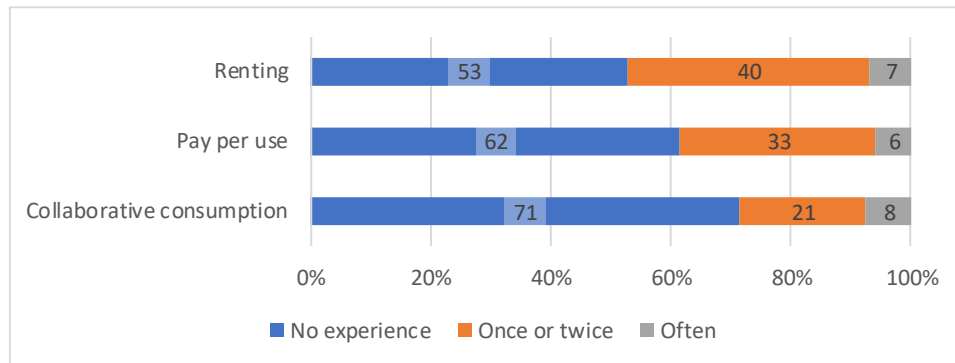


Figure 40: Experience with access-based consumption

The experience decreases with the age of consumers – the younger the customer is, the more often he/she uses access-based consumption ($F = 12.11, p = 0$; $F = 21.33, p = 0$; $F = 12.34, p = 0$).

In the group of washing machine owners, all three access-based consumption models are less frequent: this is evident specifically for pay per use (Cramer's $V = 0.270, p = 0.00$) and collaborative consumption (Cramer's $V = 0.304, p = 0.00$). For the renting the relation to ownership is weaker (Cramer's $V = 0.134, p = 0.004$). **The data suggest that washing machine owners prefer the ownership also of other products** than washing machine as this group is underrepresented in the answer of "often" – another way round: the people who often use any kind of access-based consumption own the washing machine less frequent.

The experience is related to many consumers' characteristic. In short, **the experience with access-based consumption is related to:**

- **Approach to innovations and new technology** (innovators and early adopters have more experience)
- **Eco-friendliness** (positive relationship)
- **A higher level of education** (positive relationship)
- **Location in towns** (positive relationship)

Just for renting, intensive washing frequency, higher income and gender (males) are also positively related to extensive experience.

6.2.2.2 Renting of washing machine

Out of diverse motives of transition from owning to renting, **the following four factors seem to be the most relevant** (Figure 41):

- **Getting rid of the responsibility** for washing machine maintenance (if maintenance is offered together with renting)
- **Smaller risk of breakdowns** due to professional maintenance done by a service company and due to the high quality of washing machine (within renting usually higher quality machines are provided)
- **Opportunity to test** the washing machine (e.g. brand I would like to have)
- **Environmental concerns** (renting requires durable products that operate for a longer time)

The aspect of cost/money is relevant, but to some extent only.

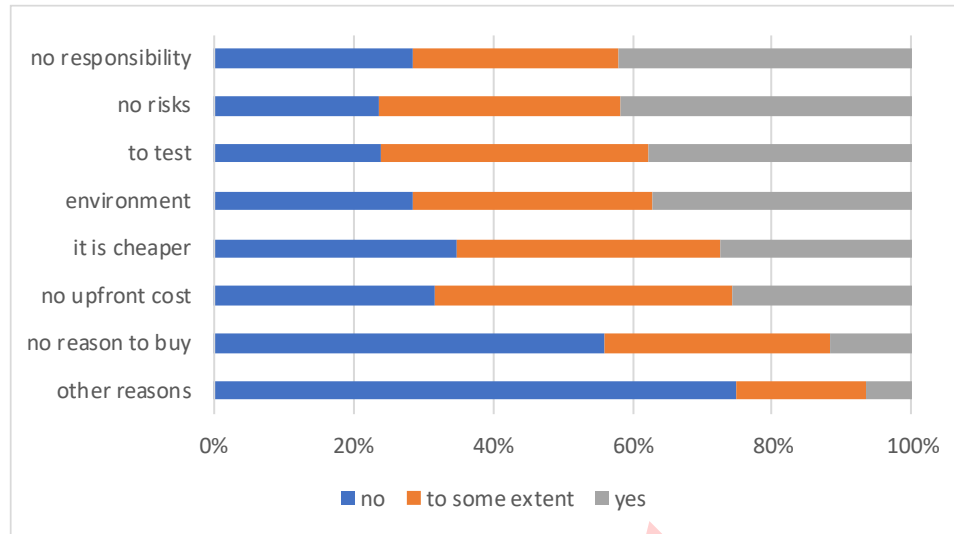


Figure 41: Motivators for renting of washing machine

Although there are several differences across countries, only two of them are of higher statistical power – both refer to **Slovenia**. In this market, the customers are substantially more motivated for renting by the opportunity to test the washing machine (without buying it; adjusted residuals = 5.3) and by environmental concern (adjusted residuals = 3.7).

The sociodemographic characteristics are not related to motivation. Among other consumers’ characteristics, four of them are related to motivation for renting (Table 11):

- **New product approach** – consumers profiling themselves as more innovative towards new technologies would like to avoid the upfront cost and declare to have a lesser interest in ownership; they are more considerate to environmental protection.
- **Eco-friends** share the motives with the above group, but testing, cheaper cost and risk avoidance are relevant too.
- **Washing machine ownership** is negatively related to factors of no reason for buy and other reasons.

Lower age is associated with higher importance of six motivators.

	no upfront cost	no reason to buy	it is cheaper	to test	no responsibility	no risks	enviro.	other reasons
New product approach	-.111**	-.178**	-0.053	-.088*	-0.034	-0.079	-.142**	-0.045
Eco-friends	.189**	.120**	.123**	.136**	.126**	.170**	.328**	0.071
Washing frequency	-0.005	-0.010	-0.024	.092*	0.005	-0.020	-0.005	-0.059
WM owners	-0.058	-.210**	-.093*	0.043	0.014	0.009	-0.026	-.150**
Education	0.048	0.043	0.054	-0.005	0.038	0.077	.081*	0.021
Location	0.056	0.066	0.042	-0.025	0.026	0.050	0.009	0.016
Income	-0.013	-0.063	0.029	-0.006	-0.034	-0.030	-0.012	-0.033
Gender	0.036	-0.002	0.053	0.038	-0.003	0.024	0.055	0.000
Age	-.135**	-.103*	-.122**	-.092*	-0.054	-.092*	-.164**	-0.073

Note: ** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed).

Table 11: Renting - rank correlations between motivators and consumers factors



6.2.2.3 Pay per wash

The similar battery of items inquired the motivation for pay per wash system (Figure 42). **The relevance of factors for pay per wash is like those for renting.** In countries comparison, **only the position of Slovenia is specific:** the Slovenian consumer would be motivated more for pay per wash by **chance to test a new washing machine and to avoid the upfront cost.**

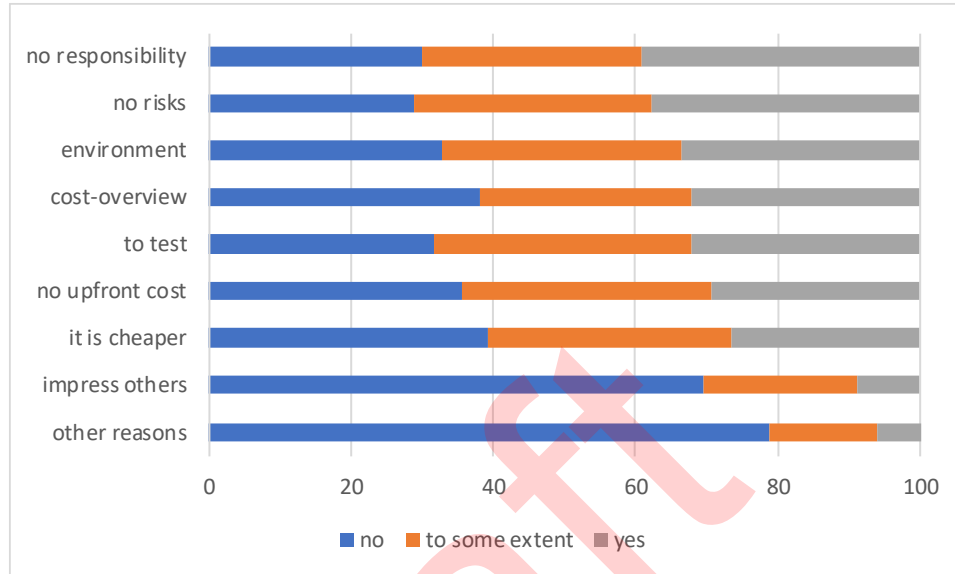


Figure 42: Motivators for pay per wash (in %)

Among other consumers' characteristics, the approach to innovations, eco-friendliness, age, and washing machine ownership are associated with most of the factors, as apparent from the Table 12).

	no upfront cost	it is cheaper	to test	no respons.	no risks	Enviro.	Cost overview	impress others	Other
New prod.app.	-.088*	-0.064	-.093*	-0.051	-0.018	-.098*	-.087*	-.196**	-.097*
Eco-friends	.215**	.145**	.185**	.169**	.200**	.330**	.183**	.202**	.088*
Washing freq.	-0.025	-0.061	0.063	-0.014	-0.032	-0.008	-0.03	.083*	-0.027
Age	-.126**	-.103*	-.103*	-0.073	-.092*	-.133**	-.090*	-.167**	-.138**
Edu.	0.074	.093*	0.031	.133**	.102*	.105*	0.063	0.073	0.023
Location	.088*	.085*	-0.023	0.08	0.044	0.051	0.046	0.008	0.047
Income	-.089*	0.005	-0.019	-0.023	-0.036	-0.037	-0.067	-0.059	-0.043
Gender	0.077	0.058	0.019	0.015	0.061	.083*	0.069	-0.061	-0.04
WM owners	-0.07	-.123**	-0.053	-0.024	-0.048	-0.036	-0.055	-.232**	-.314**

Note: ** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed).

Table 12: Pay per wash - rank correlations between motivators and consumers factors

Among barriers that could discourage people from pay per wash, the two are of the most importance: **insisting on ownership** and **the belief that pay per wash is a more expensive option** in the end compared to owning. To the contrary, fear of personal data leakage or misuse is rather limited.

The view on barriers is uniform across countries. The association of barriers with other consumers' characteristics is sporadic: pay per wash as an expensive alternative is perceived by

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older people and in the group of washing machine owners (this group puts more stress on the factor of ownership as a barrier too). Preference of ownership is more important for those who wash more frequent. For eco-friends, ownership is a barrier of lesser impact.

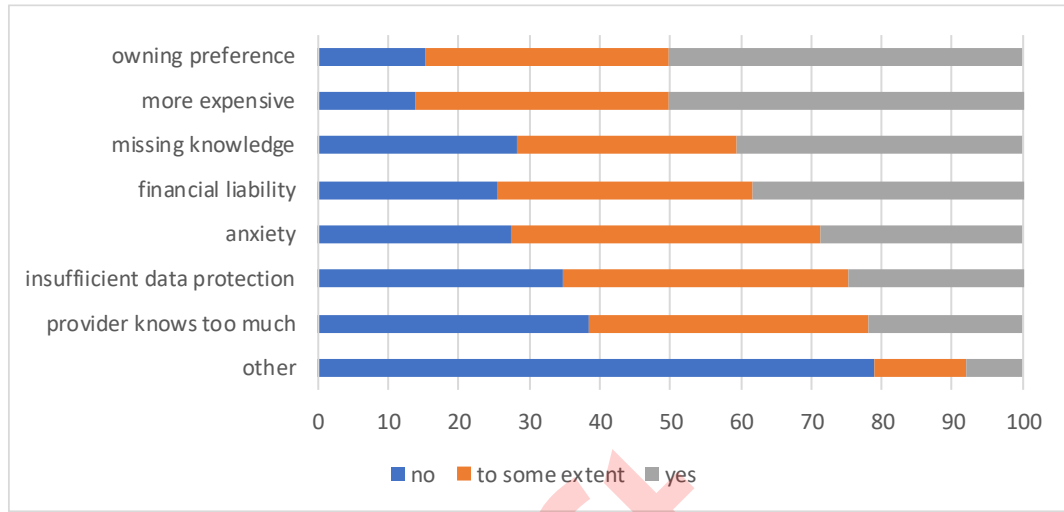


Figure 43: Barriers to pay per wash (in %)

6.2.2.4 Collaborative consumption

The first battery of question covered diverse motives that would persuade the consumers to get involved in collaborative consumption. **The most relevant factors are** as follows (in decreasing order - Figure 44):

- **Flexibility – getting rid of the ownership ties**
- **The belief that washing would be cheaper**
- **Avoiding upfront purchasing cost**
- **Environmental concerns**
- **To get rid of the responsibility for washing machine maintenance**

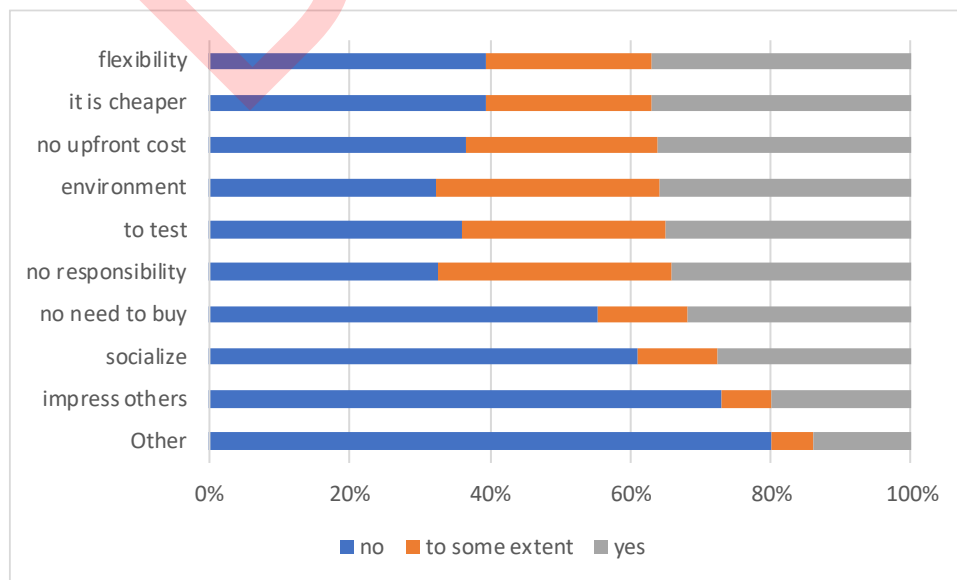


Figure 44: Motives for collaborative consumption (in %)

The countries differ in the above motives in minor aspects only – generally, the perception of motives is shared across all the four countries. Like results for renting, also in case of collaborative consumption Slovenian would be more motivated by chance to test the products. The issue of getting rid of the responsibility for maintenance is stronger in this country too.

The association with consumers' features is similar to previous results: **the motivation is related to approach to innovations** (negative correlations in the table results from coding scheme – lover innovativeness was coded with higher number), **eco-friendliness, age, and washing machine ownership** (the relation is negative here – people who own washing machine expressed lover motivation in seven out of ten factors). See Table 13.

	no upfront cost	no need to buy	it is cheap	to test	no resp.	Enviro.	flexibility	impress others	socialize	Other
New product app.	-.081*	-.132**	-.103*	-0.064	-0.049	-0.075	-0.061	-.121**	-.137**	-.092*
Eco-friends	.145**	.127**	.149**	.102*	.135**	.230**	.192**	.156**	.182**	0,05
Washing freq.	-0.047	-0.04	-0.016	-0.067	-0.064	0.004	-0.026	0.041	-0.024	-0,079
Age	-.129**	-0.076	-	-0.054	-0.067	-.093*	-0.068	-.156**	-.083*	-.095*
Edu.	0.078	0.065	.122**	0.033	0.051	.104*	0.062	0.028	0.009	0,055
Location	-0.025	0.068	.092*	-0.017	0.033	0.049	.084*	0.036	0.028	0,042
Income	-0.075	-0.031	0.012	-0.036	-0.075	-0.071	-0.079	-.082*	-0.06	-0,058
Gender	-0.012	-0.077	-0.018	-0.039	-0.025	0.032	-0.038	-0.021	-0.053	-0,059
WM owners	-.157**	-.152**	-.085*	-0.052	-0.07	-0.049	-.106**	-.252**	-.147**	-.230**

Note: ** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed).

Table 13: Collaborative consumption - rank correlations between motivators and consumers characteristics

6.2.2.5 Refurbished and remanufactured washing machine

The vast majority of consumers (70%) have no experience with refurbished or remanufactured products; this inexperience is slightly higher in Austria (78%) compared to the other countries. No more substantial differences were identified across countries.

A battery of questions inquired the perception of these products in diverse aspects (Table 14). For all respondents, regardless of their experience, the essential factor when thinking about reman/refurbished washing machine is brand reputation. They also perceive such products as inferior compared to new production. At the same time, a contradictory statement (reman is of the same value as new productions) is present quite often too, suggesting that there might be two or more consumer segments when it comes to reman/refurbished products views.

Surprisingly, out of seven aspects, it is just one that differs between the group of experienced and inexperienced respondents: **consumers with the experience with reman/refurbished products are more afraid of problems with the reliability of washing machine after its warranty period is over.**

It is worth to mention that **elderly people more disagree with most statements.** No other associations to consumers' characteristics were identified.

refurbishing/reman experience:	no	yes	Total
brand reputation essential	3.36	3.35	3.36
reman is inferior	3.26	3.37	3.29
concern about hygiene	3.2	3.27	3.22
reman valued as new	3.19	3.27	3.21
reliability problems	3.13	3.36	3.2
less enviro. Impact	3.01	3.13	3.04
resources protection	2.96	3.12	3.01

Note: values represent means on scale 1 (fully disagree) to 5 (fully agree)

Table 14: Perception related to experience with reman/refurbished products

6.2.2.6 Ideal washing machine

The respondents expressed dis/agreement (on scale 1 (not at all) to 5 (absolutely)) with a battery of statements describing diverse features of the washing machine. Overview of features that were assessed is in the Table below.

<p><i>I would like a washing machine that:</i></p> <ul style="list-style-type: none"> • <i>is robust and durable so that it lasts longer</i> • <i>is smart and Internet-connected so that I can manage and control washing online</i> • <i>tells me in advance if something in the washing machine has to be cleaned or repaired</i> • <i>works with my personal profile, so it recommends me how and when to wash (to optimize water, energy and detergent consumption)</i> • <i>is upgraded by the service provider so I can always have the up-to-date machine</i> • <i>has an auto dose for the detergent (auto dosing washing machines will weigh your clothes in the drum and set the perfect detergent amount automatically)</i> • <i>an online calendar connection</i> • <i>online expert advice (available 24 hours/7 days per week – tutorials, videos etc.)</i> • <i>gives me information about energy and water consumption</i> • <i>gives me information about the price for wash</i>
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Table : Overview of washing machine features assessed by consumers

The differences among features are not dramatic (see the Figure 45); using the mean as a measure of central tendency – it spreads from 3.18 to 2.49 (least preferred feature). **Three of the most willing options include:**

- a function that informs a consumer in advance about necessary cleaning or repair (**cleaning/repair warning**)
- the up-to-date washing machine that is upgraded by the service provider (**upgrading up to date**)
- a function displaying the price of the washing cycle (**the price of washing cycle info**)

Online calendar functionality is relatively less important, but **it is the robustness that is required at least.**

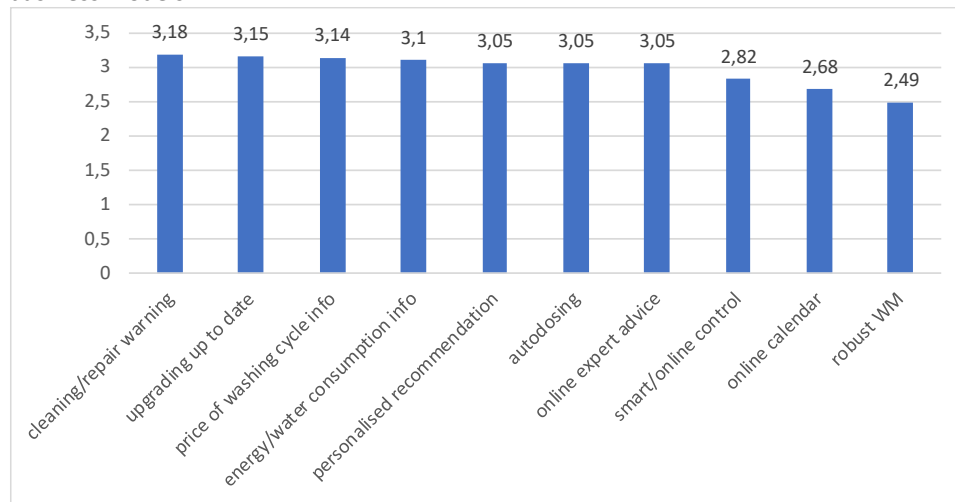


Figure 45: Features of an ideal washing machine

The view of consumers across countries is rather similar (see the figure depicting the differences in the appendix), the only thing that can be distinguished is the view of Slovenian vs Dutch consumers that is elaborated in the next section.

In terms of consumer characteristics, the specific association is identified for eco-friends – these people are less interested in five out of ten assessed features. Elderly people and washing machine owners are less interested in robustness of the machine and in online calendar functionality.

6.2.2.7 Country profiles: The Netherlands vs Slovenia

After conducting several bi-variate tests and applying multivariate methods such as cluster analysis and tree analysis, a significant difference among countries was identified in two of them – in consumers from the Netherlands and Slovenia. Denmark and Austria are neither identical nor “average”, but the consumers here share many views/preferences with each other as well as with Dutch and/or Slovenian consumers – this does not allow for creation of a unique country profile.

The following figures visualize those aspects that distinguish Slovenian and Dutch consumers the most. In short, these factors are of higher importance in Slovenia in comparison to Dutch customers:

The motivation for renting:

- Avoidance of up-front cost
- A chance to test new/other product
- Getting rid of responsibility for maintenance
- Environmental concerns
- Smaller risk of breakdowns due to professional maintenance

The motivation for pay per wash (same as above, plus):

- Better overview of the cost of washing
- To impress others

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Slovenians feel more anxiety related to PPW caused by limited knowledge of this business model (its risks) and are more aware of data protection risks.

The biggest motivators for Dutch consumers are no responsibility and no risks (in case of renting) and no risks and costs overview (in case of PPW).

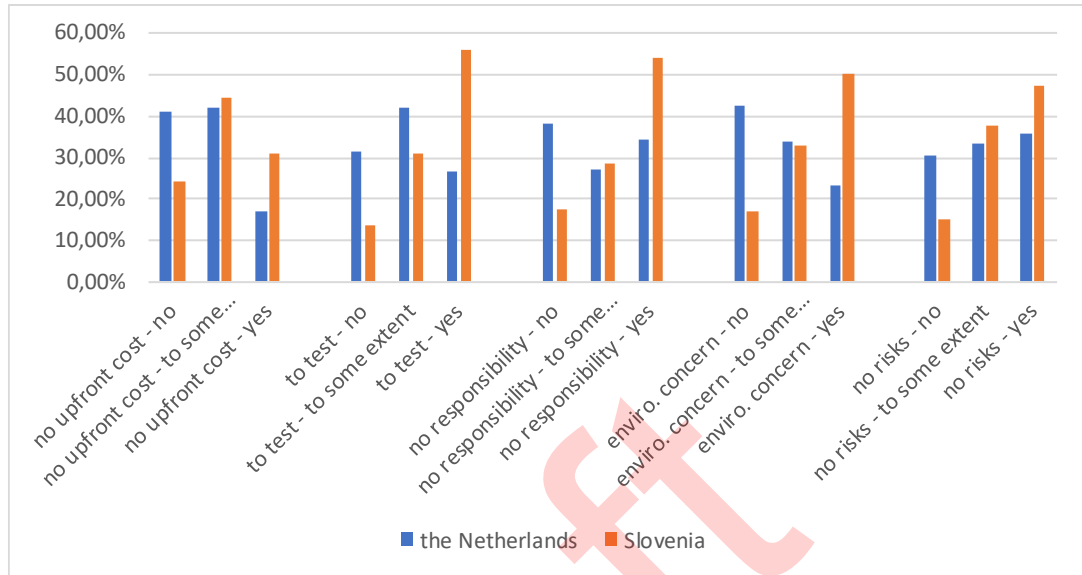


Figure 46: Renting (in %)

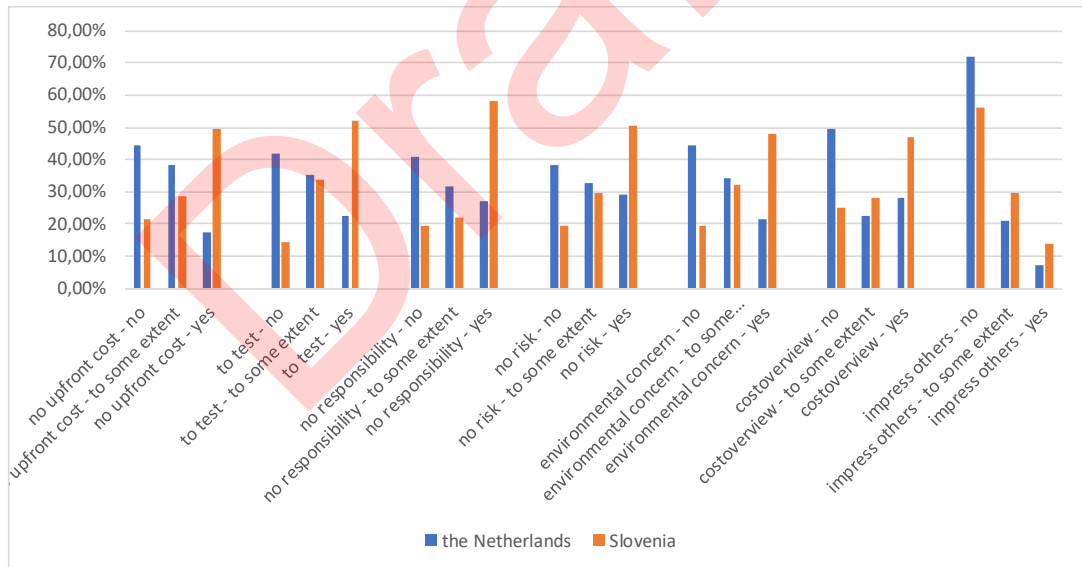


Figure 47: PPW (in %)

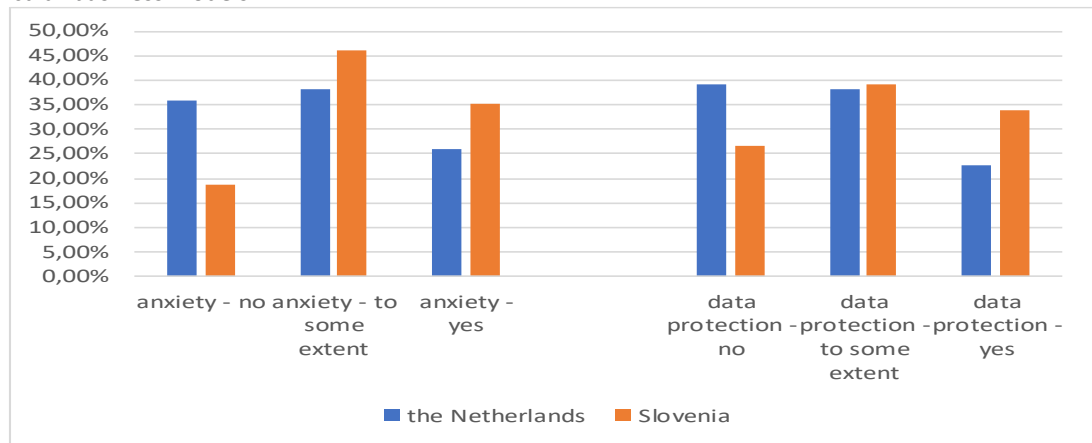


Figure 48: PPW barriers (in %)

6.2.3 Conjoint analysis

6.2.3.1 Research goal and methodology for the conjoint analysis part of the pilot survey

As the new circular business model for Gorenje demonstrator might mean a substantial change for customers, assessment of market readiness is essential for its successful implementation. However, market acceptance can depend even on details in the business model configuration. The problem is that empirical testing of such details/particularities would require multiple (representative) studies (in multiple countries) and that would go far beyond the pilot survey. For this reason, we focused in detail on one aspect only within the pilot survey (the pricing), even though the demonstrator has already started with detailing diverse product versions (labelled as the Gold, Silver, and Bronze provisionally). Reliable testing the product design in its full complexity/completeness would be impossible due to both the methodological issues and resource constraints.

The research aim for conjoint analysis is twofold:

RQ1: What is the customers' view on the pricing of pay per wash (willingness to pay, the payment scheme)?

RQ2: What are the customer differences in pricing perception across the four countries?

Conjoint analysis belongs to the group of the most frequently used method/research design in marketing studies focusing on customer research. Specifically, it is able to provide a deeper understanding of customers' preferences – the understanding that is usually more reliable than a traditional, simple scale-based assessment of preferences (the researched factors). The main benefits come from the fact that conjoint analysis requires the respondents (the customers) to CONsider the factors JOINTly. In other words, the customers are not asked to assess the potential factors (e.g. affecting the purchasing decision) one by one on scale measure (agree/disagree; important/unimportant), but they express the preferences by assessing (sorting/ranking) the virtual products called the profiles. Each profile contains a specific combination of factors (the different levels of product attributes). From the ranked list of profiles, the statistical tools infer the importance of each factor (the attribute and its levels). Working with virtual products rather assessing some factors on the scale is what classify the conjoint analysis as an experimental method.

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Conjoint analysis is especially beneficial, if the factors to be assessed (product attributes) are inter-related and if there is a trade-off between some of the factor (such as product price vs product quality). For this reason, the conjoint analysis was employed for the analysis of pay per wash pricing.

The conjoint method was applied in a traditional way – the respondents ranked the profiles from the most preferable to the least. Instead of physical cards, the respondents manipulated with a virtual profile on the screen of their computer; the conjoint analysis was conducted online as a part of the customer's surveys. The instruction was as follows:

“The cards (product profiles) below represent diverse washing options. Please rank the cards in terms of your preferences (drag them by mouse and drop them in the right-hand box). At the top of your list, there will be the most preferable (the most desired) washing option, whereas the least willing one will be put on the bottom.”

The analysis focused on four products attributes (each containing three levels) – price, payments scheme, condition of mashing machine, and contract duration. The levels of attributes are summarized in the next table.

Price for one wash cycle			
Austria:	0,40 Eur	0,80 Eur	1 Eur
Denmark:	3 DKK	6 DKK	7,5 DKK
the Netherlands:	0,40 Eur	0,80 Eur	1 Eur
Slovenia:	0,30 Eur	0,60 Eur	0,80 Eur
Contract duration			
flexible (monthly)	yearly	long-term (5 years)	
Washing machine condition			
New	As new (ca. 5 years)	Re-used (ca. 10 years)	
Billing scheme			
Pre-paid (and pay up the rest)		Post-billed	Instant (directly after laundry event)

Table 15: Product attributes tested in CA

The number of attributes (and their levels) was balanced with the statistical requirements for conjoint method: The higher number of attributes enters the analysis, the higher cognitive load for respondents is necessary, as more attributes requires more product profiles to be ranked (for keeping the same level of statistical significance of the regression model).

The four attributes with three levels each resulted in nine profiles through the procedure of orthogonal design in the SPSS. These nine profiles were supplemented by two additional, holdout profiles that are not used for parameters calculation, but for statistical testing of the statistical model behind the conjoint analysis. The example – the complete list of profiles for Austrian survey - can be found in the appendix. To rank eleven profiles is the quantity which is within the recommended limits of cognitive load for respondents as suggested by the literature. Nevertheless, the number of cases with incomplete answers relating to the conjoint part of the survey (the cases with missing values) reached 37%. The high amount of missing values can be traced back to the high load for respondents compared to other questions in the survey. The no-response was extreme in the case of Slovenia, where 47% of respondents omitted the conjoint part of the survey.

The final sample size for each country was around 100 cases (for exact sample sizes see the table below), which was enough for conjoint model calculation as documented in the next section of

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results. The ranking of the eleven profiles took the respondents 177 sec (approx. three minutes) as measured by 5% trimmed mean on data from an online survey system. The ANOVA supplemented by post-tests didn't indicate any cross-country differences in time the respondents spent on this task.

Country	All cases		The final sample for CA		Missing cases	
	Frequency	Percent	Frequency	Percent	Freq.	Freq. in %
Austria	162	24.8	105	25.6	57	35.2%
Denmark	174	26.6	118	28.8	56	32.2%
Netherlands	157	24	102	24.9	55	35.0%
Slovenia	160	24.5	85	20.7	75	46.9%
Total	653	100	410	100	243	37.2%

Table 16: Initial and final sample for CA

6.2.3.2 The initial model for conjoint analysis

The initial model reflected the assumption about customer evaluation of the attributes as follows: The increasing price for the product (pay per wash) was expected to lower the utility of the product for customer – the relation in the conjoint model was set as linear and decreasing (linear less). The contract duration was also linear and decreasing as longer contracts should decrease the utility by diminishing the flexibility for customers. For the condition of the washing machine and for payment (billing) scheme, there was no assumption – both the factors were modelled as a discrete (nominal) variable.

Product attribute	Utility definition
Price for one wash cycle: 0.40 Eur 0.80 Eur 1 Eur (<i>values for Austria</i>)	Linear less
Contract duration: flexible (monthly) yearly long-term (5 years)	Linear less – <i>original model</i> Discrete – <i>second model</i>
Washing machine condition: New As new (ca. 5 years) Re-used (ca. 10 years)	Discrete
Billing scheme: Pre-paid Post-billed Instant	Discrete

Table 17: The utility definition for CA

The analysis – calculated for each country separately - indicated an extensive number of reversals, which are the cases not meeting the expected utility profile in one or more attributes. In approx. one-third of cases, the contract duration was evaluated opposite to expectation: the longer duration, the higher utility it brings (see table below). Based on this, the model was re-specified so that contract duration was set as a discrete (nominal) attribute. The final number of reversals dropped to those related to price (second line in the table below). **All the results presented further on in this study refer to the second model, in which the contract duration is set as a discrete variable** (without any utility profile specified in advance). The conjoint analysis was calculated for each country individually, and the fifth calculation included all respondents regardless of their country of origin (in the further text labelled as “together”). All the models are statistically significant (see the table with the model fit).

	Austria	Denmark	NL	Slovenia	Together
Reversals in contract duration	35	33	35	26	129
Reversals in price	23	36	28	26	113
1 reversal	40	47	41	34	162
2 reversals	9	11	11	9	40

Table 18: Reversal in the initial model

Model evaluation	Austria	Denmark	NI	Slovenia	Together
Pearson`s R	0.985	0.989	0.998	0.978	0.989
Sig.	0.0	0.0	0.0	0.0	0.0

Table 19: Final model fit

6.2.3.3 Results of CA

In the first part of the analysis, the importance of each attribute for purchasing behaviour is analysed and compared among countries. In the next step, each attribute is elaborated in terms of utility associated with different attribute level¹⁸ and – again – the four markets are compared.

The most remarkable similarity across countries refers to the contract duration - it is the most important factor for decision making in all countries (see Table 20 and Figure below). The distance from remaining attributes is largest in Austria; the washing machine status, payment scheme, and price are distinctively less powerful, and their importance is comparable. For the Netherland, the price is a characteristic feature, because in no other country the price takes the second position among factors, it is third or fourth (Austria). For Denmark, the contract duration and washing machine status are of similar importance; whereas in Slovenia, the result suggests a rather equal role of all the factors except for contract length. The profiles of countries as depicted in the figure below.

Attribute importance (%)	Austria	Denmark	NI	Slovenia	Together
Contract duration	31.214	27.493	29.395	27.951	29.014
Washing machine status	23.207	26.065	23.780	24.982	24.540
Payment scheme	23.508	21.817	20.416	23.281	22.205
Price	22.072	24.626	26.409	23.786	24.241

Table 20: Attribute importance

¹⁸ From the ranked list of profiles, the statistics calculate part-worth utilities. These utilities are numeric expressions estimating the value for the consumer that is associated with each particular attribute`s level. The summation of part-worth utilities for attributes` levels of specific product measures the total utility of the product for the customer. Next, the comparison of part-worth utilities expresses the preference for attributes and their levels (for details see Lieder et al., 2018).

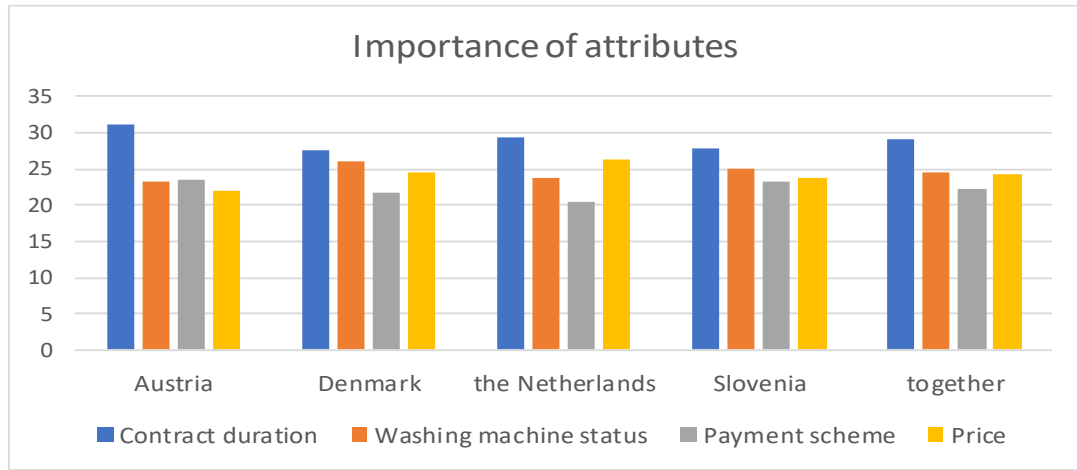


Figure 49: Comparison of attributes priorities in four countries and for the whole sample

For product variant assessment and for product optimization, the main inputs are presented in Table, which contains the part-worth coefficients (estimating the utility associated with the particular attribute level). The sum of the part-worth coefficients (together with the constant) measures the utility of the whole product as perceived by customers. If the calculation is conducted flawlessly, the highest utility is associated with the product profile, which the respondents preferred most often (see Table 21).

Part-worth coefficients	Austria	Denmark	NI	Slovenia	Together
Contract duration:					
Flexible	0.454	0.545	0.467	0.302	0.452
Yearly	0.384	0.223	0.131	0.275	0.252
Long-time	-0.838	-0.768	-0.598	-0.576	-0.704
Washing machine condition					
New	0.241	0.463	0.438	0.431	0.393
As-new	0.083	-0.215	-0.255	-0.263	-0.159
Re-used	-0.324	-0.249	-0.183	-0.169	-0.235
Payment					
Pre-paid	0.006	0.028	0.245	-0.125	0.045
Post-paid	-0.200	-0.311	-0.271	-0.176	-0.245
Instant	0.194	0.282	0.026	0.302	0.200
Price – pay per wash					
Low price	-0.724	-0.729	-0.770	-0.855	-0.764
Mid	-1.448	-1.458	-1.539	-1.710	-1.528
High	-2.171	-2.186	-2.309	-2.565	-2.291
the constant	6.448	6.458	6.539	6.710	0.348

Note: for the price, which was the only attribute modelled as linear, the utilities for low price express the beta coefficients (regression coefficient). The mid and high prices are then calculated as the beta multiplied by two (mid-level price) and three (high-price).

Table 21: Part-worth coefficients

The Figure 50 visualizes the distribution of answers to the question about the most preferred product profile. For approx. ¼ of respondents the most preferred one was the profile no 7. (new washing machine, monthly contract duration, price of 0.40 Eur, pre-paid) and for 17 per cent of respondents, it was profile no.2 (re-used washing machine (10 years), yearly contract, price of 0.40 Eur, instant payment).

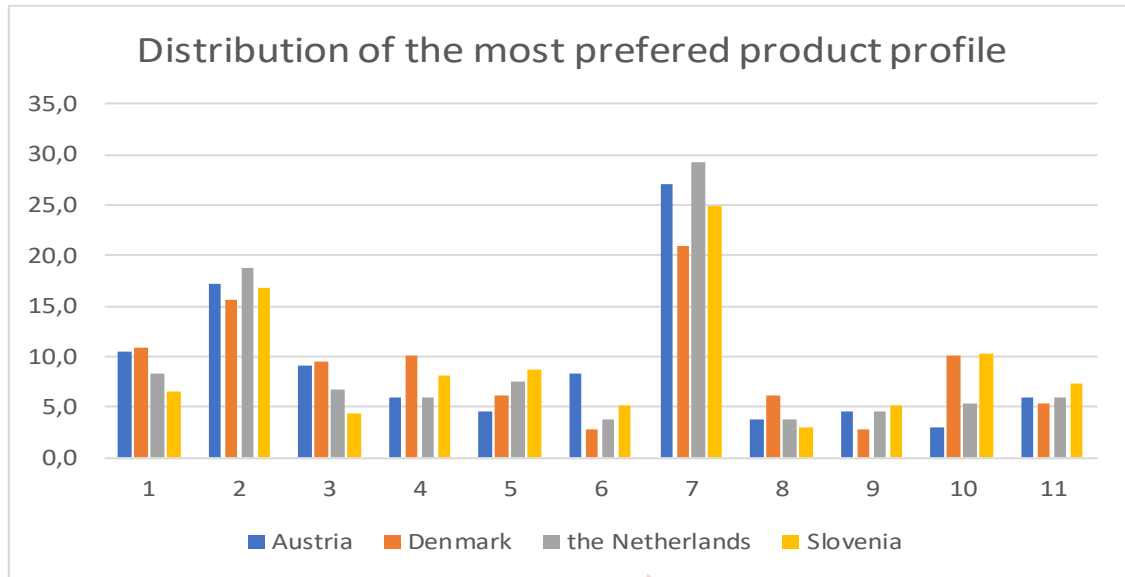


Figure 50: Frequencies of the most preferred profiles

For each respondent, the conjoint procedure generated utility estimations for all attribute levels and from these estimations, it derived the utility of each profile (that can be interpreted as customer preference for profile). Employing these profile utilities, we can analyse the respondents -the means for four countries are in Table 22 below: Red colour highlights the higher values, whereas low values are in blue. The result is similar to the one in the figure above (which took the most preferred profile into consideration only, positions on second and other remaining position was neglected). The least preferred is profile 11 (*re-used washing machine (10 years), 5-year contract, 1 EUR and pre-paid*).

The analysis of variability provides supplementary information: The second part of Table 22 (St.dev/Mean) shows the unity in profiles assessment (cells in blue colour) and the divergences (cells in red colour). It is apparent that the preference for profile no. 7 (the highest rated profile) is unified, whereas in case of the least preferred profile (no. 11) such unity is missing. The colours also uncover a slightly different position of Slovenians respondents; except for no. 11 (least preferred profile), their view is slightly more uniform (as expressed by blue-colour cells in Table).

	Mean										
	SCORE1	SCORE2	SCORE3	SCORE4	SCORE5	SCORE6	SCORE7	SCORE8	SCORE9	SCORE10	SCORE11
Austria	5,01	5,98	4,93	4,76	4,60	5,47	6,43	4,86	4,77	4,70	3,12
Denmark	4,88	5,99	4,99	4,99	4,98	5,04	6,77	4,66	4,44	4,65	3,28
the Netherlands	4,47	5,74	5,01	5,01	4,87	5,12	6,92	4,68	4,65	4,53	3,69
Slovenia	4,49	6,26	4,96	5,41	5,16	4,89	6,46	4,93	4,84	4,67	3,27
Total	4,73	5,98	4,97	5,02	4,89	5,14	6,65	4,77	4,66	4,64	3,34
	St.dev/Mean										
Austria	0,53	0,44	0,46	0,53	0,44	0,34	0,38	0,42	0,47	0,47	0,74
Denmark	0,51	0,42	0,46	0,52	0,44	0,37	0,36	0,40	0,48	0,53	0,75
the Netherlands	0,55	0,52	0,44	0,50	0,47	0,34	0,32	0,38	0,46	0,49	0,69
Slovenia	0,55	0,40	0,41	0,49	0,37	0,40	0,40	0,39	0,53	0,51	0,76
Total	0,53	0,45	0,44	0,51	0,43	0,36	0,36	0,40	0,48	0,50	0,73

Table 22: Utilities of profiles (Score 1 – 11) and variability across respondents

6.2.3.4 Analysis of attribute levels

The contract duration is the most important factor in customers’ decision – accounting for 29 per cent of the impact on average. As described in the methodological section of conjoint analysis part, the contract duration was expected to be (negatively) related to the utility for customers, but the high number of reversals (the respondents answer contradicting this hypothesis), in the final calculation it was modelled as a nominal variable. The part-worth coefficients taken from the Table 21 and visualised in Figure below put shed on the root of the problem – for Austria and Slovenia, the flexible (monthly) and yearly contracts both generate similar positive utility, much different from the 5-year long contract, with the negative effect on utility. This explains why it would be ineffective to model the attribute as linear.

Apparently, the country comparison suggests that the respondents can be divided into two groups according to the contract duration: Austria and Slovenia vs Denmark and the Netherlands – in the latter group, it is sensible to distinguish between monthly and yearly contracts.

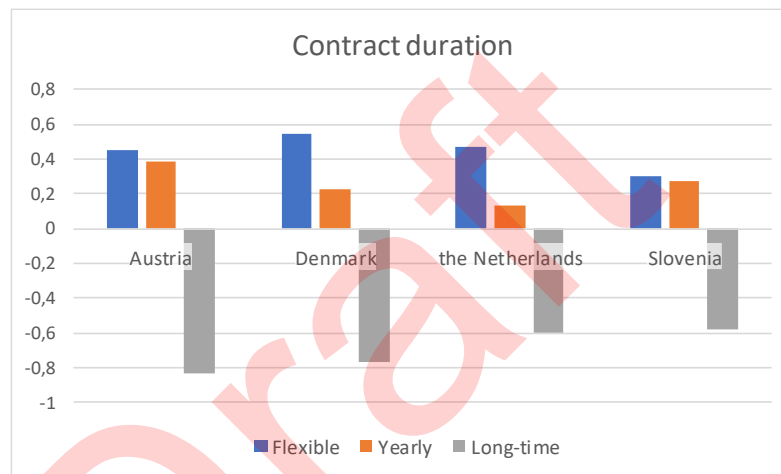


Figure 51: Part-worth coefficients for the contract duration

In terms of washing machine condition (Figure 52), the customers from the Netherlands, and Slovenia shares their view: the re-used (approx. 10 years old washing machine) is preferred over as-new (5 years old) – see Figure below. Unfortunately, the quantitative study is unable to uncover the motivation for this result. In other words, this analytical outcome would deserve further research to find out any explanation of the phenomena. The order of preferences in Austria and Denmark is similar; however, Austria is the only country, where the as-new washing machine increases the total utility for customers (the part-worth coefficient is positive). The new washing machine is the most preferred choice generally.

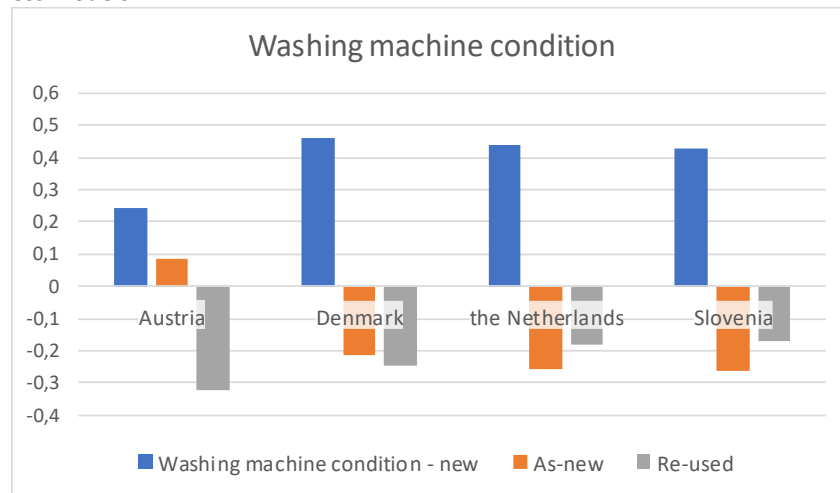


Figure 52: Part-worth coefficients for washing machine condition

The price is the only attribute that is perceived similarly in all four countries: the higher price for one washing cycle leads to the lower whole utility (Figure 53). As described above, the price as a factor is more important for Dutch customers.



Figure 53: Part-worth coefficients for price levels (pay per wash)

To the contrary to the price attribute, the payment scheme differs substantially across the countries: The only thing that is shared is the negative approach to post-paid option (see the orange-colour bars in the Figure below). In Austria and Denmark, the instant (online) payment is the most preferred choice. The customers here are indifferent towards pre-paid system – this option adds an only negligible amount of utility. Instant payment is the only positive option for Slovenian customers. Dutch customers` preferences don't resemble any another country: Instant payment is not relevant for them; the only sensible choice is pre-paid scheme.

The diversity in perception of payment scheme needs to be relativized for practical usage: As stated at the beginning of the analytical part, the importance of payment scheme is the lowest among all the four attributes - that is also apparent from the low values of part-worth coefficients for payment scheme (the values on vertical axis in Figure 54).

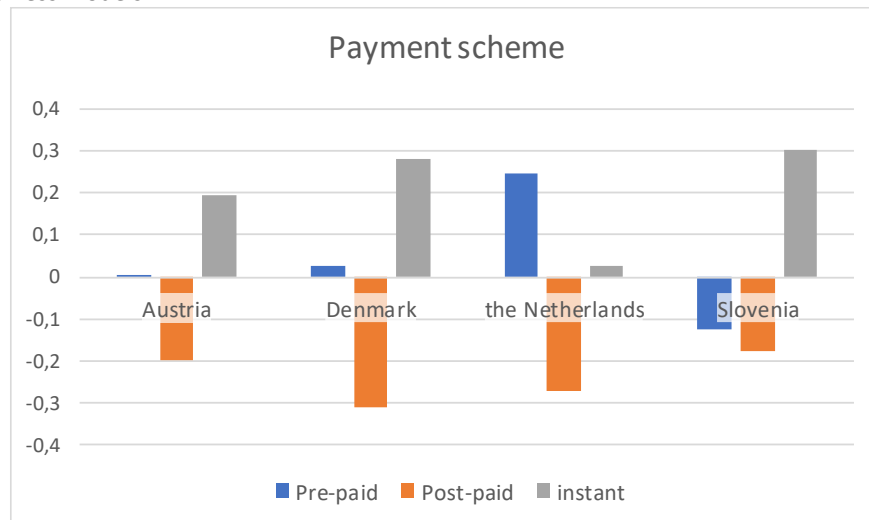


Figure 54: Part-worth coefficients for the diverse option of payment scheme

6.2.3.5 Identification of customer segments

The calculated part-worth utilities can be interpreted regardless of their nationality. In other words, all the respondents can be grouped based on attributes` evaluation – the expressed customers` preferences. The segmentation / clustering in the next text employed the utilities calculated in the conjoint analysis only, without any additional socio-demographic data. The aim was to test the existence of specific segments and to uncover their characteristic features.

Methodologically, the complete sample of 410 cases was clustered by Ward`s method (distance measured as Squared Euclidean distance) into three clusters – the decision about a number of clusters was based on Proximity distance as calculated in the hierarchical cluster analysis. All the variables used for clustering have statistically different means across the cluster (as tested by ANOVA) suggesting the good quality of final clustering. The importance of each variable for clustering is summarized in Figure 55 – the utility associated with 5-year and monthly contract duration, and price (beta coefficient) is the most relevant for cluster membership of respondents. To the contrary, the options of a new washing machine and pre-paid system are the factors with least distinguishing power, as these choices are perceived positively/neutrally by the vast majority of respondents

As a result of clustering, the sample split into uneven groups – the first includes almost half of respondents (Cluster 1), the second (Cluster 2) makes 30 per cent and the third (Cluster 3) remaining 21 per cent.

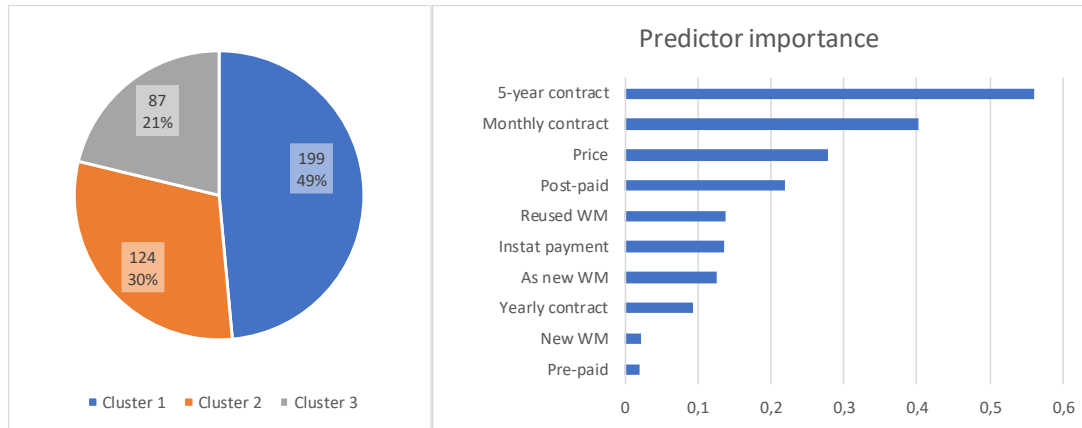


Figure 55: Cluster structure description and predictors importance (squared eta coefficients)

Cluster 1: – *Price-sensitive Consumers* - with its 49% respondents represents the most typical customer: It is the customer with high price sensitivity meaning that any increase in price in pay per wash diminishes the utility much more than in the other two groups. This customer prefers instant payment and dislikes the post-payment scheme. Long contract duration (5 years) is unacceptable; the optimal duration is one-year; monthly contracts are acceptable too. In terms of the washing machine, the view is not clear-cut: A new machine is preferred over reused (10 years), but the utility loss associated with the as-new washing machine is not so extensive and could be potentially compensated with the right mix of other attribute levels (e.g. price).

Cluster 2: *Long-term Consumers* - includes customers with mostly opposite preferences as compared to Cluster 1: the customers of Cluster 2 are the least price sensitive. They refuse very old washing machines and prefer a new one, but the as-new condition is also desired and can be accepted without any problems. The standard deviations of utilities related to washing machine condition are very high suggesting the view on this attribute is not uniform (see the Appendix). Cluster 2 is focusing on long term contracts; shorter contract duration is rejected. The optimal payment is the post-paid (pre-paid could also be accepted – the potential loss in the utility is rather small).

Cluster 3: *Flexible consumers* - representing 21 per cent of customers is strongly focused on flexibility in contract duration. Monthly contract brings very high utility for these people (the 5-year contracts are unacceptable). Other attributes are not so important - the newer machines are preferred over the older; the instant payment is the optimal choice for them. Their price sensitivity is rather low.





Figure 56: Clusters comparison

6.2.3.6 Summary of CA results

The outputs of conjoint analysis can be interpreted from the whole sample perspective, or from cross-country comparison, or customer segments, which ignore the nationality of respondents. The cross-country analysis and segmentation study were enabled by relatively large sample size; the conclusions from this group comparison have a direct link for managerial implications that are summarized as follows:

- Out of the four tested attributes, the contract duration turned out to be the most influential factor for customers' decision. On the other side, the evidence suggests that the payment scheme is the least influential. This conclusion is based on the *average* customer, but for some groups of customers it could be relevant or even the most important factor.
- The analysis of variance indicates that customers are quite certain in their choices concerning preferred products, but it is not the case when it comes to unpreferred options. This high variance raises the question of segmentation. The uniform view on customers might not work well here.
- Austria is the only country, in which washing machine in the as-new condition is positively assessed by typical customers – besides the new washing machine, which is the choice related to positive utility in all countries.
- The contract duration should be set to one month (i.e. flexible contracts) in the Netherlands and Denmark specifically. The Austrians and Slovenians are indifferent in terms of monthly

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and yearly contracts leaving more room for choices about product design specification. If there is just one product version to be launched on the market, it should avoid long term contract in any of the countries, because as such a choice would decrease the utility for customer substantially.

- In the same vein, the post-paid option of billing scheme is ineffective for a typical customer in all countries.
- By neglecting the country affiliation, three customer segments can be distinguished. In terms of interpretation and managerial implications, working with these three clusters is more effective than cross-country comparison, because the differences among typical (“average”) representants of countries are rather small. The three segments enable better, more complex understanding of diverse customers wishes/needs:
 - Price-sensitive Consumers: The most typical customer (49%) is highly price-sensitive (for pay per wash payment), prefers one-year contract, and besides a new washing machine he/she is willing to consider a reused washing machine as well (Cluster 1)
 - Long-term Consumers: Customers of Cluster 2 (30%) can be labelled as long-term customers, as they prefer 5-year contract with a new or as-new (5 years old) washing machine. A specific feature of this group is its price insensitivity.
 - Flexible consumers: The smallest Cluster 3 (21%) represents customers requiring flexibility (monthly contract duration), new washing machines supplemented by choice of instant payment. The price sensitivity is low.

6.3 Internal environment

On the market of WM, GOR profiles themselves as experts for washing who take over this task from customers, who need not care for washing anymore. This ambition is closely related to the focus on smart products. In recent years, higher customer demands stimulated Gorenje to the extension of its product lines and product varieties. This process was accompanied with further development of products’ functionalities, resulting in higher complexity of products and the production. In that way, the focus on digitisation (smart product, the IoT, and Ana bot¹⁹ in Slovenia (or Anna bot for other countries), on the one hand, the planned upgrade of internal company-wide information system - including ERP – on the other) is a natural follow-up of the past steps. The digital strategy is further speeded up due to Gorenje’s takeover by China’s Hisense Electric.

In contrast to smart production, the circularity concept is much more in the beginning: Gorenje didn’t focus on reuse or remanufacturing in the past. The attention was paid to forward logistics, and the reverse one was not among corporate priorities. From this perspective, a circular business model is a big challenge, which impact is of long-term, strategic nature - even for practical reasons: the development of a new WM model takes around 3 years of teamwork.

Gorenje doesn’t start its circularity activities from scratch: It can draw on the knowledge accumulated during the Rescom project (Resource Conservative Manufacturing - the European Union’s Seventh Programme for research, technological development and demonstration; No 603843), in which Gorenje was one of the project partners. Another source of circular economy

¹⁹ Ana bot is Gorenje’s virtual shopping assistant helping consumers with online advices

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related knowledge can also stream from Sweden`s Asko company, the Gorenje`s subsidiary, which expertise covers the design and design methods in particular.

Circular model is one of the ways (but not the only), where Gorenje is looking for new business opportunities.

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7 Current business models

Following subchapters describe current business models of both demonstrators (in context to the product and problems solved in the ReCiPSS projects). For the detailed circular business model development, more information should be incorporated to be able to elaborate on innovative dimensions and processes.

7.1 Current business model - Bosch

In the automotive sector repair services, remanufacturing and dealing with used vehicles are a common and established practice. Vehicle manufacturers and parts suppliers, like Bosch, have established delegated divisions to serve this market. This is where the corporate division Automotive Aftermarket (AA) of Bosch comes in because it is specialized to provide products, know-how and services for the automotive aftermarket.

As a first step in understanding the business model of remanufacturing at AA, the value proposition canvas is presented (Figure 57). Starting with the customer profile, the targeted customer segment is a generalized workshop. Thereby, it is important to consider that the market has multiple trade levels. Starting with the remanufacturing plant, the parts supplier (Bosch AA), followed by wholesalers with local dealer network, the automotive repair shop and finally the vehicle owner as the end customer. Consequently, the customer in this business model, who makes the decision whether to buy a remanufactured part or not is the repair shop, not the end customer. Additionally, the market is divided in several trade channels, the service organisation of the care manufacturer (Original Equipment Services OES) and the independent aftermarket (IAM).

The main task of the repair shop is to ensure the maintenance of a car because end customers go to repair shop to get their vehicles repaired. Therefore, the demand of the repair shop is the long-term spare parts supply. There are various gains and pains for the repair shop by carrying out its tasks. One gain for the repair shop is to offer a most reasonable and high-quality repair service to the end customer. Thereby, another gain is to have a high customer loyalty. Normally the OES sales channel is dominating the service for newer vehicles, losing their market after three and seven years to the IAM dominating the aftermarket for older vehicles. This time span emerges through the fact that within the first two years all repairs are covered by the warranty of the car manufacturer and afterwards the situation arises in which end customers must pay for their repairs and often second hand vehicle owners have less loyalty to the vehicle manufacturer. Consequently, they switch between the offers provided by the repair shops. Therefore, a gain for the workshop is that the car remains in service. Lastly, revenue streams are a gain for the customer. Pains for the repair shops are high costs for the end customer, long repair times and too many cars blocking space in the repair shop if the workshop depends on brand new produced original spare parts. To overcome this barrier, remanufactured parts are provided, which are used by the workshop.

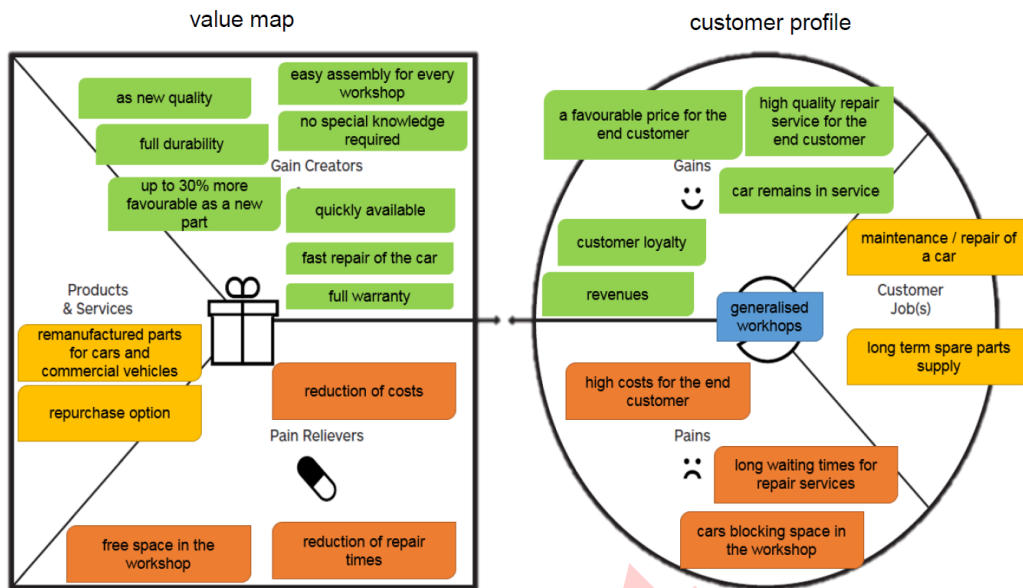


Figure 57: Value proposition of remanufacturing at Automotive Aftermarket

Turning to the value map of the value proposition canvas (Figure 57), the products offered to the repair shops consist of a broad product portfolio of remanufactured parts for cars and commercial vehicles. The remanufactured products feature the same high quality, durability and warranty as a new product. Brands and customers' brand awareness play an essential role when selling remanufactured products. Remanufactured products are sold as a reasonably priced solution, not a cheap solution which is offered on the market through reproductions from low cost countries. These reproductions generally are of the same price as remanufactured ones but feature a poorer quality with a durability of approximately 10 to 30 percent of a new part, whereas the remanufactured version provides the full durability and quality. In addition to it, the remanufactured spare part is immediately available, and it is to be installed easily.

Besides the sale of the remanufactured product, a return option is sold to incentivize the workshop to return the defective part. Concretely, with the purchase of a remanufactured product the workshop receives the right to sell back a defective part to the remanufacturer. Once the wholesaler sells the remanufactured part to the repair shop, it collects the defective part and returns the core to the remanufacturer, who in turn refunds the amount of the return option. The invoice shows both the price for the remanufactured product and the amount of the return option. Thereby, it is important to notice that the repair shop usually only considers the price for the product, not the amount of the return option because the workshop assumes that it is able to redeem the defective part and subsequently to receive the refund of the made return option. The amount of the return option plays a crucial role. The amount should be at least more than twice as high as the residual value of the core. The residual value is the value of the core at the end of its service life, which is traded on the market, for example it is the price that a specialised dealer would pay for the used part, the core. As a result, if the amount of the return option is not significantly higher than the residual value, the customer has no incentive to return the core to the remanufacturer.

The products offered create several results and advantages for the repair shops. First, the remanufactured product can easily be assembled in the vehicle without requiring special knowledge of the repair shop. Second, it has the same durability as a new part. Third, the

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customer receives full warranty on the remanufactured product. Fourth, the remanufactured part is on average up to 30 cheaper priced than a new part. In this way the end customer obviously perceives the price difference, which is an advantage for the repair shop. The repair shop can easily explain the price difference to the end customer by highlighting that in turn of providing the remanufacturer with a defective part; the end customer purchases a like-new part with the same quality, durability and warranty. Thus, the end customer choses a reasonably priced solution in comparison to a new product. Lastly, the remanufactured part is quickly available for the repair shop even for older vehicles. In this way the customer’s pains such as high costs, long repair times and blocked space in the repair shop are relieved and the vehicle is in a maintained condition.

As a result, a match between the customer profile on the left hand side and the value map of the right hand side of the value proposition (Figure 57) is achieved, because the corporate division Automotive Aftermarket addresses important tasks, solves severe issues and enables substantial advantages, which are important for the repair shop. Achieving this match is the cornerstone of creating value propositions. Afterwards, the elements, customer segments and value proposition are dovetailed with the business model canvas, illustrated in Figure 58.

Starting from the customer perspective (Figure 58), the distribution channel in the business model is an automotive distribution network. This implies that AA does not directly sell the products to workshops but rather to several trade levels upfront, including wholesalers and buying groups, who sell the remanufactured products to workshops. Through the return of the core, AA promotes a stronger customer loyalty of the workshops. Bosch uses the CoremanNet service network, provided by C-ECO, to fulfil the task. A particularly designed repair shop concept is the main customer relationship instrument. The revenue streams are input-based meaning that workshop pay for the delivered remanufactured products.

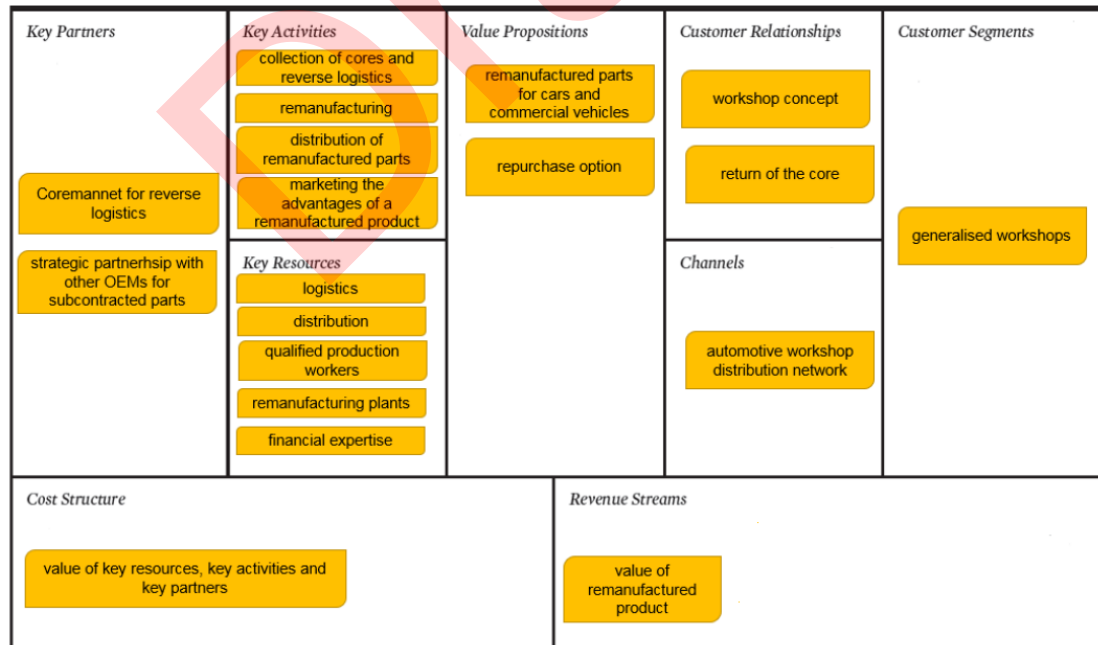


Figure 58: Business model of remanufacturing at Automotive Aftermarket

Turning to the right-hand side of the business model (Figure 2) which takes the infrastructure perspective, the identified key resources in the business model are logistics, distribution, qualified production workers, remanufacturing plants and financial expertise. The expert

circular business models

stressed that conventional enterprise resource planning (ERP) systems cannot model circular economy flows, hence 80 percent of the complexity of the business model lies on financial issues. Option trading knowledge is of great significance meaning who acquired an option, when does an option expire and are there any buying cooperation.

These key resources are the basis for the organization's key activities which include collection of cores and reverse logistics, remanufacturing of used automotive parts and distribution of remanufactured parts. Furthermore, the communication of the value proposition is of foremost importance for illustrating the advantages of a remanufactured product. For the implementation of the activities collection of cores and reverse logistics, AA cooperates with the reverse logistics partner CoremanNet. The last element of the business model is the cost structure which describes all important costs incurring for key resources, key activities and key partners.

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7.2 Current business model Gorenje

The aim of this section is to outline the initial position of the company: its processes, factors and open questions that are relevant for transformation toward the circular business since Gorenje's current business is linear, rather than circular character.

VALUE PROPOSITION

Gorenje profiles itself as “Design-driven innovators” on household appliances market, recognizing its responsibilities for social and environmental sustainability (“Gorenje Group 2017 annual report,” 2018, p. 19). The innovations focusing on aesthetics, ergonomics, and user-friendly controls specifically, are the way Gorenje provides extra value/incentive to the customers. Besides the innovations, the other value streams include “safe and high-quality products and services, fair prices, quality and rapid service, and appropriate after-sales services (“Gorenje Group 2017 annual report,” 2018, p. 23).

Gorenje washing machines’ value proposition for the European markets and different customer segments (due to the relatively wide range of washing machines in the portfolio) differs to some extent, however in average rests in familiarity, reliability, good value for money and in the innovativeness and design/aesthetics.

CUSTOMER/CONSUMER SEGMENTS

Gorenje group operates under 8 brands, of which washing machines brand Gorenje and Asko are the global ones, making 67.8% and 12.5 % of total revenues. The remaining sig brands comprising other than washing machines products (Atag, Mora, Pelgrim, Etna Upo, and Körting) are offered on local markets only.

In terms of market segments, the Asko are positioned as premium brands and Gorenje as mid, and with some models could be perceived as almost the budget brands (“Gorenje Group 2017 annual report,” 2018). Asko machines are produced for both consumer and business or professional market, while Gorenje only serves the consumer market (but of course could be purchased by small businesses for instance in the hospitality sector).

CUSTOMER RELATIONSHIPS

For consumer communication, the common mix of media is employed, which include call centre, product websites, social media, brand magazines, electronic newsletter, and promotional materials (“Gorenje Group 2017 annual report,” 2018, p. 23). For Gorenje, as a company operating internationally, the language translations are of importance: In numbers, it means that Gorenje is running approximately 60 website presentations internationally in 40 languages.

Special attention is paid to the Internet in the communication strategy. Via the Internet, Gorenje answers questions from customers, provides customer support and also collects feedback. To be more specific: Gorenje does press clipping (media monitoring), which includes mass media and customer communities (blogs, discussion forums, social networks). The company’s www presentation (both global and local) are monitored by Google analytics. Market research applying different methods for diverse topics /problems is also employed.

In general, getting feedback from the business partners (corporate customer, trading partners – intermediaries) is more difficult. Gorenje makes on-site visits to the distributors once or twice a year. The co-operation with some distributors is close: They prepare reports about end-



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consumers for Gorenje; they collect and provide feedback (which otherwise would be a task for Gorenje).

CHANNELS

For product distribution, Gorenje uses a hybrid model consisting of indirect and direct distribution. Slovenia is a specific case, as this is the only country where Gorenje operates its own e-shop, covering full product portfolio. The other 5 e-shops (for different countries) typically sell an accessory for Gorenje's products; in other words, the assortment is limited.

KEY PARTNERS

Gorenje develops a relationship to the distributors: The quality department collects feedback from them (in a monthly video conference call) and takes this occasion for streaming information both sides. The distributors inform about operations problems to get advice. Gorenje informs the business partners about its plans. Having the information about short as well as long plans, the distributors are not getting nervous about the future of the cooperation (e.g. regarding the digitalization process, etc.).

KEY ACTIVITIES AND PROCESSES

Circularity related activities that are realised in the current business model include after-sale service and reverse logistics. The extent of these activities at Gorenje and the experience with them is rather limited: In some countries, the after-sale service is done by Gorenje themselves; in the remaining markets, these services are outsourced to specialized companies.

Regarding the reverse logistics, the end-of-life products are disposed of according to the national legislative requirements. In Slovenia, the collection and disposal of old washing machines are in the responsibility of ZEOS (55 % of their shares are owned by Gorenje); the same company can also fulfil the legislation requirements for Gorenje in countries where Gorenje operates indirectly. In those countries, ZEOS pay the recycling fee for products introduced to the market – the fee calculation is based on export data for a particular country. However, reverse logistics in other countries is extremely limited.

The reverse flow also consists of 10 000 returned Gorenje's products in an Internet shop.

Gorenje just recently (summer 2018) has started to map what happens with the return of washing machines in their market. Mapping should reveal if any potential profit and business exist, if the processes would be internalized to some extent and not realized by the second parties as it is everywhere. Not only a financial loss but also an information loss could be the result of outsourcing.

KEY RESOURCES AND CAPABILITIES

Research&Development and innovative capabilities, production, quality management, brand image and brand position in some countries, IT solutions

COST STRUCTURE

Currently, costs are a barrier for circularity: remanufacturing and refurbishment are too costly resulting in higher prices for remanufactured or refurbished products for the customer when compared to brand new products. Transportation is another cost-related barrier: product transportation to some central reprocessing facility result in relatively high costs, which further limits the circularity principle.

Production costs, cost for R&D, for IT development and for marketing are the major categories of costs currently.

REVENUE STREAMS

Indirect sale of products via independent retailers represent the main revenue stream. Sales via own e-shop are still relatively very small. Revenues from the sales of used products and excess materials are very limited. Some revenue is from selling production waste.

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8 Target circular business models

In this chapter content of the circular business models (in Table 23 for Bosch and in Table 24 for Gorenje) for both demonstrators is suggested base on the review of existing theoretical knowledge and based on the empirical research within ReCiPSS project. Core ideas related to the models that explain the key logic are introduced before models themselves and challenges and questions concerning the individual elements which should be approached during the demonstration are introduced after the models.

8.1 Circular business model Bosch

Three customer segments may be the targets for the demonstration of the IT platform with interest to streamline the process of the cores return flow and being able to manage the planned amount of spare parts on their forward route to customers and back.

Bosch eXchange programme partners and Bosch OE distributors are relatively easy to reach and persuade to participate in the demonstration and/or in the involvement to the platform use and after understanding and experiencing the benefits they may stay connected. The reason behind this segment selection lies in the findings from the in-depth interviews regarding the dependency between the major suppliers and trade level as a customer in the software utilization – it is often the suppliers who equip their customers with the specific software.

IAM buying groups are – on the contrary – rather difficult to convince for the trial. They have their own software (or other commercial software like i.e. SAP but tailored-made) and it is them, who decide, which software to use. Core benefits of the platform must be very carefully explained and small steps during the negotiation have to be done. Costs, time, flexibility, excellence of all services offered through the cloud, scope of services and perception of a win to use the cloud (first mover advantage?) are the key issues to persuade. Personal relationships and some history of platform existence are important. Bosch as the important OEM can have some bargaining power for the trial. Buying groups are potentially very perspective partners because of the amount of the spare parts they trade with. But buying groups very seldom handle the return processes. The targeted groups should belong to those, which do it.

Core-brokers – particularly in France – may be curious (if supported) if they are independent players and their software is not the best one.

Platform functionality is highly dependent on the capability of the spare parts to be the IoT product. If a spare parts become the IoT products they will be not only the physical objects but the tangible things *“equipped with identifying, sensing, networking and processing capabilities that will allow them to communicate with one another and with other devices and services over the Internet to achieve some useful objective”* (Cortés et al, 2015). The capability of spare parts to be the IOT product depends on many factors – features of the spare part (in some time) as for instance size, perishability, durability, value; on the purpose of spare parts (except their basic functionality and in terms of Circular economy the purpose can be repairability, remanufacturability, recyclability, repeated usability); on the level of research development but also financial resources (capability and ability to involve more smartness into the part) etc. Depending on the capability of a spare part to be an IoT product the cloud platform may provide different functions (Ben-Daya et al, 2017):

- Tracking the route of a part (and a core in reverse flows), it means to identify the actual location, tracing the part and so to be able to identify the initial source (e.g. OEM) and/or final destination (if known);

circular business models

- Real time visibility and real time information of location and status (to some extent) as well as of the amount of spare parts;
- Status tracking (quality) – to certain extent;
- Accompanied data and information tracking – e.g. conditions of parts use, deposit status (paid, waiting for return, returned...)

The above mentioned functions enable:

- Advance planning and predictive modelling and decision making of related and follow-up processes and needed capacities (e.g. transport, warehousing, remanufacturing etc.) and
- Product assortment and sourcing across the supplier network (specially in case of multiple sourcing);
- Real time performance tracking and performance data for analysis;
- Automated sharing (based on the contracts) of data and information about the parts, cores, demands, supplies – so again the capacities of the platform members can be optimised;
- More efficient inventory management (inventory accuracy; reduction of inventory misplacement);
- Rerouting based on demand and automated deposit management redirection;
- Savings in scanning and recording the parts;
- Theft reduction.

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Business vision		
Become pioneers in the real circular cloud-based platform solutions for core management in a global scope		
A Customer segment (s)		
A1 Existing Bosch (e.g. Bosch eXchange programme partners) OE distributors	A2 IAM buying group(s)	A3 Core-broker(s)
B Value proposition for stakeholders in the system		
<p>B1 Cores route online tracking</p> <p>B2 Transparency of the processes along the cores route</p> <p>B3 “One-stop” database for forward and return data processing</p> <p>B4 Cloud as the trading and exchange platform</p> <p>B5 First-movers to cloud-based business world and industry 4.0 logistics</p> <p>B6 Higher cores availability in the system</p> <p>B7 Fast quality assessment and deposit transfer</p> <p>B8 Credibility of cloud platform provider</p> <p>B9 Compliance with existing and readiness to the new legislation and policies -</p> <p>B10 Circular economy image – many informants are very conscious of the environmental problems and policies and of the rapidly growing trend which strengthens the effort around</p>		
C Customer relationships		
<p>C1 Trust building</p> <p>C2 Personal assistance</p> <p>C3 Online support</p> <p>C4 Membership</p> <p>C5 Privacy assurance</p>		
D Channels		

<p>D1 Sales representatives</p> <p>D2 Conferences</p> <p>D3 Fairs and exhibitions</p> <p>D4 News – own web, associations, professional media</p> <p>D5 Seminars</p> <p>D6 Meetings</p> <p>D7 Trainings</p> <p>D8 Events</p> <p>D9 Web</p> <p>D10 Social media (linkedin, youtube...)</p> <p>D11 Word-of mouth</p> <p>D12 Platform itself</p>
E Key activities
<p>E1 Software and hardware development</p> <p>E2 Processes and functionality tracking</p> <p>E3 Spare parts and cores tracking</p> <p>E4 Money (deposit) flow tracking</p> <p>E5 Advisory to customers</p> <p>E6 Relationships maintenance</p> <p>E7 Online advisory</p> <p>E8 Standards development and certification</p> <p>E9 Collection and other cores-related reverse logistics processes</p>
F Key resources
<p>F1 IT staff</p> <p>F2 Intellectual property</p> <p>F3 Process managers</p> <p>F4 Sales and advisory service providing staff</p> <p>F5 Quality managers specialized in software and hardware quality</p> <p>F6 Standards</p> <p>F7 Finance</p> <p>F8 Cloud platform itself</p> <p>F9 Quality diagnosis tools</p>
G Key partnerships

G1 Server hosting services provider
G2 Universities
G3 Financial institutions
G4 Logistics services providers
H Costs structure
H1 Cloud maintenance and governance costs
H2 Intellectual property protection costs
H3 ICT development costs (staff)
H4 Server hosting costs
H5 Insurance
H6 Legal advisory costs
H7 Incentives to try the platform
I Revenue streams
I1 Efficiency improvement
I2 Lost opportunity avoidance Software sale
I3 Leasing of hardware
I4 Usage fee
I5 Software sale
I6 “Cross-selling” and “up-selling”

Table 23: Components of Bosch circular business models

Following issues should be examined and answered during the demonstration:

B VALUE PROPOSITION

B1 Cores route online tracking – due to the prevalent deposit system companies (Trade levels) consider cores as their own property (their money are embedded in cores) and if they do not know where their money is (or where their core is) they do not feel well.

B2 Transparency of the processes along the cores route – this proposition is interlinked with the previous one. There is one major risk when reaching such value proposition – how high the transparency should be at the expense of the security and privacy.

B3 “One-stop” database for forward and return data processing – the platform can solve problems of – probably – many wholesalers who work with several software applications.

B4 Cloud as the trading and exchange platform – this proposition should respond to the existing gap between demand and supply in the relationships between only a few partners. Placing cores

circular business models

“online” may lead to closing this gap and to the reduction of waiting time until the stock is ready to sell.

B5 First-movers to the cloud-based business world and industry 4.0 logistics = readiness.

B6 Higher cores availability in the system – reduction of potential losses.

B7 Fast quality assessment and deposit transfer – higher level of unification of the quality assessment and reduction of waiting time for decision making.

B8 The credibility of the cloud platform provider – image of a reliable, responsible and well-known provider is crucial.

B9 Compliance with existing and readiness to the new legislation and policies – cores return and remanufacturing as well as the sale of reman parts is global business with many cross-countries

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circular business models

processes and interlinkages, however legislation related to this business is national or regional and may create barriers – for privacy, security, packaging etc.

B10 Circular economy image – many informants are very conscious of the environmental problems and policies and of the rapidly growing trend which strengthens the effort around.

C CUSTOMER RELATIONSHIPS

C1 Trust building – being on the platform is extremely sensitive – this means that understanding the components of trust and techniques and means for trust building is crucial (see Chapter 3.2.4).

C2 Personal assistance – especially in the beginning of platform operations online 24/7 personal (face-to-face, online or telephone) assistance is needed.

C3 Online support – constant online passive and interactive support for various functionality features must be offered.

C4 Membership – membership supports commitment and mutual knowledge and experience sharing.

C5 Privacy assurance – data and information leakage protection from the technical and business point of view presents key pillar of relationships.

D CHANNELS

At the beginning of the demonstration – or before – mutual development of platform functionalities and various aspects is crucial.

D5, D6, D7 Visits, meetings, co-creation sessions promote commitment and interest.

D2 and D3 For the wider audience after the platform starts to be tested, conferences and fairs and exhibitions are suitable.

E KEY ACTIVITIES

E1 continuous development and even co-creation in development and upgrading of platform with the customers and other stakeholders is necessary which requires online communication.

E8 Standards development and certification – for many processes related to the cloud design and cloud processes design as well as for the cloud development, specific standards should exist - this is even more urgent with the global presence.

E8 Standards may be turned into the DIN or even ISO standards to be used for the certification.

F KEY RESOURCES

F1, F3, F4, F5, F9 4 IT staff, knowledge, the capability to keep pace with the digital revolution and sales competencies and capabilities are the core for success.

G KEY PARTNERSHIPS

G1 Server hosting services provider – in case Bosch or C-ECO would not be the owner.

circular business models

G2 Universities – for the ICT development – innovative and creative solutions and source of job applicants especially in IT.

G3 Financial institutions – for payments flow (connection to the platform should be solved).

G4 Logistics services providers – it is recommended to invite LSPs to join the platform to some extent (product and core tracking, transport and other logistics services tracking and transparency).

H COSTS STRUCTURE

H2 Intellectual property protection costs – it is possible that functionality of the platform will be based on multiple parts coexistence – if possible such solutions should be protected.

H3 ICT development costs (staff) – probably the highest share of all costs – global sourcing can be helpful but also with higher risks.

H4 Server hosting costs – depends on the ownership.

H5 Insurance – platform, processes, data protection should be insured.

H6 Legal advisory costs – in front, for contracts and for processes.

H7 Incentives to try the platform – trust is necessary to build, and trials could be beneficial.

REVENUE STREAMS

I1 Efficiency improvement in whole system gains for every member of the network joined in. Efficiency improvement leads to potential higher profitability.

I2 Lost opportunity avoidance – lost opportunity can happen in the case if the sufficient quality cores are thrown away like scrap or if complaints about the deposit return are not solved properly. In the first case effective online tracking of cores and processes (e.g. quality checking) with all documented and more or highly visible evidence can help to reduce wrong evaluation of quality and hamper to throw away valuable core. In the second case service recovery should be applied so customers are not dissatisfied.

I3 Leasing of hardware – rather questionable stream, however, could be considered in some situations. This depends on hardware equipment elements that either enables the platform functionality and complements the functionalities (e.g. smart connected quality checking equipment or diagnosis tools). Such tools might be expensive and represent investment costs for the platform network participants.

I4 Usage fees (for extra functionalities of the cloud service).

I5 “Cross-selling” and “up-selling” of additional products (diagnosis tools, computers) – depends on the organisations involved in platform development and provision of all functions of the

circular business models

platform and on their “possession” of the above mentioned products and on demand of the network members.

I6 Software sale – for the clones of the software.

8.2 Circular business model Gorenje

The circular business model of Gorenje, as outlined so far, integrates circularity with digitization strategy and propose three life cycles/stages for each product being offered within this business model. In the testing phase (demonstration phase), 300 units should be brought to the markets. The rationale behind the number of WM included in the demonstration is twofold. The number is small enough to enable some improvisations (managerial, technical, logistics etc.). Second, the quantity is possible to integrate with the current systems of Gorenje.

The demonstration model belongs to (semi-)professional product line (ASKO product line). As the model expects to go through three life-cycles, its construction needs to withstand over 20 000 washings cycles. The model will be equipped with a Wi-Fi module (and some other modules if needed, such as coin machine²⁰). Technologically, the Wi-Fi module implemented into WM is an essential feature for implementation of both the IoT and CE. The Wi-Fi integration with the WM is the biggest technical challenge for product development. After application in this premium product line, the Wi-Fi module will be added to the middle class – Gorenje brand, as well.

For the second and third-life washing machines, there are no special business models suggested further. However, some implications within the components of BM are outlined below.

The following table explains the content of the components of suggested circular business model for Gorenje.

Business vision
Become the global manufacturer of washing machine and provider of laundry pay per wash system and so to help the planet and society to be sustainable and concurrently to ensure own long-term sustainable competitiveness.
Customer segment(s) – consumer market
Demographics: Customers living in (bigger) towns or near bigger towns, with a higher level of education, students, people who move often, single households, young couples: who would do their laundry as much as possible carefree, who would like to test the machine, have an environmental concern and/or customers: who consider upfront costs who like to have an overview of costs and consumption who like to test something new <i>For the second and third life washing machines:</i> <i>Younger or on the contrary older customers</i>

²⁰ Coin (or card or app-payment operated)– washing machine can be used in case of washing machine sharing, e.g. in apartment building

circular business models

<p><i>price sensitive customers</i></p> <p><i>environmentally focused customers</i></p>			
Austria	Denmark	Netherlands	Slovenia
<p>100 units (due to the shorter distance to manufacturer, dense network of retailers, quality and brand-sensitive demand)</p> <p>foreigners often moving</p> <p>students</p> <p>young couples</p> <p>costs and investment sensitive people</p> <p>quality and brand (Scandinavian) focused people</p>	<p>40 - 80 units (due to the distance to the manufacturer and current supply chain character of Gorenje)</p> <p>single households</p> <p>students</p> <p>young couples</p>	<p>40 - 80 units (due to strong competition)</p> <p>students</p> <p>young couples</p> <p>foreigners often moving</p>	<p>100 units (due to the shorter distance to the manufacturer and potential interest to test Gorenje premium brand which is targeted for Western Europe)</p> <p>students</p> <p>young couples</p> <p>innovators</p> <p>quality and brand (Scandinavian) focused on people who do not want to invest</p>
<p>Customer segment(s) – landlords and summer/winter cottage/house owners for renting</p>			
<p>Those who do not want up-front costs, desire a durable long-lasting robust product and desire constant costs tracking</p> <p><i>For the second and third life washing machines:</i></p> <p><i>Start-ups or newcomers in the segments</i></p> <p><i>Price and costs sensitive customers</i></p> <p><i>Environmentally focused customers</i></p>			
<p style="text-align: center;">A Value proposition</p>			
<p>Aa For customers (specific value proposition content for every individual country should be taken from the survey and conjoint analysis)</p>	<p>Ab For environment</p>	<p>Ac For society</p>	
<p>Aa1 Getting rid of the responsibility for washing machine maintenance</p> <p>Aa2 Smaller risk of breakdowns due to professional maintenance and due to the high quality of washing machine</p> <p>Aa3 Opportunity to test the washing machine</p> <p>Aa4 Environment (renting requires durable products that operate for a longer time)</p> <p>Aa5 No up-front costs needed</p> <p>Aa6 Online tracking of costs</p> <p>Aa7 Consumption behaviour related to advisory – sparing money, improving consumption patterns</p> <p>Aa8 Bundle of a tangible product – laundering function + functionality services + detergent and softener (if demanded and deliveries are possible) + personal advice and assistance</p>	<p>Ab1 Less energy consumption</p> <p>Ab2 Less water consumption</p> <p>Ab3 Less environmental pollution due to production</p> <p>Ab4 Less raw materials extraction</p>	<p>Ac1 New jobs</p>	



Aa9 if detergent and softener – reusable packaging			
Ad For Gorenje management	Ae For service providers (logistics and maintenance)	Af For Gorenje owner (shareholder)	
Ad1 Big data about consumer behaviour Ad2 A higher level of control of forward and reverse supply chain processes and maintenance and service needs as well of spare parts management Ad3 Improvement of operational management (big data for quality management, for planning...)	Ae1 Job Ae2 Earnings Ae3 New knowledge of PPW services (e.g. online provision of repair, upgrading) Ae5 Network involvement	Af1 Image; conformity with the legislation and policies; “first mover” benefit	
For the second and third life washing machines:			
<ul style="list-style-type: none"> a) Customers: costs, image of environmentally-friendly person; value for money b) Environment: less raw material extraction and use – less transport and production pollution c) Society and Service providers: job opportunities in refurbishing and remanufacturing market and in complemented service provision d) Gorenje management and Gorenje owner: costs reduction, image of the environmentally-friendly company, compliance with legislation, new “second-hand” market reach, better product life and total cost of ownership knowledge 			
B Customer relationships			
<p>B1 Personal assistance, create customer loyalty through PSS</p> <p>B2 Membership</p> <p>B3 Automated services</p> <p>B4 Self –service (if required)</p> <p>B5 Co-creation (experience sharing, mutual learning and product development)</p> <p><i>For the second and third life washing machines:</i></p> <p><i>loyalty</i></p>			
C Channels			
Austria	Denmark	Netherlands	Slovenia
Carinthia and Styria, resp. also Tyrol: a combination of Velenje staff and online channel (cloud platform web-based)	Asko retailers network Start in Copenhagen or another university town	Asko staff retailers network or Asko staff direct web channel (common to Slovenia)	Velenje staff – web solution - cloud (the cheapest way and the highest level of information flow and control)

<p>Other lands: Current retailers network</p> <p>Chain of retailers associated in (Gorenje brand is sold by some members already): https://www.mietenstattkaufen.info/</p> <p>partnership with Energie Steiermark: https://www.e-steiermark.com/privat/leistungen/haushaltsgeraete-mieten/</p> <p>Print ads: colleges and universities hostels</p> <p>Expat webpages</p>	<p>Webpage (linked as the platform to Asko staff and Velenje)</p> <p>Print ads: colleges and universities hostels</p> <p>Ambassadors and word-of-mouth</p> <p>For Copenhagen airbnb partnerships</p>	<p>Webpage (linked as the cloud platform to Asko staff and Velenje)</p> <p>Print ads: colleges and universities hostels</p> <p>Ambassadors and word-of-mouth</p> <p>Expat webpages</p> <p>For Amsterdam airbnb partnerships</p> <p>Partnership with Homie</p>	<p>Print ads: colleges and universities hostels</p> <p>Ambassadors and word-of-mouth</p> <p>Print and online news</p> <p>TV - news</p>
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For the second and third life washing machines:

Could be the same as with the new products + internet marketplaces for refurbished products

D Key activities

- D1 IoT platform management and continuous improvement of the platform across countries
- D2 High quality, online and offline and 24/7 days services (advisory, repair, logistics to and from consumers to some extent)
- D3 Complaint management
- D4 Marketing communication
- D5 Pricing
- D6 Big data analyses
- D7 Online and offline world cross-management
- D8 Customer relationships and network partners' relationships
- D9 Refurbishing and remanufacturing
- D10 Washing machine production
- D11 Legal advisory – GDPR and intellectual property, country-specific legislation
- D12 Payment tracking
- D13 Accounting and Lifecycle analyses
- D14 Market analysis (customer service satisfaction, communication, competitors, legislation)
- D15 Innovation management and design research and management



E Key resources
E1 Intellectual property to the cloud platform and IoT solution
E2 Service personnel
E3 IT specialists
E4 Quality management staff
E5 Intellectual capital
E6 Stakeholders relationships
E7 Finance
F Key partnerships
F1 Customers and customers as a community
F2 Services providers
F3 Supply chain network' partners
F4 Financial institutions (payments flows)
F5 Media
F6 Universities and colleges
G Costs structure
G1 Fixed costs connected to the production and brick-and stone facilities for the operations and for the Intellectual property protection
G2 Variable costs for services provision and other activities (Marketing, IT development, quality management, refurbishment, the motivation of salespeople and sales partners)
G3 Environmental costs (transport)
<i>For the second and third life washing machines:</i> <i>Reverse logistics, refurbishing, remanufacturing, forward logistics, marketing</i>
H Revenue streams
H1 Pay per wash
H2 Deposit fees
H3 Co-branding (detergent and softeners brand)
H4 Sale of refurbished washing machine
H5 Sale of materials from refurbished or remanufactured machines
H6 Sale of waste
H7 Avoiding costs for washing machine early end-of-life disposal

Table 24: Components of Gorenje circular business models

Some more detailed information and questions raised to be answered during the demonstration:

VALUE PROPOSITION

The potential benefits from the new circular model for the **customer** include the following (due to the IoT functionality):

- Better monitoring and controlling of WM
- In the future, the connectivity should serve as a tool for preventative maintenance – based on usage and system monitoring; the system should suggest the preventative maintenance actions (parts replacement etc.).
- The warranty/liability could be extended for low usage of WM owners.
- The introduction or the application of a bot Ana (and associated IoT-functionality) for PPW system may provide quick advice in a problem situation (saving the time and cost for the consumer and Gorenje or its PPW service providers) as well as supporting customer relationship management and sharing real information (not distorted by transcription) to all interested parties in real time (if needed).
- Signalling function - (end of washing signal, red sock detection, ...).
- Upgradability of WM software enables the reaction to new customer demands relating to their new life situations (baby born, etc.). In other words, the software updates can provide new washing programs option being purchased later.
- For B2B customers: for laundries, IoT application enables the functionality of order/scheduling system for end-consumers (laundry's customers).
- Because the new model should be used more intensively (be more robust), it needs to be designed for intuitive control and resistant to wrong customer usage (poka-yoke): higher system availability is appreciated by consumers and businesses (e.g. laundries).
- High-quality product design / appealing product design appreciated by end-consumers in the first and second lifecycle of the washing machine. (Aesthetics is, however, unimportant in laundries and similar business).
- Longer lifespan

Pay per wash system:

- eliminate the problem of a high upfront cost (purchasing cost)
- responsible utilization due to the decrease in washing frequency.

Value proposition for environment exists in potential less energy and water consumption through both the optimisation of washing machine usage by customers and also in production processes. Less environmental pollution due to production could be reached if production is less extensive (less new machines produced). Less material extraction may occur if washing machines stay longer in usage life and if materials are gained through dismantling and recycling of machines at the end-of-life.

Value proposition for service provide in terms of new job opportunity may be created in case of big data analysis (and processing). This is specific capability, usually outsourced to experts who have not only big data statistics analysis knowledge and skills but are also able to deliver structured results and provide suggestions how to use results.

CUSTOMER/CONSUMER SEGMENTS:

Diverse consumer/customer groups are relevant for proposed circular mode, as demonstrated on the list below. It is expected that motivation in some groups might be similar or might overlap; however, because of other factors and groups characteristic it is reasonable to start the analysis with a broader list of segments, not for value proposition only, but for the design of other elements of the business model (such as customer relationship).

I. Households

- Individuals (singles)
- Poor (no up-front costs)
- Students
- “Eco-mothers”²¹
- Savers (energy, water...)
- Environmentalists
- IoT fans
- “No-invests” willing
- Movers
- Trends-followers
- Care-free (not willing to care, not able to care)
- “Controllers” (costs, performance...)
- High-quality brand followers
- “Eco-snobs”²²
- “Non-materialists”

II. Laundrettes

- Low operation costs seekers
- Care-free (no extra maintenance costs and effort)
- Ethical values fulfillers (ethical codex)²³
- Governmental policy and legislation fulfillers
- Technology leaders
- Trend followers

III. Business (other than laundrettes) – wash for themselves

²¹ Eco-mothers (or green eco-mothers, green moms, eco-moms) are women with children who show extraordinary caring passion not only for their children (and family) but also for their environment. They are very active in searching for and sharing the information about the best for their families and usually are rather innovative. The prevalently belong to middle class and are well-educated (Cairns et al, 2014).

²² Eco-snobs are people who want to distance themselves from the masses and to be superior through the purchase, consumption and promotion of green-labelled products (and services), however usually products which are in fashion, are not necessary and are expensive (for instance because they are imported from very far distance. These people want to have the best and or something special. Some characteristic features are common with eco-mothers (Sustainable, 2019).

²³ Ethical value fulfillers are people who try to behave the best according some ethical rules or standards, which used to be written and even codified. If they present some organization and the organization is a member of some association or belongs to some specific industry exposed to public interest, their effort is focused on the maximal compliance with the existing rules, despite the fact that their personal values may be very different (Hartmann, 2014).

circular business models

- Hotels, restaurants, masseurs, spas....
- Developers
- Landlords

CUSTOMER RELATIONSHIPS:

The new functionality of the circular model and the IoT feature provides potential benefits for Gorenje, for developing longitudinal relationships with users:

- A new way of individual communication with the potential to gain an emotional bond with consumers.
- More effective direct marketing activities
- IoT can improve and/or enhance the brand image
- Customer feedback (data) about the intensity of washing and washing programme usage can be used for the washing programs optimization (product quality improvement) and for marketing communication
- Feedback gathered from online appliances can be used for improving the traditional offline products too
- The IoT data may improve forecasting if spare parts are resulting in lower aftersales cost and improved customer service.

The IoT functionality raises some questions that need to be solved and addressed in customer communication:

- Private data leakage – Because the data will be collected internally by Gorenje, there is full control of the data. The system would also require users to register themselves into the cloud-based system and agree with the conditions (see GDPR).
- Non-IoT status: The Wi-Fi functionality (IoT functions) can be switched off by the customer. If the IoT module is broken down, the appliance should continue working without problems.
- IoT and all the feedback for Gorenje need not bother the customers – factor of simplicity.
- Guarantee for the IoT software updates: the customers should be informed about the time span, after which Gorenje stops upgrading the software of IOT system.

Whereas many of the above points had relation to IoT, the remanufacturing aspects also deserve attention in customer relations. These are examples of some crucial issues:

- The companies, in general, avoid communicating the total cost of ownership (TCO), as the TCO puts more light on the expected cost structure for the customer and on the system availability. Due to reasons such as brand image protection, the companies operating on consumer markets avoid mentioning any facts that could address the problem of operating cost, disposal cost or maintenance cost. However, TOC is essential information in the circular economy. Leaving the task of public education about TOC to the governments or consumer associations, the question is how to communicate TOC when offering the pay per use service and its benefits?
- During purchasing, customers should get information, which products are repairable and which not.

- How to motivate the customers to considerate renting the products?

KEY ACTIVITIES:

D11 Legislation restriction on business model activities:

At the moment, the legislation restricts usage of old parts in a new product, which is sold to the customers. However, such refurbishing activities are possible in the pay per use system, as the ownership remains to the manufacturer. The legislation in this field is changing/relaxing, however.

Legislation regarding renting in the four demonstrator markets could be different and can negatively influence business model.

D2 High quality, online and 24/7 days services can be a competitive advantage (current competitors work only 5-6 days and from-to during the day for fast help) but also extremely challenging (personnel costs and capabilities and partners for service provision – again costs and relationships)

D7 Online and offline world cross-management – despite many activities provided online, the move to PPW system will require vigorous step toward more integrated cross-management of the offline and online business mainly in cross-channels cooperation across different countries, logistics and marketing. The purpose of such a cross-management is to harmonise business models, avoid product (market) cannibalization, keeping the promises given to customers, unify the message of Gorenje and optimise value-added processes globally (as the introduction of PPW in the four markets requires support also form other markets).

D9 Refurbishing and remanufacturing – recommended to keep in house (Gorenje) at least for the first period – for knowledge leakage risk

D1, D6 Cloud platform, IoT solutions and data management - recommended keeping in house across the markets

D2 Quality assurance problem:

Currently, regular products are being tested for 10 months to get reliable information about their technical life and conditions. The testing period for the long-lasting product would be too long if the same test methodology is used. Some alternative procedures need to be developed, to test the reliability and longevity of the washing machine.

KEY RESOURCES:

E1 IoT platform – this needs to be extremely high-quality managed and supervised – up-to-date, security, intellectual property

E2, E3 Knowledge workers and service personnel – for the IT solution innovation and provision and service personnel as the key pillars for customer journeys and their satisfaction. PPW product service system in both consumer and business customer market is extremely sensitive on various interactions (person-machines, machines-persons, persons-person) and any problem requires immediate response from the service provider. Moreover, there will be bundles of services in several packages probably (transport, installation, consulting, detergent delivery, repair, contract changes, payment solution, moving etc.), which will be provided also by the external parties and so mutual dependence on fast and high quality work is crucial. Knowledge of which (even potential) pain points customers perceive throughout their journeys of finding

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all relevant information, through contract closure, washing machine delivery, washing, technical and IT problems solutions with washing machine and services, and which critical incidents emerge during such journeys belong to key resources and capabilities to approach them as well.

KEY RELATIONSHIPS:

F1 Customers and customers as a community – extremely important for word-of-mouth and co-creation – services and product development

F6 Universities and colleges – for the innovative solutions, community involvement and word-of-mouth

COSTS STRUCTURE:

G1 Fixed costs connected to the production and brick-and stone facilities for the operations and for the Intellectual property protection - brick-and stone facilities for the operations represents all facilities needed for services provision not able to do at customers, logistics (specially warehousing), refurbishing and remanufacturing together with repackaging etc.

REVENUE STREAMS:

H3 Co-branding (detergent and softeners brand) – eco-detergent and eco-softeners are preferred

H7 To avoid cannibalisation, the new, long-lasting WM will be provided by per pay use system only (not sell to customers). As the circular business model (pay-per-use) is new to many customers, they should get a chance to test the service first, for some period of time, before making a long-term contract.

8.3 Potential synergies between the models for both demonstrators

Several synergies exist or potentially may exist between both circular business models.

a) Potential synergy: access-based model for both demonstrators

Whereas in Gorenje case the access-based model is the primary choice, to keep ownership of the spare parts (and further of the core) might seem to be advantageous idea. Nevertheless, the complexity of car parts is growing, especially for the electric parts (and electric and hybrid parts). So, there will be less parts in production and in cycles and more module that will be changed in the cars. Traceability of such modules is easier than traceability of parts and the price (and the height of the incentive) will be much higher. This will lead to the higher flow of money in the forward and return processes – for many actors in the market rather problematic situation. Renting instead of selling spare parts could be solution for streamlining the process and for simplifying the database of parts and cores in the cloud platform. The pay per use system can be also discussed. Revenue streams will be different if involving such an approach(es).

b) Expected synergy: cloud-based circular business

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Continuous product and stakeholders’ behavior tracking, quick (online) response to behaviour, closing the cycles, less inefficient processes, less waste.

- c) **Expected synergy:** **keeping ownership** (Gorenje) and **keeping governance over the cloud platform** (both demonstrators) enable to maximize slowing the resource loops.
- d) **Expected synergy:** knowledge and skills sharing (Outcomes of Synergy session at General Assembly meeting, Delft, May 2019):
 - a. cleaning of cores (Bosch) and cleaning of washing machines (Gorenje)
 - b. reverse logistics, recovery processes (Bosch) for Gorenje
 - c. ICT knowledge (Bosch to Gorenje)
 - d. Sector-wide solutions (Bosch to Gorenje)
 - e. Quality assurance of used and reman products (Bosch to Gorenje)
 - f. Localization of collection hubs (Bosch to Gorenje)
 - g. Promotion and sharing the common ideas and goals across whole company (Bosch to Gorenje)
 - h. User-centred design (Gorenje to Bosch)
 - i. Ana bot (service app) (Gorenje to Bosch)
 - j. Marketing towards end-users (Gorenje to Bosch)
- e) **Expected synergy:** applying principles from (R)eSOLVE framework – “R” is, however, rather complicated to apply in the near future for both demonstrators

8.4 “Tools” suitable for the transition and adaptation of business models to be (more) circular

Bosch and Gorenje will have to make their potential customers to follow the path of awareness, interest, desire and action (or through other stages of so called hierarchy effects models). For these individual mental processes, attraction of customers is necessary.

Gorenje – when working with final consumers – can apply more intensive action-based and group involving tools, as for instance the experimentation models are.

From the SLR following “tools” seem to be the most appropriate and convenient – without the exclusion of the other from the review:

<i>Tools</i>	<i>demonstrator</i>
Circular Material Library	both
Predictive maintenance model	esp. Gorenje
The Ecology of Business Models Experimentation map	both, but more appropriate for Gorenje
A framework to support PSS design to encourage sustainable behaviour using IoT strategies	both
Process model of ecosystem transformation toward a circular economy paradigm	both
Evaluation tool “Value-Circle”	both

<p>“Typology of upgrades” and “checklist of practices” for the upgradable PSS</p>	<p>esp. For Gorenje, potentially also for Bosch</p>
<p>Environmentally extended input–output analysis (EEIOA) for circularity interventions</p>	<p>both</p>

Draft

9 Conclusions

The aims of this report are to define the current baseline of business models of two companies – demonstrators and based on the results of the markets analyses to define target/improved circular business models and impact of market characteristics on these models. Both demonstrators belong to the European industrial leaders operating also globally. While the first demonstrator - Robert Bosch GmbH (Bosch) and its reverse logistics service provider Circular Economy Solutions GmbH (C-ECO) have been engaged in two of the most typical processes of circular economy – in the aforementioned reverse logistics and remanufacturing of cores for a longer time, the second demonstrator, Gorenje Gospodinjski Aparati D. D. (Gorenje) is more of a newcomer to the circular economy initiatives (except some recycling activities).

Bosch and C-ECO intend to be among the first who try to change current patterns of reverse supply chains behaviour in returns of automobile spare parts, which are not at the end of life and due to the character of spare parts production, character of demand for spare parts and due to the recovery value of cores, it is economically advantageous to reprocess them. Current reverse logistics processes with cores most often follow the same path – in reverse direction – as the new or remanufactured spare parts delivered to the markets. Despite the existing logic behind such behaviour, which has its roots in the benefits of the traditional distribution through several trade levels – from manufacturers to the local retailers (and garages) – the development of information and communication technologies open the possibilities to streamline often rather time consuming, complicated approach. Streamlining reverse logistics processes may bring reduction of costs (for warehousing, transport, handling processes) of the individual trade levels and if organised well, it also can help to lessen pollution (reducing transport) and maximize the usage rate of cores for remanufacturing (and so to reduce raw material extraction, transport and processing). The second expected benefit, connected to the development and testing of the internet cloud-based platform for various processes concerning tracking and tracing the flow of cores and reman parts, their status and for managing relationships between the users and providers of platform, is the simplification, higher transparency and higher speed of reverse logistics processes. **Awareness, interest, intention to be involved, involvement, trust building and trust maintenance and the existence of proof of the efficiency and effectiveness of being in the cloud are the key building blocks for the success of this aim. Breaking the long tradition and existing relationships, as well as to reach win-win situation for all interested parties in the cloud, reverse logistics, remanufacturing and sales of reman parts are the main challenges.**

Gorenje's aim is different at first sight. Nevertheless, to change traditional way of doing business through the introduction of new approach with the utilization of ICT (and IoT) has some commonalities with the Bosch and C-ECO plan. Gorenje wants – besides its current linear production system (take-make-dispose) to test circular business where the sales of washing machines (with only minimal control over the life after the sale) will be substituted with retaining the ownership and start with the access-based Product Service System, more specifically with the pay per wash approach. Retaining the ownership of washing machines will enable to prolong the life of these products, also reduce raw materials extraction, transport and processing, potentially promoting loyalty of customers (through the second and third life of washing machines) or gaining new customer segments. Broadening the knowledge about customer-washing machine interaction for customer relationship management and for own research and development and innovation processes are another potential benefits. Also third markets can be approached – with the sale of second hand materials and recycled materials. IoT

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and cloud help to monitor behaviour, usage and status of washing machines, monitor and optimise washing behaviour of customers (and so be more environmentally friendly as well as to spare costs) and help to manage operations and relationships with customers. **The key building block for the success are the same as in the case of Bosch and C-ECO. The main challenges are to persuade customers to give up the ownership of washing machine (further maybe also other products) and stay profitable.**

To be able to fulfil the tasks several steps had to be done. First, literature review to find out what knowledge, experience, proofs of best practices or examples of mistakes to be aware of when doing business according the circular economy principles has been done. Both state of the art review and two systematic literature reviews were undertaken. Because innovation of business models is central for both demonstrators, **the most extensive and intensive review was targeted to find existing tools that help companies to change, transform or develop new business models within circular economy.** Second, **several secondary and primary market research activities have been realized.** Their aim was **to summarize trends and forces that enable or hamper the transition of both demonstrators in their way towards circular (or more circular) business.** Primary collection of data had two forms. **Online quantitative survey with end consumers in four European markets for Gorenje** (to determine attitudes, beliefs, experience of consumers related to pay per wash system, sharing washing machines and to second and third life washing machines. **For Bosch and C-ECO, in-depth interviews in two countries with several representatives from the automotive aftermarket** were done. The main aim was to reveal which pains they have with reverse logistics of cores (and associated processes) and what attitudes, experience and beliefs as well as fears they have with clouds.

Review on circular business models unveils that there are still many unknown areas, or not sufficiently known issues. Case studies mapping CBMs development, implementation and testing of large companies for several years are almost absent. More complex understanding of how CBMs of large companies work (if any), and what are the circumstances for the concrete functioning do not exist as well.

Very little knowledge exists with the tools appropriate for the innovation steps towards circular business models. Most of the existing stress stakeholders' participation and co-creation of the elements of business models. Only few examples are developed more thoroughly and can serve as some guide for companies. Measurement and measures for the assessment of a change (or development) and impact of the transition are missing. Also, tools which would help in the transition of different functions are very rare (for instance marketing, human resource management, finance). Tools for logistics and supply chain management processes and for information management processes and their innovation and transformation for circular economy reality are also missing.

The question of ownership must be explored in both demonstrators' cases. The Bosch and C-ECO knowledge from B2B value and B2B network, and value relationship theory must be studied to understand specificities for value proposition formulation and value delivery. There are only fragmentary information and knowledge about how clearinghouse for payments and other transactions works. Also, this must be studied comprehensively. Performance management and measurement for understanding cost structures (of the relevant stakeholders) and revenue streams related to the relevant customers requires another research. It may be that performance management and measurement approaches would not fit many circular business models. The conclusion is that many challenges exist both in practice and in research to get deeper and broader insights into the business life in a circular economy.

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Appendix 2: Bosch- in-depth interview protocol

(only protocol for the IAM distributor is presented here; for other two categories of AAM the protocols are almost identical)

Introduction

My name is..... I am from Masaryk University in Brno, Czech Republic and I cooperate in the Horizon 2020 project Resource efficient circular product-service systems (the abbreviation is ReCiPSS). It is a European Union funded research program aiming to foster circular economy – one of the focus areas which is actively supported by the EU. We do this interview also in...France/Germany (DEPENDS ON THE COUNTRY).

The research team is a big consortium of members from France, Germany (THE SEQUENCE DEPENDS ON THE COUNTRY YOU MAKE THE INTERVIEW), Netherlands, Sweden, Slovenia, Romania and Czechia. Members include the Royal Institute of Technology, Stockholm, Technical University Delft, Fraunhofer Institute, Stuttgart etc.

Today, there is little knowledge about concrete pains and gains of buying groups, wholesalers and garages when handling core returns. The main aim of the project is to find out how to optimize existing reverse logistics processes of cores. The results of the project serve as an information basis for EU policy makers and their decision making in the future – also in terms of policies they develop for businesses.

Our research interest is to find out the way how automotive aftermarket stakeholders, particularly trade levels, manage their core returns. We would like to investigate what challenges they face and what potential solutions can be developed to overcome these challenges. As a representant for the **IAM distributor segment**, we have identified your company as a relevant information source to gain insights into your reverse logistics processes of cores. We will neither ask you about any sensitive information nor financial data.

Would you mind if we record this interview? Recording is a common approach when doing interviews as it is very challenging doing an interview and making notes at the same time. This allows us to better analyze your answers. We can go back and forth in the interview dialogue and do not loose important details of the conversation. Recording will be analyzed only by us. The results will be summarized in an anonymous way and clustered according to type of trading level, country and company size. If you desire, no individual data such as your name and your company name will be ever published.

Here is the consent form.....

Interview Questions

<p>I. General information</p>	
<p>1. What is your role in the company?</p>	<ul style="list-style-type: none"> • What are you responsible for? • Do you also deal with....<u>DEPENDS ON THE ANSWER....</u>

	<ul style="list-style-type: none"> • purchase of spare parts, • negotiation with suppliers, • customer relationships, • parts sales and negotiation with customers • cores handling, • cores reverse logistics • IT solution for logistics, • IT solution for reverse logistics...
<p>2. Are you a member of some buying group?</p> <p>If yes, which one(s)?</p> <p>If no, why not?</p>	<p>What benefits do you have from such a membership? Do they concern also cores returns?</p>
<p>3. What is the field of action of your company? What does your company deal with?</p>	<p><u>Compare and add to the profile of the company if some other activities are mentioned:</u></p> <ul style="list-style-type: none"> • Only purchase and sale of the spare parts • Car sales • E-shop • Repair • If car sales...also leasing and Insurance? • Anything else?
<p>4. How is your company structured? I mean do you have special departments for – for instance – purchase, sales, customer relationship, logistics, IT etc.?</p>	<p><u>! ask only in case of companies with more than 10 employees</u></p> <p><u>! ask also for the chart...if they can give you or draw</u></p>
<p>5. What percentage of your total business is related to selling remanufactured products, in comparison to your new product sales? I mean, how many new parts and how many remanufactured parts do you sell – as a ratio?</p>	<p>So, is business with reman parts important for you?</p>
<p>6. In your opinion what are the major trends affecting your business / market / industry?</p>	<p>For instance:</p> <ul style="list-style-type: none"> • How is it with the concentration?;

	<ul style="list-style-type: none"> • How is it with the legislation?; • How is it with the IT development in logistics?; • How is it with the bargaining power of your suppliers and customers in case of remanufactured spare parts?
7. Is there any specific trend – how the reman business is evolving and probably will evolve?	For instance, higher demand for reman parts, cheaper reman parts, increasing speed of demand for reman parts?
8. How many different suppliers for remanufactured products do you work with? Are there some changes – more or less suppliers? If yes, why?	
II. Core return management and processes	
<p>9. How does your company manage core returns?</p> <p>Are the processes centralized or decentralized?</p> <p><i><u>! ask only in case of companies with more than 10 employees</u></i></p> <p>And do you do it internally or as outsourced processes?</p>	<p>Can we start with the physical processes when collecting cores from your customer? How do you do it, how often, how much, who, where...</p> <ul style="list-style-type: none"> • Collecting the cores • Quality checking and sorting • Gatekeeping (refusing low quality cores) • Transport • Warehousing • Scrapping low quality • Delivering to the remanufacturers
10. What are the reasons for managing your cores this way?	Tradition? Efficiency? Effectiveness? Convenience?
<p>11. Have you considered other approaches? If yes, why?</p> <p>And why have you not changed? If not, why?</p>	Outsourced, internalised, more or less frequent
12. How do you know which core you have to return to which supplier?	Do you have special database, do cores have special marking?

	commercial processes
13. How do you manage the different procedures for different suppliers?	<p>in terms of:</p> <ul style="list-style-type: none"> • physical logistics, • acceptance criteria: <ul style="list-style-type: none"> ○ technical core return criteria (quality), ○ amount of surcharge, ○ time limits to redeem the deposit
14. Do you apply the same core return conditions to your customers as your supplier to you?	<ul style="list-style-type: none"> ○ technical core return criteria (quality) – <i>are your conditions better, same or more strict to your customers?</i> ○ amount of surcharge – <i>are the amounts of deposit same, higher or lower to your customers or you individualize/customize them?</i> ○ time limits to redeem the deposit - <i>are the time limits same, higher or lower to your customers or you individualize/customize them?</i>
15. How often do your suppliers reject cores? Do you take any steps when cores are rejected? Which ones?	
16. How often do you reject a core from your customers and for what reason (quality, time limit, no demand for the cores that time, loss of money...)? IF YES , how do you handle that?	<p>If not, e.g.:</p> <ul style="list-style-type: none"> • it would damage my customer relations • I need the cores and I know I can use most of them somehow ▪ Immediately after checking – personally through our sales staff, via email, via shared information system ▪ I have to give customers some compensation instead ▪ I have to explain in detail the reason...

<p>17. How do you keep track on deposit balancing?</p> <p>Does this influence which supplier you choose (returning cores and purchasing reman products)?</p>	<p>HAVE IN MIND THE ANSWER TO Q. 11: IF THEY USE SOME SPECIAL DATABASE TO KNOW WHICH CORE TO RETURN TO WHICH SUPPLIER</p> <ul style="list-style-type: none"> ▪ Track keeping for some suppliers is very demanding, complicated ▪ to work with reports and protocols is very demanding etc.
	<p>IT and IS</p>
<p>18. Which information systems [eg. SAP, MS Dynamics) do you use to manage cores?</p> <p>Are you satisfied with this/these systems? If yes, why?</p> <p>If not, why not?</p>	<ul style="list-style-type: none"> ▪ Do you use it/ (them – if different) and <u>SAME OR DIFFERENT</u> for all processes?: <ul style="list-style-type: none"> ○ Evidence of collection, quality checking and sorting, warehousing, evidence of transport, ○ Evidence of deposits... <p>Easiness of use, speed, transparency, compatibility with other systems...ALSO WITH OUT SUPPLIERS AND CUSTOMERS' SYSTEMS</p>
<p>19. Which core related processes should be also supported, which are not supported today?</p>	
<p>20. What would you like to improve in the current information flow related to the core handling?</p>	<p>eg.: software functions, hardware, speed, sharing the information and data</p>
<p>Cloud</p>	
<p>21. What are your experiences with cloud-service?</p>	<ul style="list-style-type: none"> • Do you use any for the purchase of spare parts, inbound or outbound logistics, for reverse logistics of cores?

	<ul style="list-style-type: none"> • IF YES, what are the benefits and what are the problems (e.g. reliability, time, costs, transparency...)? • IF YES, who is the provider? • IF NO, WHY NOT?
22. What are OR WOULD BE IF NO EXPERIENCE EXISTS YET your requirements to a cloud-service?	
23. Is the location where your data is or would be hosted of importance to you? If so, would you prefer some specific hosting location?	e.g. Europe, France, Germany, India...
24. What needs to be provided to you to rely on the cloud-service? So you feel safe, you can trust to it?	e.g.: <ul style="list-style-type: none"> • Certifications • Reputation of the provider • Contracts • References and recommendations from other firms...
III. What is going well and what not so well	
Could we now summarize what is going well and what not so well in your current core return handling and management?	
25. Which core return procedures are going well ?	physical and commercial procedures, IT, processes towards and relationships with customers and suppliers: <ul style="list-style-type: none"> • Time • Costs • Transparency • Relationships...
26. Which core return procedures are not going well ?	e.g.: <ul style="list-style-type: none"> • Physical: (centralized/decentralized approach, collection, sorting and quality checking, space, dirty spaces, pickup frequencies, capacity, costs...)

	<ul style="list-style-type: none"> • commercial procedures (costs, deposits, time limits, demand and supply, customers and suppliers relationships...) • IT/IS (quality, capacity, connectivity, availability, software, hardware...)
IV. Claims and complaints – cores handling	
27. What type of claims and complaints do you receive from your customers regarding returned cores?	<ul style="list-style-type: none"> • Amount of deposit • Time for returning the deposit • Time for decision making related to deposit • Quality of cores • Others?.....
28. How many claims or how often do you receive claims and complaints from your customers regarding returned cores?	<ul style="list-style-type: none"> • How do you feel about it? • Is it a problem for you or just unpleasant?
29. How do you resolve the claims?	
30. Do you complain to your suppliers in terms of your core returns? If yes, about what and how often?	<ul style="list-style-type: none"> • Amount of deposit • Time for returning the deposit • Time for decision making related to deposit • Quality of cores • Others?.....
31. How do you experience the complaint process? Are you satisfied with the solutions? If not, why?	<ul style="list-style-type: none"> • Length of the process • Solution • Power of supplier...
32. Are there issues that you cannot address with your suppliers and/or customers in case of core handling? If yes, why?	
V. Outsourcing DO NOT INTRODUCE THIS TOPIC AS A SPECIAL ONE – JUST CONTINUE WITH ASKING	THERE ARE 2 VERSIONS OF QUESTIONS...DEPENDS ON THE ANSWERS IF THEY OUTSOURCE OR NOT SOMETHING FROM THE CORES HANDLING

A) NO OUTSOURCING:	
33. Which activities from the core returns handling would you be willing to yield to some other firm and why? Why not?	
34. Which activities would you DEFINITELY like to keep and why?	
35. Could you imagine letting somebody else to do core inspection and/or deposit management (meaning that you do not do any selection and evaluation)?	<i>!!!ASK ONLY IF THEY DO NOT MENTION IT WITH THE Q. 33</i>
36. Can you imagine someone in your network doing it? (garages, your sales branches) If no, why not?	
37. Can you imagine an independent third party doing it? (logistics partner, such as DHL, UPS) If no, why not?	
B) THEY DO SOME OUTSOURCING	
38. You mentioned that you outsource some procedures from cores handling..... Which other procedures or activities would you be willing to yield to some other firm and why? Why not?	
39. Which activities are provided by other firms and why?	<i>!!!ASK ONLY IF THEY DID NOT MENTION it before</i>
40. Which activities would you DEFINITELY like to keep and why?	

<p>41. Could you imagine letting somebody else to do core inspection and/or deposit management (meaning that you do not do any selection and evaluation)?</p>	<p>!!!ASK ONLY IF THEY DID NOT MENTION THESE ACTIVITIES BEFORE....THAT SOMEBODY ELSE DOES</p>
<p>42. Can you imagine someone in your network doing it – <u>IF IT IS NOT DONE THIS WAY YET?</u> (garages, your sales branches)</p> <p>If no, why not?</p>	
<p>43. Can you imagine an independent third party doing it? – <u>IF IT IS NOT DONE THIS WAY YET?</u> (logistics partner, such as DHL, UPS)</p> <p>If no, why not?</p>	
<p>VI. Trust</p>	
<p>44. What would you need to see or to know to trust the external party’s inspection of cores and deposit management? Especially if the transparency is needed...</p>	<p>e.g.:</p> <ul style="list-style-type: none"> • picture of the damage, • a written report about the inspection and deposit management, • direct call from the operations team to discuss... •
<p>45. What evidence would you require to feel that you keep control when inspection and deposit management is provided by the external party? ..So you can influence the process and the outcomes...</p> <p>Could certain information support you in that?</p>	<p>eg.:</p> <ul style="list-style-type: none"> • tracking where your cores are, • transparency of your deposit flows ...online process is directly connected to your information system, • core handling reports, • core stock information...
<p>46. Do you consider any data in the context of core return as “confidential”?</p> <p>What is confidential data for you and for what reason?</p>	<p>eg. quantities – supply and sales, customers, suppliers, deposit values.....SENSITIVITY,</p>

	RELATIONSHIPS, SECRET...MY OWN BUSINESS....
47. What information are you or would you be willing to share in terms of core returns?	eg. quantities – supply and sales, customers, suppliers, deposit values, time limits...

Would you like to know more about the project and would you like to participate in the demonstration? For instance, testing the online platform? (IF YES... we will give your contact to the partners in our consortium to get in touch with you.

If you would like to demonstrate your participation in the research, your name and the name of your company can optionally be listed in the final report to the European Commission and in our academic articles. Are you interested in this?

Thank you very much for your answers and time.

Draft

Appendix 3: Questionnaires for the pilot survey in 4 markets for Gorenje

English version:

Washing machine in circular economy – owing, pay per wash or pooling

The aim of the questionnaire is to find out attitudes, motives and barriers consumers feel and have towards various circular economy solution of how to wash the laundry and how with washing to help with the main goals of circular economy. Survey is a part of the European Union funded project with the name ReCiPSS (<http://www.recipss.eu/>).

This questionnaire is fully anonymous and no sensitive personal data which can be misused are collected.

Questionnaire is available in English, German, Dutch and Slovenian language.

If you are interested in the results summarizing all answers across four countries, please, add your email address at the end of this questionnaire or write to: klapalov@econ.muni.cz.

Thank you very much for your cooperation.

Survey is realized in 4 countries: Austria, Denmark, Netherlands and Slovenia. The goals of circular economy are to reduce waste to minimum, reduce negative impact of production and transport on the environment, helps business and society to be sustainable through keeping products as long as possible in the use (consumption) cycle and not to promote so called “throw-away” society.

Circular economy solutions are: 1. to produce and deliver high-quality durable long-lasting products (which are rather expensive); 2. to repair the products as long as possible (in the U.S.A. and some other countries legislation promoting the right to repair exists, in the EU rules will apply from April 2021); 3. to refurbish the products (making products as new); to remanufacture the products (almost the same as to refurbish with some more processes involved); to recycle the products (to use materials and components from the old products in the new production). To keep products longer in the cycle could be also done through **renting/sharing/pooling (so called collaborative consumption) or pay per use instead of buying, owing and throwing away**. These ways are called “access-based consumption”.

On behalf of the ReCiPSS research team from Masaryk University, Faculty of Economics and Administration, Brno, Czech Republic,

Alena Klapalová

1. Experience with access-based consumption:

- a) What is your experience with renting or leasing of products (e.g. any home appliance, car, tool, notebook etc.)?

No experience x I did it once or twice x I rent/lease things often

- b) What is your experience with pay per use for products (e.g. any home appliance, car, bicycle, tool, notebook etc.)?

No experience x I did it once or twice x I use pay per use system often

- c) What is your experience with so called “collaborative consumption” (one form of sharing products with the others – products may be bought by a group of people or by one person or even an institution and offered for use for some compensation (financial or product or service)?

No experience x I did it once or twice x I use collaborative consumption often

I. Renting washing machine

- 1. What reasons would persuade you **to rent a washing machine instead of owing it?** (renting means to have a temporary contract with regular payment) In case, you do not own a washing machine but you already rent it, what did make you to do you? Please, choose from the answers (you can choose also more answers):

- a. No upfront purchasing costs (no need to have money to buy it or to buy it on credit)

no	to some extent	yes
----	----------------	-----
- b. I do not want to buy and to own: If you answer “yes”, why? Please fill in the reason bellow

no	to some extent	yes...Why?.....
----	----------------	-----------------
- c. The belief that it would cost me cheaper

no	to some extent	yes
----	----------------	-----
- d. Opportunity to test the washing machine (e.g. brand I would like to have)

no	to some extent	yes
----	----------------	-----
- e. To get rid of the responsibility for washing machine maintenance (if maintenance is offered together with renting)

no	to some extent	yes
----	----------------	-----
- f. Smaller risk of breakdowns due to professional maintenance done by a service company and due to high quality of washing machine (within renting usually higher quality machines are provided)

no	to some extent	yes
----	----------------	-----
- g. Environmental concerns (renting requires durable products that operate for longer time)

no	to some extent	yes
----	----------------	-----
- h. Flexibility – no ownership ties

no	to some extent	yes
----	----------------	-----
- i. Something else.....fill in, please:.....



no to some extent yes

2. What reasons would persuade you **to use a pay per wash service**? Pay per wash means that you do not buy washing machine, but you use it and you pay for each washing – either at your home for your own individual use (usually you rent it or lease it) or within collaborative consumption or in the laundromat). If you already use this possibility, please, tick what did persuade you....in that case, do not choose “maybe”). You can choose more answers.

a. No upfront purchasing costs (no need to have money to buy it or to buy it on credit)

no to some extent yes

b. The belief that it would cost me cheaper

no to some extent yes

c. Opportunity to test the washing machine (e.g. brand I would like to have)

no to some extent yes

d. To get rid of the responsibility for washing machine maintenance (if maintenance is offered together with renting related to pay per wash)

no to some extent yes

e. Smaller risk of breakdowns due to professional maintenance done by a service company and due to high quality of washing machine (within pay per wash usually higher quality machines are provided)

no to some extent yes

f. Environmental concerns (as above – usually more durable washing machines are used for this solution)

no to some extent yes

e. Overview of the payments for every wash

no to some extent yes

g. Impressing others (people would admire me for that...how Innovative I am)

no to some extent yes

h. Flexibility – no ownership ties

no to some extent yes

i. Something else.....what?

no to some extent yes

3. Thinking about **pay per wash** instead of owning the washing machine, would these factors **discourage** you from pay per wash? (pay per wash requires installing a module that connects the machine over the internet with the provider and enables to offer different supplementary functions)
 - a. I prefer to own things

no	to some extent	yes
----	----------------	-----
 - b. the pay per wash provider would know too much about me

no	to some extent	yes
----	----------------	-----
 - c. the pay per wash provider cannot guarantee perfect data protection

no	to some extent	yes
----	----------------	-----
 - d. in the end, I pay more in comparison to owning washing machine

no	to some extent	yes
----	----------------	-----
 - e. I have never heard, or I know minimum about pay per wash system

no	to some extent	yes
----	----------------	-----
 - f. Anxiety from unknown (I feel there are many or some risks with pay per wash– I can damage the product, the prices can rise...)

no	to some extent	yes
----	----------------	-----
 - g. Pay per wash creates another financial liability for me, which is stressful (e.g. I do not want to see billing every month)

no	to some extent	yes
----	----------------	-----
 - h. Anything else? What?.....

II. Collaborative consumption/use of a washing machine shared with the others and pay per wash

4. What reasons would persuade you **to not to dispose with the washing machine in your household but wash within the collaborative consumption, e.g. one washing machine for several households or in the laundromat?**
 - a. No upfront purchasing costs (no need to have money to buy it or to buy it on credit)

no	to some extent	yes
----	----------------	-----
 - b. I do not want to buy and to own: If you answer “yes”, why? Please fill in the reason bellow

no	to some extent	yes...Why?.....
----	----------------	-----------------



- c. The belief that it would cost me cheaper
no to some extent yes
 - d. Opportunity to test the washing machine (e.g. brand I would like to have)
no to some extent yes
 - e. To get rid of the responsibility for washing machine maintenance (if maintenance is offered together with pay per wash in collaborative consumption)
no to some extent yes
 - f. Environmental concerns (collaborative consumption requires durable products that operate for longer time)
no to some extent yes
 - g. Smaller risk of breakdowns due to professional maintenance done by a service company and due to high quality of washing machine
no to some extent yes
 - h. Flexibility – no ownership ties
no to some extent yes
 - i. Impressing others – people would admire me for that
no to some extent yes
- Possibility to socialize with other people
no to some extent yes
- j. Something else.....fill in, please:.....
No to some extent yes

III. Refurbished and remanufactured washing machine (Refurbished and remanufactured washing machine is a used washing machine remanufactured to the new-like condition through disassembly, cleaning, replacement of major components of the product, re-assembly and testing. It provides the same functionality (same electricity and water consumption) and same quality as a new product or better. Remanufacturing requires more operations and use of more new parts.

- 5. Do you have any experience with the refurbished and/or remanufactured product, especially with home appliances and electronics?
No yes
- 6. What are your beliefs about refurbished and remanufactured washing machine?

circular business models

- a) I value the refurbished/remanufactured machine the same as if it were new
 - 1) Fully disagree.....5) fully agree

- b) Purchasing a refurbished/remanufactured washing machine will help use less finite resources
 - 1) Fully disagree.....5) fully agree

- c) Buying refurbished/remanufactured washing machine can reduce harmful effects to the environment.
 - 1) Fully disagree.....5) fully agree

- d) I am afraid that the performance of refurbished/remanufactured WM is inferior to performance of new ones
 - 1) Fully disagree.....5) fully agree

- e) I am afraid of the problem with the reliability of washing machine after the end of warranty period
 - 1) Fully disagree.....5) fully agree

- f) I would be concerned about hygiene of a refurbished/remanufactured washing machine
 - 1) Fully disagree..... 5) fully agree

- g) The brand's reputation is essential for making a purchasing decision regarding a remanufactured washing machine
 - 1) Fully disagree..... 5) fully agree

The cards (product profiles) below represent diverse washing options. Please rank the cards in terms of your preferences (drag them by mouse and drop them in the right-hand box). At the top of your list, there will be the most preferable (the most desired) washing option, whereas the least willing one will be put on the bottom.

Price for one wash cycle

_____ _____ _____

contract duration

flexible (monthly) yearly long-term (5 years)

washing machine condition

New	As new (ca. 5 years)	Re-used (ca. 10 years)
-----	----------------------	------------------------

service readiness

Within 1 day	Within 4 days	Within 1 week
--------------	---------------	---------------

billing scheme



Pre-paid (and pay up the rest)	Post-billed	Instant (directly after laundry event)
--------------------------------	-------------	--

IV. Your ideal washing machine?

(please indicate your level of agreement with the statements below)

1. I would like washing machine that:
 - a) is robust and durable so that it lasts longer
1 (not at all).....5 (absolutely)
 - b) is smart and Internet-connected so that I can manage and control washing online
1 (not at all).....5 (absolutely)
 - c) tells me in advance if something in the washing machine has to be cleaned or repaired
1 (not at all).....5 (absolutely)
 - d) works with my personal profile so it recommends me how and when to wash (to optimize water, energy and detergent consumption)
1 (not at all).....5 (absolutely)
 - e) is upgraded by the service provider so I can always have the up-to date machine
1 (not at all).....5 (absolutely)
 - f) has an auto dose for the detergent (auto dosing washing machines will weigh your clothes in the drum and set the perfect detergent amount automatically)
1 (not at all).....5 (absolutely)
 - g) an online calendar connection
1 (not at all).....5 (absolutely)
 - h) online expert advice (available 24 hours/7 days per week – tutorials, videos etc.)
1 (not at all).....5 (absolutely)
 - i) gives me information about energy and water consumption
1 (not at all).....5 (absolutely)
 - j) gives me information about price for wash
1 (not at all).....5 (absolutely)

2. Do you consider yourself in acceptance and purchase of new products and acceptance of new trends in general as:
 - a) innovator b) early adopter c) early majority d) late majority e) laggard

3. Do you consider yourself as an eco-friend, eco-fan or even an eco-campaigner?

1 (not at all).....5 (absolutely)

4. How is it with the ownership and purchase of the washing machine you use?

- a) I (we – if you are in pair or a family) bought it/got it
- b) I/we leased it/bought on credit (I/we will pay whole sum step by step)
- c) I/we rent it (we have a temporary contract)
- d) /I/we use washing machine in our apartment, but it is owned by our landlord
- e) I/we use washing machine in our house of flat –(so called collaborative consumption) – it is not our and I/we pay for the use
- f) I/we use the laundromat in the town
- g) Other...please, fill in how:

5. How often do you wash your laundry?

- a) Less than once a week
- b) 1-2 times per week
- c) 3-4 times a week
- d) More than 4 times a week

Your age group:

- 18-23 24-30 31-40 41-50 51-60 60
and more

Your education:

- primary education high school bachelor degree and more

Your current place of residence:

- Village small town big town

Your status:

- Living alone
- Living with partner without children
- Living with partner with 1-2 child
- Living with partner with 3 and more children
- Living with parents and/or grandparents (2-3 persons)
- Living with parents and/or grandparents (more than 3 persons)
- Living with friends/ schoolmates/colleagues
- Other:

Your living conditions:

- Living in a private house/cottage
- Living in the apartment (house with apartments)
- Other:.....



Your income group (xxx/person):

Danish version:

Vaskemaskine i cirkulær økonomi - eje, betaling pr. vask eller fælles

Formålet med spørgeskemaet er at finde ud af holdninger, motiver og barrierer, som forbrugerne føler og har over for forskellige cirkulærøkonomiske løsninger, hvordan man vasker tøj og hvordan man vasker for at hjælpe med de vigtigste mål for en cirkulær økonomi. Undersøgelsen er en del af det EU-finansierede projekt med navnet ReCiPSS (<http://www.recipss.eu/>).

Dette spørgeskema er fuldt anonymt, og der er ikke indsamlet følsomme personoplysninger, som kan misbruges.

Spørgeskemaet er tilgængelig på engelsk, tysk, hollandsk og slovensk.

Hvis du er interesseret i resultaterne, der opsummerer alle svar på tværs af fire lande, bedes du tilføje din e-mailadresse i slutningen af dette spørgeskema eller skrive til: klapalov@econ.muni.cz.

Mange tak for dit samarbejde.

Undersøgelsen er udført i 4 lande: Østrig, Danmark, Holland og Slovenien. Formålet med cirkulær økonomi er at reducere affaldet til et minimum, reducere negative virkninger af produktion og transport på miljøet, hjælpe virksomheder og samfund til at være bæredygtige ved at holde produkter så længe som muligt i brug (forbrug) og ikke fremme såkaldte "smid-væk" samfund.

Cirkulære økonomiløsninger er: 1. At producere og levere holdbare langtidsholdbare produkter i høj kvalitet (som er ret dyre); 2. at reparere produkterne så længe som muligt (i USA og nogle andre lande findes lovgivning om ret til reparation i EU-reglerne fra april 2021) 3. at renovere produkterne (gøre produkterne som nye); at istandsætte produkterne (næsten det samme som at genopbygge med nogle flere processer involveret); at genbruge produkterne (at bruge materialer og komponenter fra de gamle produkter i den nye produktion). Man kan bevare produkterne længere i cyklus ved at **leje/dele/være fælles (såkaldt fællesskabsforbrug) eller betale pr. forbrug i stedet for at købe, eje og smide væk**. Disse måder kaldes "adgangsbaseret forbrug".

På vegne af ReCiPSS forskergruppen fra Masaryk University, Fakultet for Økonomi og Administration, Brno, Tjekkiet,

Alena Klapalová

1. Erfaring med adgangsbaseret forbrug:

- d) Hvad er din erfaring med udlejning eller leasing af produkter (f.eks. husholdningsapparater, biler, værktøj, bærbare computere osv.)?
Ingen erfaring x Jeg har gjort det en eller to gange x Jeg lejer/leaser ofte ting
- e) Hvad er din oplevelse med betal pr. forbrug for produkter (f.eks. husholdningsapparater, bil, cykel, værktøj, bærbare computer osv.)?

Ingen erfaring x Jeg har gjort det en eller to gange x Jeg bruger ofte systemet med at betale pr. forbrug

- f) Hvad er din oplevelse med såkaldt "fællesskabsforbrug" (en form for deling af produkter med de andre - produkter kan købes af en gruppe mennesker, af en enkelt person eller endda en institution og brug tilbydes så for en kompensation (finansiell, produkt eller service)?

Ingen erfaring x Jeg har gjort det en eller to gange x Jeg bruger ofte fællesskabsforbrug

V. Leje af vaskemaskine

4. Hvilke grunde ville overtale dig til at leje en vaskemaskine i stedet for at eje den? (leje betyder at have en midlertidig kontrakt med regelmæssig betaling) Hvis du ikke ejer en vaskemaskine, men allerede lejer en sådan, hvad fik dig til at gøre det? Vælg venligst fra svarene (du kan vælge flere svar):

- f. Ingen forudgående købsomkostninger (ikke nødvendigt at have penge til at købe den kontant eller købe på kredit)
- nej i nogen grad ja

- g. Jeg ønsker ikke at købe og dermed eje: Hvis du svarer "ja", hvorfor? Udfyld venligst årsagen nedenfor
- nej i nogen grad ja...Hvorfor?.....

- h. Troen på, at det ville være billigere for mig
- nej i nogen grad ja

- i. Mulighed for at teste vaskemaskinen (f.eks. det mærke jeg gerne vil have)
- nej i nogen grad ja

- f. For at slippe af med ansvaret for vedligeholdelse af vaskemaskinen (hvis vedligeholdelse tilbydes sammen med leje)
- nej i nogen grad ja

- j. Grundet vedligeholdelse udført af en professionel servicevirksomhed samt vaskemaskinens høje kvalitet, formindskes risikoen for at maskinen lige pludselig ikke fungerer (ved leje stilles der normalt maskiner af højere kvalitet til rådighed)
- nej i nogen grad ja

- k. Miljømæssige årsager (leje kræver holdbare produkter, der virker i længere tid)
- nej i nogen grad ja

- l. Flexibilitet - ingen ejerforhold

nej i nogen grad ja

m. Noget andet.....udfyld venligst:.....

nej i nogen grad ja

5. Hvilke grunde ville overtale dig **til at bruge en betal pr. forbrug service**? Betal pr. vask betyder, at du ikke køber en vaskemaskine, men du bruger den og betaler for hver vask - enten i dit hjem til eget brug (normalt lejer eller leaser du den), ved fællesskabsforbrug eller i vaskeri). Hvis du allerede bruger denne mulighed, skal du markere, hvad der overtalte dig....vælg i så fald ikke "måske". Du kan vælge flere svar.

h. Ingen forudgående købsomkostninger (ikke nødvendigt at have penge til at købe den kontant eller købe på kredit)

nej i nogen grad ja

i. Troen på, at det ville være billigere for mig

nej i nogen grad ja

j. Mulighed for at teste vaskemaskinen (f.eks. det mærke jeg gerne vil have)

nej i nogen grad ja

k. For at slippe af med ansvaret for vedligeholdelse af vaskemaskinen (hvis vedligeholdelse tilbydes sammen med leje relateret til betaling pr. vask)

nej i nogen grad ja

l. Grundet vedligeholdelse udført af en professionel servicevirksomhed samt vaskemaskinens høje kvalitet, formindskes risikoen for at maskinen lige pludselig ikke fungerer (inden for betaling pr. vask stilles der normalt maskiner af højere kvalitet til rådighed)

nej i nogen grad ja

m. Miljømæssige årsager (som ovenfor - normalt bruges mere holdbare vaskemaskiner til denne løsning)

nej i nogen grad ja

j. Oversigt over betalinger for hver vask

nej i nogen grad ja

n. Imponere andre (folk ville beundre mig for det...og for hvor innovativ jeg er)

nej i nogen grad ja

j. Flexibilitet - ingen ejerforhold

nej i nogen grad ja

k. Noget andet.....hvilket?

nej i nogen grad ja

6. Hvis du tænker på **betaling pr. vask** i stedet for at eje vaskemaskinen, ville disse faktorer **afholde** dig fra betaling pr. vask? (betaling pr. vask kræver installation af et modul, der forbinder maskinen via internettet med udbyderen og giver mulighed for at tilbyde forskellige supplerende funktioner)

i. Jeg foretrækker at eje ting

nej i nogen grad ja

j. betaling pr. vask-leverandøren ville opnå for meget viden om mig

nej i nogen grad ja

k. betaling pr. vask-leverandøren kan ikke garantere fuldstændig databeskyttelse

nej i nogen grad ja

l. i sidste ende betaler jeg mere i forhold til at eje en vaskemaskine

nej i nogen grad ja

m. Jeg har aldrig hørt om det, eller jeg ved kun ganske lidt om betaling pr. vask-systemet

nej i nogen grad ja

n. Utryk ved det ukendte (jeg føler, at der er mange eller nogle risici ved betaling pr. vask. Jeg kan beskadige produktet, priserne kan stige...)

nej i nogen grad ja

o. Betaling pr. vask skaber endnu en økonomisk forpligtelse for mig, hvilket er stressende (f.eks. jeg ønsker ikke at modtage en regning hver måned)

nej i nogen grad ja

p. Andre faktorer? Hvilke?.....

VI. Fællesskabsforbrug/brug af en vaskemaskine der deles med andre og betaling pr. vask

4. Hvilke grunde ville overbevise dig om **ikke at anvende din vaskemaskine i din husstand, men i stedet vaske ved anvendelse af fællesskabsforbrug, f.eks. en vaskemaskine der deles af flere husholdninger eller er i et vaskeri?**

- k. Ingen forudgående købsomkostninger (ikke nødvendigt at have penge til at købe den kontant eller købe på kredit)
nej i nogen grad ja
- l. Jeg ønsker ikke at købe og dermed eje: Hvis du svarer "ja", hvorfor? Udfyld venligst årsagen nedenfor
nej i nogen grad ja...Hvorfor?.....
- m. Troen på, at det ville være billigere for mig
nej i nogen grad ja
- n. Mulighed for at teste vaskemaskinen (f.eks. det mærke jeg gerne vil have)
nej i nogen grad ja
- o. For at slippe af med ansvaret for vedligeholdelse af vaskemaskinen (hvis vedligeholdelse tilbydes sammen med betaling pr. vask i fællesskabsforbrug)
nej i nogen grad ja
- p. Miljømæssige årsager (fællesskabsforbrug kræver holdbare produkter, der virker i længere tid)
nej i nogen grad ja
- q. Grundet vedligeholdelse udført af en professionel servicevirksomhed samt vaskemaskinens høje kvalitet, formindskes risikoen for at maskinen lige pludselig ikke fungerer
nej i nogen grad ja
- r. Flexibilitet - ingen ejerforhold
nej i nogen grad ja
- s. Imponere andre - folk ville beundre mig for det
nej i nogen grad ja
- Mulighed for at mødes med andre mennesker
nej i nogen grad ja
- t. Noget andet.....udfyld venligst:.....
Nej i nogen grad ja

- VII. Renoveret og istandsat vaskemaskine** (Renoveret og istandsat vaskemaskine er en brugt vaskemaskine, der er renoveret, så den fremstår som ny, via demontering, rengøring, udskiftning af hovedkomponenter af produktet, samling og testning. Den har samme funktionalitet (samme strøm- og vandforbrug) og samme kvalitet som et nyt produkt eller bedre. Istandsætning kræver en større arbejdsindsats samt brug af flere nye dele.

7. Har du nogen erfaring med renoverede og/eller istandsætte produkter, især husholdningsapparater og elektronik?
Nej ja
8. Hvad er din opfattelse af en renoveret og istandsat vaskemaskine?
- e) Jeg værdsætter den renoverede/istandsatte maskine på samme måde som var den ny
2) Helt uenig.....5) helt enig
- f) Køb af en renoveret/istandsat vaskemaskine vil bidrage til mindre forbrug af begrænsede ressourcer
2) Helt uenig.....5) helt enig
- g) Køb af en renoveret/istandsat vaskemaskine kan reducere skadelige virkninger for miljøet.
2) Helt uenig.....5) helt enig
- h) Jeg er bange for, at ydeevnen af renoverede/istandsatte vaskemaskiner er ringere end ydeevnen af nye
2) Helt uenig.....5) helt enig
- h) Jeg har ikke den store tiltro til vaskemaskiners driftsikkerhed efter udløbet af garantiperioden
1) Helt uenig.....5) helt enig
- i) Jeg vil nok være bekymret for hygiejnen i en renoveret/istandsat vaskemaskine
2) Helt uenig..... 5) helt enig
- j) Mærkets omdømme er afgørende for at træffe en købsbeslutning vedrørende en istandsat vaskemaskine
2) Helt uenig..... 5) helt enig

Kortene (produktprofiler) nedenfor repræsenterer forskellige vaskemuligheder. Vær venlig at angive rangfølgen af kortene baseret på dine præferencer (træk dem med musen og slip dem i højre boks). Øverst på din liste vil der være den mest foretrukne (den mest ønskede) vaskeopsætning, mens den mindst prioriterede vil være placeret nederst.

Pris for en vaskecyklus

☐ _____ ☐ _____ ☐ _____

kontraktens varighed

☐ fleksibel (månedlig) ☐ årlig ☐ langsigtet (5 år)

vaskemaskinens tilstand



Ny	Som ny (ca. 5 år)	Genanvendt (ca. 10 år)
----	-------------------	------------------------

serviceberedskab

Inden for 1 dag	Inden for 4 dage	I løbet af 1 uge
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faktureringsordning

Forudbetalt (og betal resten af aftalens beløb)	Efterfaktureret	Øjeblikkeligt (direkte efter vasken)
---	-----------------	--------------------------------------

VIII. Din ideelle vaskemaskine?

(angiv venligst din grad af enighed med nedenstående udsagn)

6. Jeg vil gerne have en vaskemaskine der:
- k) er robust og holdbar, så den holder længere
1 (slet ikke).....5 (absolut)
- l) er smart og internetforbundet, så jeg kan styre og kontrollere vask over nettet
1 (slet ikke).....5 (absolut)
- m) informerer mig på forhånd, hvis noget i vaskemaskinen skal rengøres eller repareres
1 (slet ikke).....5 (absolut)
- n) arbejder baseret på min personlige profil, så den anbefaler mig, hvordan og hvornår jeg skal vaske (for at optimere vand-, energi- og vaskeforbrug)
1 (slet ikke).....5 (absolut)
- o) opgraderes af tjenesteudbyderen, så jeg altid har en maskine med den seneste nye teknologi
1 (slet ikke).....5 (absolut)
- p) har en selv-dosering af vaskepulver (selv-doserende vaskemaskiner vejer dit tøj i tromlen, og indstiller automatisk den optimale mængde af vaskepulver) |
1 (slet ikke).....5 (absolut)
- q) forbindelse til en online kalender
1 (slet ikke).....5 (absolut)
- r) online ekspertrådgivning (tilgængelig 24 timer/7 dage om ugen - vejledning, videoer osv.)
1 (slet ikke).....5 (absolut)
- s) giver mig oplysninger om energi- og vandforbrug
1 (slet ikke).....5 (absolut)

t) giver mig oplysninger om prisen for en vask
1 (slet ikke).....5 (absolut)

7. Anser du dig selv for at være en der accepterer og køber nye produkter og generelt acceptere nye tendenser som en:

b) innovator b) pionerer c) der er på forkant d) der ser tiden an e) der halter bagefter

8. Betragter du dig selv som en øko-ven, øko-fan eller endog en øko-ambassadør?

1 (slet ikke).....5 (absolut)

9. Hvordan står det til med ejerskabet og købet af vaskemaskinen du bruger?

h) Jeg (vi - hvis du er i et parforhold eller har en familie) købte den/fik den

i) Jeg/vi lejede den/købte på kredit (Jeg/vi betaler hele summen tilbage i rater)

j) Jeg/vi lejer den (vi har en midlertidig kontrakt)

k) /Jeg/vi bruger vaskemaskinen i vores lejlighed, men den er ejet af vores udlejer

l) Jeg/vi bruger vaskemaskinen i vores boligforening - (såkaldt fællesskabsforbrug) - det er ikke vores, og jeg/vi betaler for brugen

m) Jeg/vi bruger vaskeriet i byen

n) Andet...venligst, udfyld hvordan:

10. Hvor ofte vasker du dit vasketøj?

e) Mindre end 1 gang om ugen

f) 1-2 gange om ugen

g) 3-4 gange om ugen

h) Mere end 4 gange om ugen

Din aldersgruppe:

18-23

24-30

31-40

41-50

51-60

60 og

derover

Din uddannelse:

grundskole

gymnasiet

bachelor grad eller højere

Din nuværende bopæl:

Landsby

lille by

stor by

Din status:

Bor alene

Bor sammen med partner uden børn

Bor sammen med partner med 1-2 børn

Bor sammen med partner med 3 eller flere børn

Bor hos mine forældre og/eller bedsteforældre (2-3 personer)

Bor hos mine forældre og/eller bedsteforældre (mere end 3 personer)

Bor hos venner/skolekammerater/kolleger

Andet:

Dine levevilkår:

Bor i et privat hus/sommerhus

Bor i lejlighed (ejendom med lejligheder)

Andet:.....

Din indkomstgruppe (xxx/person):

Dutch version:

Wasmachine in circulaire economie - verschuldigd, betalen per wasbeurt of poolen

Het doel van de vragenlijst is om te achterhalen welke gedragingen, motieven en hindernissen consumenten ondervinden en hebben ten opzichte van verschillende circulaire economie-oplossingen voor het wassen van wasgoed en hoe met wassen de belangrijkste doelen van circulaire economie kunnen worden geholpen. De enquête maakt deel uit van het door de Europese Unie gefinancierde project met de naam ReCiPSS (<http://www.recipss.eu/>).

Deze vragenlijst is volledig anoniem en er worden geen gevoelige persoonsgegevens verzameld, die kunnen worden misbruikt.

De vragenlijst is beschikbaar in het Engels, Duits, Nederlands en Sloveens.

Als u geïnteresseerd bent in de resultaten met een samenvatting van alle antwoorden in de vier landen, voeg dan uw e-mailadres toe aan het einde van deze vragenlijst of schrijf naar: klapalov@econ.muni.cz.

Dank u wel voor uw hulp.

De enquête wordt gerealiseerd in 4 landen: Oostenrijk, Denemarken, Nederland en Slovenië. De doelstellingen van een circulaire economie zijn om afval tot een minimum te beperken, de negatieve impact van productie en transport op het milieu te verminderen en om de bedrijven en de samenleving te helpen om duurzaam te blijven door producten zo lang mogelijk in de gebruikscyclus (consumptie) te houden en de zogenaamde "wegwerpmaatschappij" niet te promoten.

Oplossingen voor de circulaire economie zijn: 1. duurzame producten van hoge kwaliteit produceren en leveren (die vrij duur zijn); 2. de producten zo lang mogelijk te repareren (in de VS en in sommige andere landen bestaat een wetgeving die het recht op herstelling bevordert, in de EU zullen er vanaf april 2021 regels van toepassing zijn); 3. producten opknappen (producten als nieuw maken); producten opnieuw fabriceren (bijna hetzelfde als renoveren met een aantal extra processen die erbij betrokken zijn); producten recyclen (materialen en componenten van de oude producten in de nieuwe productie gebruiken). Producten langer in de cyclus houden zou ook gedaan kunnen worden door het **huren/delen/poolen (zogenaamde gezamenlijke consumptie) of betalen per gebruik in plaats van kopen, betalen en weggooien**. Deze manieren worden "op toegang gebaseerde consumptie" genoemd.

1. Ervaring met op toegang gebaseerd verbruik:

- g) Wat is uw ervaring met het huren of leasen van producten (bijv. een huishoudtoestel, auto, gereedschap, notebook enz.)?
Geen ervaring x Ik heb het een of twee keer gedaan x Ik huur/lease vaak dingen
- h) Wat is uw ervaring met betalen per gebruik voor producten (bijv. een huishoudtoestel, auto, fiets, gereedschap, notebook enz.)?
Geen ervaring x Ik heb het een of twee keer gedaan x Ik gebruik vaak het systeem van betalen per gebruik
- i) Wat is uw ervaring met zogenaamde "gezamenlijke consumptie" (een vorm van producten delen met anderen - producten kunnen worden gekocht door een groep mensen of door één persoon of zelfs een instelling en worden aangeboden voor gebruik voor een bepaalde vergoeding (financieel of product of service)?
Geen ervaring x Ik heb het een of twee keer gedaan x Ik gebruik vaak gezamenlijke consumptie

IX. Het huren van een wasmachine

7. Welke redenen zouden u ertoe aanzetten **om een wasmachine te huren in plaats van deze te bezitten**? (huren betekent een tijdelijk contract met regelmatige betaling). In het geval dat u geen wasmachine bezit, maar deze al huurt, wat heeft u ertoe gebracht om dit te doen? Kies uit de antwoorden (u kunt ook meerdere antwoorden kiezen):
- k. Geen directe inkoopkosten (u hoeft geen geld te hebben om het te kopen of om het op krediet te kopen)
nee tot op zekere hoogte ja
- l. Ik wil niet kopen en bezitten: als je "ja" antwoordt, waarom? Vul hieronder de reden in
nee tot op zekere hoogte ja... Waarom?.....
- m. De overtuiging dat het me goedkoper zou kosten
nee tot op zekere hoogte ja
- n. Mogelijkheid om de wasmachine te testen (bijv. het merk dat ik graag zou willen hebben)
nee tot op zekere hoogte ja

- g. De verantwoordelijkheid voor het onderhoud van de wasmachine kwijtraken (indien het onderhoud samen met huur wordt aangeboden)
nee tot op zekere hoogte ja
- n. Kleinere kans op storingen door professioneel onderhoud door een servicebedrijf en door de hoge kwaliteit van de wasmachine (bij huren worden meestal machines van een hogere kwaliteit geleverd)
nee tot op zekere hoogte ja
- o. Milieuaspecten (huren vereist duurzame producten die langer werken)
nee tot op zekere hoogte ja
- p. Flexibiliteit - geen eigendomsverhoudingen
nee tot op zekere hoogte ja
- q. Iets andersInvullen:
nee tot op zekere hoogte ja
8. Welke redenen zou u ertoe **brenge** om een **betalen-per-wasbeurt-service te gebruiken**? Betalen per wasbeurt betekent dat u wasmachine koopt, maar deze gebruikt en u betaalt voor elke wasbeurt - bij u thuis voor uw eigen individuele gebruik (meestal huurt u of leaset u de machine) of in gezamenlijke consumptie of in het wassalon). Als u deze mogelijkheid al gebruikt, vink dan aan wat u heeft overtuigd... in een dergelijk geval, niet "misschien" kiezen). U kunt meerdere antwoorden kiezen.
- o. Geen directe inkoopkosten (u hoeft geen geld te hebben om het te kopen of om het op krediet te kopen)
nee tot op zekere hoogte ja
- p. De overtuiging dat het me goedkoper zou kosten
nee tot op zekere hoogte ja
- q. Mogelijkheid om de wasmachine te testen (bijv. het merk dat ik graag zou willen hebben)
nee tot op zekere hoogte ja
- r. De verantwoordelijkheid voor het onderhoud van de wasmachine kwijtraken (indien het onderhoud aan het betalen per wasbeurt is gerelateerd)
nee tot op zekere hoogte ja
- s. Kleinere kans op storingen door professioneel onderhoud door een servicebedrijf en door de hoge kwaliteit van de wasmachine (bij huren worden meestal machines van een hogere kwaliteit geleverd)
nee tot op zekere hoogte ja

- t. Milieuaspecten (zoals hierboven - meestal worden duurzamere wasmachines gebruikt voor deze oplossing)
nee tot op zekere hoogte ja
- o. Overzicht van de betalingen voor elke wasbeurt
nee tot op zekere hoogte ja
- u. Indruk maken op anderen (mensen zouden me bewonderen omdat ik zo innovatief ben)
nee tot op zekere hoogte ja
- l. Flexibiliteit - geen eigendomsverhoudingen
nee tot op zekere hoogte ja
- m. Iets anders.....wat?
nee tot op zekere hoogte ja
9. Indien u erover denkt om te **betalen per wasbeurt** in plaats van een wasmachine te bezitten, zouden deze factoren u **ontmoedigen** om te betalen per wasbeurt? (betalen per wasbeurt vereist het installeren van een module die de machine via internet met de provider verbindt en het mogelijk maakt om verschillende aanvullende functies aan te bieden)
- q. Ik geef er de voorkeur aan om dingen te bezitten
nee tot op zekere hoogte ja
- r. de leverancier van betalen per wasbeurt zou teveel van me te weten komen
nee tot op zekere hoogte ja
- s. de leverancier van betalen per wasbeurt kan geen perfecte gegevensbescherming garanderen
nee tot op zekere hoogte ja
- t. uiteindelijk betaal ik meer in vergelijking met het bezit van een wasmachine
nee tot op zekere hoogte ja
- u. Ik heb nog nooit gehoord, of ik weet slechts heel weinig over het systeem van betalen per wasbeurt
nee tot op zekere hoogte ja
- v. Angst voor het onbekende (ik denk dat er veel of sommige risico's zijn verbonden aan het betalen per wasbeurt - ik kan het product beschadigen, de prijzen kunnen stijgen...)

nee tot op zekere hoogte ja

w. Betalen-per-wasbeurt creëert een andere financiële verantwoordelijkheid voor mij, wat stressvol is (ik wil bijvoorbeeld niet elke maand een factuur zien)

nee tot op zekere hoogte ja

x. Was er nog iets? Wat?.....

X. Gezamenlijke consumptie/gebruik van een wasmachine gedeeld met de anderen en betalen per wasbeurt

4. Welke redenen zouden u ertoe brengen om de wasmachine in uw huishouden niet weg te gooien, maar te wassen in het kader van gezamenlijke consumptie, bijvoorbeeld één wasmachine voor meerdere huishoudens of in de wasserette?

u. Geen directe inkoopkosten (u hoeft geen geld te hebben om het te kopen of om het op krediet te kopen)

nee tot op zekere hoogte ja

v. Ik wil niet kopen en bezitten: als je "ja" antwoordt, waarom? Vul hieronder de reden in

nee tot op zekere hoogte ja... Waarom?.....

w. De overtuiging dat het me goedkoper zou kosten

nee tot op zekere hoogte ja

x. Mogelijkheid om de wasmachine te testen (bijv. het merk dat ik graag zou willen hebben)

nee tot op zekere hoogte ja

y. De verantwoordelijkheid voor het onderhoud van de wasmachine kwijtraken (indien onderhoud wordt aangeboden samen met betalen per wasbeurt in het kader van samenwerkende consumptie)

nee tot op zekere hoogte ja

z. Milieuaspecten (samenwerkende consumptie vereist duurzame producten die langer werken)

nee tot op zekere hoogte ja

aa. Kleinere kans op defecten door professioneel onderhoud door een servicebedrijf en door de hoge kwaliteit van de wasmachine

nee tot op zekere hoogte ja

bb. Flexibiliteit - geen eigendomsverhoudingen

nee tot op zekere hoogte ja

cc. Indruk maken op anderen - mensen zouden me daarvoor willen bewonderen

nee tot op zekere hoogte ja

Mogelijkheid om te socialiseren met andere mensen

nee tot op zekere hoogte ja

dd. Iets andersInvullen:

nee tot op zekere hoogte ja

- XI. Opgeknapte en gereviseerde wasmachine** (een opgeknapte en gereviseerde wasmachine is een gebruikte wasmachine die naar een nieuw-achtige staat is gebracht door demonteren, reinigen, vervangen van de belangrijkste componenten van het product, opnieuw monteren en testen. Het biedt dezelfde functionaliteit (hetzelfde elektriciteits- en waterverbruik) en dezelfde kwaliteit als een nieuw product of beter. Reviseren vereist meer handelingen en gebruik van meer nieuwe onderdelen.

9. Heeft u ervaring met opgeknapte en/of gereviseerde producten, vooral met huishoudelijke apparaten en elektronica?

nee ja

10. Wat vindt u van een opgeknapte en gereviseerde wasmachine?

- i) Ik schat de opgeknapte/gereviseerde machine op dezelfde manier in alsof deze nieuw was
3) Helemaal oneens.....5) volledig eens
- j) De aanschaf van een opgeknapte/gereviseerde wasmachine helpt om schaarsere hulpmiddelen te gebruiken
3) Helemaal oneens.....5) volledig eens
- k) Het kopen van een opgeknapte/gereviseerde wasmachine kan de schadelijke gevolgen voor het milieu verminderen.
3) Helemaal oneens.....5) volledig eens
- l) Ik ben bang dat de prestaties van een opgeknapte/ gereviseerde WM inferieur zijn dan de prestaties van nieuwe
3) Helemaal oneens.....5) volledig eens
- k) Ik ben bang voor problemen met de betrouwbaarheid van de wasmachine na het einde van de garantieperiode

- 1) Helemaal oneens.....5) volledig eens
- l) Ik zou me zorgen maken over de hygiëne van een opgeknapte/gereviseerde wasmachine
3) Helemaal oneens..... 5) volledig eens
- m) De reputatie van het merk is essentieel voor het maken van een aankoopbeslissing met betrekking tot een gereviseerde wasmachine
3) Helemaal oneens..... 5) volledig eens

De fiches (productprofielen) hieronder vertegenwoordigen verschillende wasopties. Rangschik de fiches op basis van uw voorkeuren (sleep ze met de muis en plaats ze in het rechtervak). Bovenaan uw lijst staat de voorkeurwasoptie (meest gewenst), terwijl de minst gewenste onderaan wordt geplaatst.

Prijs voor één wascyclus

_____ _____ _____

Contractduur

flexibel (maandelijks) jaarlijks lange termijn (5 jaar)

staat wasmachine

Nieuw	Als nieuw (ca. 5 jaar)	Hergebruikt (ca. 10 jaar)
-------	------------------------	---------------------------

servicegerichtheid

Binnen 1 dag	Binnen 4 dagen	Binnen 1 week
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Factureringschema

Voorafbetaald (en de rest afbetalen)	Facturering achteraf	Onmiddellijk (direct na de wasbeurt)
--------------------------------------	----------------------	--------------------------------------

XII. Uw ideale wasmachine?

(geef aan dat u het eens bent met de onderstaande verklaringen)

11. Ik wil een wasmachine die:

- u) robuust en duurzaam is, zodat het langer meegaat
1 (helemaal niet).....5 (absoluut)
- v) slim en op het internet aangesloten is, zodat ik online het wassen kan beheren en regelen
1 (helemaal niet).....5 (absoluut)
- w) me vooraf vertelt of er iets in de wasmachine moet worden schoongemaakt of gerepareerd
1 (helemaal niet).....5 (absoluut)



circular business models

- x) met mijn persoonlijk profiel werkt en me dus vertelt hoe en wanneer te wassen (om het verbruik van water, energie en wasmiddel te optimaliseren)
1 (helemaal niet).....5 (absoluut)
- y) door de serviceprovider wordt geüpgraded, zodat ik altijd over een up-to-date machine kan beschikken
1 (helemaal niet).....5 (absoluut)
- z) over een automatische dosering van het wasmiddel beschikt (wasautomaten met automatische dosering wegen uw kleding in de trommel en stellen de perfecte hoeveelheid wasmiddel automatisch in)
1 (helemaal niet).....5 (absoluut)
- å) een online verbinding met een kalender
1 (helemaal niet).....5 (absoluut)
- bb) online deskundig advies (24 uur/7 dagen per week beschikbaar - instructies, video's enz.)
1 (helemaal niet).....5 (absoluut)
- cc) me informatie over energie- en waterverbruik geeft
1 (helemaal niet).....5 (absoluut)
- dd) me informatie over de prijs voor wassen geeft
1 (helemaal niet).....5 (absoluut)
12. Ziet u uzelf nieuwe producten aankopen en nieuwe trends aanvaarden zoals:
c) innovator b) vroege aanvaarder c) vroege meerderheid d) late meerderheid e) achterblijver
13. Beschouwt u uzelf als een eco-vriend, eco-fan of zelfs een eco-actievoerder?
1 (helemaal niet).....5 (absoluut)
14. Hoe staat het met het eigendom en de aankoop van de wasmachine die u gebruikt?
o) Ik (wij - als u in een koppel of een gezin bent) heeft/hebben het gekocht/gekregen
p) Ik/we leaseden het/kochten op krediet (ik/wij zal/zullen alles in stappen betalen)
q) Ik/wij huur/huren het (we hebben een tijdelijk contract)
r) Ik/wij gebruiken de wasmachine in ons appartement, maar het is eigendom van onze verhuurder
s) Ik /wij gebruiken de wasmachine in ons huis of flatgebouw - (de zogenaamde gezamenlijke consumptie) - het is niet van ons en ik/wij betaal/betalen voor het gebruik
t) Ik/wij gebruik(en) het wassalon in de stad
u) Anders ... Invullen hoe:

15. Hoe vaak doet u de was?

- i) Minder dan een keer per week
- j) 1-2 keer per week
- k) 3-4 keer per week
- l) Meer dan 4 keer per week

Uw leeftijdsgroep:

- 18-23 24-30 31-40 41-50 51-60 60 en ouder

Uw opleiding

- lagere school middelbare school bachelorsdiploma en hoger

Uw huidige woonplaats:

- Dorp kleine stad grote stad

Uw status:

- Alleenwonend
- Samenwonend met partner, zonder kinderen
- Samenwonend met een partner met 1-2 kinderen
- Samenwonend met een partner met 3 en meer kinderen
- Samenwonend met ouders en/of grootouders (2-3 personen)
- Samenwonend met ouders en/of grootouders (meer dan 3 personen)
- Samenwonend met vrienden/klasgenoten/collega's
- Ander:

Uw levensomstandigheden:

- Wonend in een privé huis/cottage
- Wonend in een appartement (huis met appartementen)
- Ander:.....

Uw inkomensgroep (xxx/persoon):**German version:**

Waschmaschine in der Kreislaufwirtschaft – Besitz, Pay-per-Wash oder Pooling

Ziel des Fragebogens ist es, Einstellungen, Motive und Hindernisse herauszufinden, die Verbraucher gegenüber verschiedenen Kreislaufwirtschaftslösungen empfinden, wie man Wäsche waschen und wie man durch das Waschen bei den Hauptzielen der Kreislaufwirtschaft helfen soll. Die Umfrage ist ein Teil des von der Europäischen Union geförderten Projekts mit dem Namen ReCIPSS (<http://www.recipss.eu/>).

Dieser Fragebogen ist völlig anonym und es werden keine sensiblen personenbezogenen Daten erhoben, die missbraucht werden können.

Der Fragebogen ist in englischer, deutscher, niederländischer und slowenischer Sprache verfügbar.

Falls Sie an den Ergebnissen interessiert sind, die alle Antworten aus vier Ländern zusammenfassen, fügen Sie bitte Ihre E-Mail-Adresse am Ende dieses Fragebogens hinzu oder schreiben Sie an: klapalov@econ.muni.cz.

Vielen Dank für Ihre Bemühungen.

Die Umfrage wird in 4 Ländern durchgeführt: Österreich, Dänemark, der Niederlande und Slowenien. Die Ziele der Kreislaufwirtschaft sind Minimierung von Abfall, Verringerung der negativen Auswirkungen von Produktion und Verkehr auf die Umwelt, Unterstützung von Wirtschaft und Gesellschaft bei der Nachhaltigkeit durch die möglichst lange Beibehaltung von Produkten im Nutzungszyklus (Verbrauchsreislauf) und Nichtförderung der sogenannten "Wegwerfgesellschaft".

Kreislaufwirtschaftslösungen: 1. hochwertige, haltbare und langlebige Produkte (die ziemlich teuer sind) herzustellen und zu liefern; 2. Produkte so lange wie möglich zu reparieren (in den USA und einigen anderen Ländern gibt es Rechtsvorschriften, die das Recht auf Reparatur fördern, ähnliche werden in den EU-Vorschriften ab April 2021 gültig sein); 3. Produkte wiederaufzubereiten (Produkte wie neu auszuführen); Produkte wiederaufzubereiten (fast genauso wie bei der Überholung mit einigen weiteren Verfahren); Produkte zu recyceln (Materialien und Komponenten von alten Produkten in neuer Produktion zu verwenden). Produkte länger im Kreislauf zu halten, kann auch durch **Miete/Verleihsystem/Pooling (sogenannter kollaborativer Konsum) oder Pay-per-Use** erfolgen, anstatt sie zu **kaufen**, sie zu **besitzen** und sie **wegzuwerfen**. Diese Möglichkeiten werden als "zugangsbasierter Konsum" bezeichnet.

Im Auftrag des ReCiPSS Forschungsteams der Masaryk-Universität, Fakultät für Wirtschafts- und Verwaltungswissenschaften, Brunn, Tschechien,

Alena Klapalová

1. Erfahrungen mit zugangsbasiertem Konsum:

- j) Welche Erfahrung haben Sie mit der Vermietung oder dem Leasing von Produkten (z. B. Haushaltsgeräte, Kraftfahrzeuge, Werkzeuge, Laptops usw.) gemacht?
Keine Erfahrung x Ich habe es ein- oder zweimal versucht x Ich miete/lease Dinge oft
- k) Welche Erfahrung haben Sie mit Pay-per-Use von Produkten (z. B. Haushaltsgeräte, Kraftfahrzeuge, Fahrräder, Werkzeuge, Laptops usw.) gemacht?
Keine Erfahrung x Ich habe es ein- oder zweimal versucht x Ich benutze oft das Pay-per-Use-System
- l) Welche Erfahrung haben Sie mit dem so genannten "kollaborativen Konsum" (eine Form der Mitbenutzung von Produkten mit anderen Personen – Produkte können von einer Gruppe von Personen oder von einer Person oder sogar einer Institution

gekauft und für eine bestimmte /finanzielle oder produkt- oder dienstleistungsbezogene/ Vergütung angeboten werden) gemacht?

Keine Erfahrung x Ich habe es ein- oder zweimal versucht x Ich benutze kollaborativen Konsum oft

XIII. Mietwaschmaschine

10. Welche Gründe würden Sie überzeugen, **eine Waschmaschine zu mieten, anstatt für sie zu besitzen?** (Mieten bedeutet, einen befristeten Vertrag mit einer regelmäßigen Zahlung zu haben) Falls Sie keine Waschmaschine besitzen, aber sie bereits mieten, was hat Sie dazu veranlasst? Bitte wählen Sie aus den Antworten (Sie können auch mehrere Antworten wählen):

- p. Keine Vorab-Anschaffungskosten (keine Notwendigkeit, Geld zu haben, um sie zu kaufen oder sie auf Kredit zu kaufen)
nein teilweise ja
- q. Ich will nichts kaufen und besitzen: Wenn Sie "ja" antworten, warum? Bitte füllen Sie den Grund unten aus
nein teilweise ja...Warum?.....
- r. Ich glaube, dass es für mich billiger sein würde
nein teilweise ja
- s. Die Möglichkeit, eine Waschmaschine zu testen (z. B. Marke, die ich haben möchte)
nein teilweise ja
- h. Um die Verantwortung für die Wartung der Waschmaschine loszuwerden (wenn die Wartung zusammen mit der Vermietung angeboten wird)
nein teilweise ja
- r. Geringeres Störungsrisiko dank professioneller Wartung durch ein Dienstleistungsunternehmen und dank der hohen Qualität der Waschmaschine (im Rahmen der Vermietung werden in der Regel hochwertigere Waschmaschinen bereitgestellt)
nein teilweise ja
- s. Umweltbelange (die Vermietung erfordert langlebige Produkte, die über einen längeren Zeitraum betrieben werden)
nein teilweise ja
- t. Flexibilität – keine Eigentumsverhältnisse
nein teilweise ja

u. Etwas anderes.....bitte ausfüllen:.....
nein teilweise ja

11. Welche Gründe würden Sie überzeugen, **einen Pay-per-Wash-Service zu nutzen**? Pay-per-Wash bedeutet, dass Sie keine Waschmaschine kaufen, sondern sie benutzen und für jeden Waschgang bezahlen – entweder bei Ihnen zu Hause für Ihren individuellen Gebrauch (normalerweise mieten oder leasen Sie sie) oder im Rahmen des kollaborativen Konsums oder im Waschsalon). Wenn Sie diese Möglichkeit bereits nutzen, kreuzen Sie bitte an, was Sie überzeugt hat.....in diesem Fall wählen Sie nicht “vielleicht”). Sie können mehrere Antworten wählen.

v. Keine Vorab-Anschaffungskosten (keine Notwendigkeit, Geld zu haben, um sie zu kaufen oder sie auf Kredit zu kaufen)
nein teilweise ja

w. Ich glaube, dass es für mich billiger sein würde
nein teilweise ja

x. Die Möglichkeit, eine Waschmaschine zu testen (z. B. Marke, die ich haben möchte)
nein teilweise ja

y. Um die Verantwortung für die Wartung der Waschmaschine loszuwerden (wenn die Wartung zusammen mit der Vermietung zusammen mit Pay-per-Wash angeboten wird)
nein teilweise ja

z. Geringeres Störungsrisiko dank professioneller Wartung durch ein Dienstleistungsunternehmen und dank der hohen Qualität der Waschmaschine (im Rahmen von Pay-per-Wash werden in der Regel hochwertigere Waschmaschinen bereitgestellt)
nein teilweise ja

aa. Umweltbelange (wie oben beschrieben – üblicherweise werden für diese Lösung langlebigere Waschmaschinen verwendet)
nein teilweise ja

t. Übersicht über die Zahlungen für jeden Waschgang
nein teilweise ja

bb. Andere zu beeindrucken (die Leute würden mich dafür bewundern....wie innovativ ich bin)
nein teilweise ja

- n. Flexibilität – keine Eigentumsverhältnisse
nein teilweise ja
- o. Etwas anderes.... was?
nein teilweise ja

12. Wenn Sie **Pay-per-Wash** überlegen, anstatt die Waschmaschine zu besitzen, würden folgende Faktoren Sie vom Pay-per-Wash **abhalten**? (Pay-per-Wash erfordert die Installation eines Moduls, das die Maschine über das Internet mit dem Anbieter verbindet und es ermöglicht, verschiedene Zusatzfunktionen anzubieten)

- y. Ich bevorzuge es, Dinge zu besitzen
nein teilweise ja
- z. Der Pay-per-Wash-Anbieter würde zu viel über mich wissen
nein teilweise ja
- aa. Der Pay-per-Wash-Anbieter kann keinen einwandfreien Datenschutz garantieren
nein teilweise ja
- bb. Schließlich zahle ich mehr im Vergleich zum Besitz einer Waschmaschine
nein teilweise ja
- cc. Ich habe davon noch nie gehört, oder weiß über Pay-per-Wash nur sehr wenig
nein teilweise ja
- dd. Angst vor Unbekanntem (ich habe das Gefühl, dass es viele oder einige Risiken in Bezug auf Pay-per-Wash gibt – ich kann das Produkt beschädigen, die Preise können steigen....)
nein teilweise ja
- ee. Pay-per-Wash bedeutet für mich eine weitere finanzielle Verpflichtung, was mich stresst (ich möchte beispielsweise nicht jeden Monat eine Abrechnung bekommen)
nein teilweise ja
- ff. Sonstiges? Was?.....

XIV. Kollaborativer Konsum / kollaborative Nutzung einer gemeinsam mit anderen benutzten Waschmaschine und Pay-per-Wash

4. Welche Gründe sprechen dafür, **dass** Sie über keine **Waschmaschine in Ihrem Haushalt verfügen, sondern im Rahmen des kollaborativen Konsums Wäsche waschen sollen, z. B. in einer Waschmaschine für mehrere Haushalte oder im Waschsalon?**

- ee. Keine Vorab-Anschaffungskosten (keine Notwendigkeit, Geld zu haben, um sie zu kaufen oder sie auf Kredit zu kaufen)
nein teilweise ja
- cc. Ich will nichts kaufen und besitzen: Wenn Sie "ja" antworten, warum? Bitte füllen Sie den Grund unten aus
nein teilweise ja...Warum?.....
- dd. Ich glaube, dass es für mich billiger sein würde
nein teilweise ja
- hh. Die Möglichkeit, eine Waschmaschine zu testen (z. B. Marke, die ich haben möchte)
nein teilweise ja
- ii. Um die Verantwortung für die Wartung der Waschmaschine loszuwerden (wenn die Wartung zusammen mit Pay-per-Wash im kollaborativen Konsum angeboten wird)
nein teilweise ja
- gg. Umweltbelange (der kollaborative Konsum erfordert langlebige Produkte, die über einen längeren Zeitraum betrieben werden)
nein teilweise ja
- hh. Geringeres Störungsrisiko dank professioneller Wartung durch ein Dienstleistungsunternehmen und dank der hohen Qualität der Waschmaschine
nein teilweise ja
- ll. Flexibilität – keine Eigentumsverhältnisse
nein teilweise ja
- mm. Andere zu beeindrucken – die Leute würden mich dafür bewundern
nein teilweise ja
- Möglichkeit der Aufnahme sozialer Kontakte mit anderen Menschen
nein teilweise ja
- nn. Etwas anderes.....bitte ausfüllen:.....
Nein teilweise ja

XV. Überholte und wiederaufbereitete Waschmaschine Überholte und wiederaufbereitete Waschmaschine ist eine gebrauchte Waschmaschine, die durch Demontage, Reinigung, Austausch von Hauptkomponenten des Produkts, Wiederausammenbau und Prüfung in den neuwertigen Zustand versetzt wird. Sie bietet die gleiche Funktionalität (gleichen Strom- und Wasserverbrauch) und die gleiche oder noch bessere Qualität als ein neues Produkt. Die Wiederaufbereitung erfordert mehrere Tätigkeiten und den Einsatz von mehreren neuen Teilen.

11. Haben Sie Erfahrung mit einem überholten und/oder wiederaufbereiteten Produkt, insbesondere mit Haushaltsgeräten und Elektronik?

Nein ja

12. Was denken Sie über überholte und wiederaufbereitete Waschmaschinen?

m) Ich schätze die überholte/wiederaufbereitete Waschmaschine genauso, als wäre sie neu

4) Überhaupt nicht einverstanden.....5) völlig einverstanden

n) Der Kauf einer überholten/wiederaufbereiteten Waschmaschine wird dazu beitragen, weniger nichterneuerbare Rohstoffe zu verbrauchen

4) Überhaupt nicht einverstanden.....5) völlig einverstanden

o) Der Kauf einer überholten/wiederaufbereiteten Waschmaschine kann schädliche Auswirkungen auf die Umwelt reduzieren.

4) Überhaupt nicht einverstanden.....5) völlig einverstanden

p) Ich befürchte, dass die Leistung von überholten/wiederaufbereiteten WM schlechter ist als die von neuen WM

4) Überhaupt nicht einverstanden.....5) völlig einverstanden

n) Ich befürchte, dass Probleme bezüglich der Zuverlässigkeit der Waschmaschine nach Ablauf der Garantiezeit auftreten können

1) Überhaupt nicht einverstanden.....5) völlig einverstanden

o) Ich würde mir Sorgen über die Hygiene einer überholten/wiederaufbereiteten Waschmaschine machen

4) Überhaupt nicht einverstanden..... 5) völlig einverstanden

p) Die Reputation der Marke ist für eine Kaufentscheidung bezüglich einer wiederaufbereiteten Waschmaschine entscheidend

4) Überhaupt nicht einverstanden..... 5) völlig einverstanden

circular business models

Die folgenden Karten (Produktprofile) stellen verschiedene Waschmöglichkeiten dar. Bitte bewerten Sie die Karten nach Ihren Präferenzen (ziehen Sie sie mit der Maus und legen Sie sie in das rechte Feld). Am Anfang Ihrer Liste steht die bevorzugteste (die am meisten gewünschte) Waschmöglichkeit, während die am wenigsten gewollte Waschmöglichkeit unten steht.

Preis für einen Waschgang

Vertragslaufzeit

flexibel (monatlich) jährlich langfristig (5 Jahre)

Waschmaschinenzustand

Neu	Wie neu (ca. 5 Jahre)	Wiederverwendet (gebraucht) (ca. 10 Jahre)
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Servicebereitschaft

Innerhalb 1 Tages	Innerhalb 4 Tage	Innerhalb 1 Woche
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Abrechnungsschema

Vorausbezahlt (und den Rest bezahlen)	Nachberechnet	Sofort (direkt nach dem Waschen)
---------------------------------------	---------------	----------------------------------

XVI. Ihre ideale Waschmaschine?

(Bitte geben Sie an, inwieweit Sie den folgenden Aussagen zustimmen)

16. Ich hätte gerne eine Waschmaschine, die:

ee) robust und langlebig ist, so dass sie länger aushält
1 (überhaupt nicht).....5 (vollkommen)

cc) intelligent und mit dem Internet verbunden ist, so dass ich das Waschen online verwalten und kontrollieren kann
1 (überhaupt nicht).....5 (vollkommen)

gg) mir im Voraus mitteilt, ob etwas in der Waschmaschine gereinigt oder repariert werden muss
1 (überhaupt nicht).....5 (vollkommen)

hh) mit meinem persönlichen Profil zusammenarbeitet, daher empfiehlt sie mir, wie und wann ich waschen sollte (um den Wasser-, Energie- und Waschmittelverbrauch zu optimieren)
1 (überhaupt nicht).....5 (vollkommen)

ff) vom Dienstanbieter aktualisiert wird, so dass ich immer die aktuellste Maschine haben kann
1 (überhaupt nicht).....5 (vollkommen)



- jj) eine automatische Dosierung des Waschmittels hat (Waschmaschinen mit automatischer Dosierung wiegen Ihre Wäsche in der Trommel und stellen automatisch die genaueste Waschmittelmenge ein)
1 (überhaupt nicht).....5 (vollkommen)
- kk) eine Online-Kalenderverbindung hat
1 (überhaupt nicht).....5 (vollkommen)
- ll) Online-Expertenberatung hat (24 Stunden / 7 Tage pro Woche verfügbar – Tutorials, Videos usw.)
1 (überhaupt nicht).....5 (vollkommen)
- jj) mir Informationen über den Energie- und Wasserverbrauch gibt
1 (überhaupt nicht).....5 (vollkommen)
- kk) mir Informationen über den Preis für einen Waschgang gibt
1 (überhaupt nicht).....5 (vollkommen)
17. Sehen Sie sich bezüglich der Akzeptanz und des Kaufs neuer Produkte und der Akzeptanz neuer Trends im Allgemeinen als:
d) Innovator b) Frühadopter c) frühe Mehrheit d) späte Mehrheit e) Nachzügler
18. Betrachten Sie sich selbst als Öko-Freund, Öko-Fan oder sogar als Öko-Campaigner?
1 (überhaupt nicht).....5 (vollkommen)
19. Wie steht es mit dem Eigentum und dem Kauf der Waschmaschine, die Sie benutzen?
v) Ich (wir – wenn Sie in einem Paar oder einer Familie leben) habe sie gekauft/bekommen
w) Ich/wir habe/n sie geleast/gekauft auf Kredit (ich/wir werden den gesamten Betrag Schritt für Schritt bezahlen)
x) Ich/wir miete/n sie (wir haben einen Zeitvertrag)
y) /Ich/wir benutze/n die Waschmaschine in unserer Wohnung, aber sie ist Eigentum unseres Vermieters
z) Ich/wir benutze/n die Waschmaschine in meinem/ unserem Haus oder Wohnung – (sogenannter kollaborativer Konsum) – sie gehört uns nicht und ich/wir bezahlen für die Nutzung
aa) Ich/wir benutze/n einen Waschsalon in der Stadt
bb) Sonstiges... bitte, füllen Sie die Weise aus:
20. Wie oft waschen Sie Ihre Wäsche?
m) weniger als einmal wöchentlich
n) ein- bis zweimal wöchentlich
o) drei- bis viermal wöchentlich
p) mehr als viermal wöchentlich

Ihre Altersgruppe:

18–23 24–30 31–40 41–50 51–60 60 und
darüber

Ihre Ausbildung:

Grundbildung Sekundarschulabschluss Bachelorabschluss und darüber

Ihr aktueller Wohnsitz:

Gemeinde Kleinstadt Großstadt

Ihr Stand:

Alleinlebend
Mit Partner/in ohne Kinder lebend
Mit Partner/in mit 1-2 Kindern lebend
Mit Partner/in mit 3 und mehr Kindern lebend
Mit Eltern und/oder Großeltern (2-3 Personen) lebend
Mit Eltern und/oder Großeltern (mehr als 3 Personen) lebend
Mit Freunden/Schulkameraden/Kollegen lebend
Sonstiges:

Ihre Lebensbedingungen:

In einem Privathaus/Ferienhaus lebend
In einer Wohnung (Haus mit Wohnungen) lebend
Sonstiges:.....

Ihre Einkommensgruppe (xxx/Person):

Slovenian version:

Pralni stroj v krožnem gospodarstvu – lastništvo, plačevanje po pranju ali združevanje

Namen vprašalnika je ugotoviti, kakšen je v zvezi z načinom pranja perila in tovrstnim prispevanjem h glavnim ciljem krožnega gospodarstva odnos potrošnikov do različnih rešitev krožnega gospodarstva, kakšni so njihovi cilji glede tega in kakšne ovire pri tem zaznavajo. Raziskava je del projekta ReCiPSS (<http://www.recipss.eu/>), ki ga financira Evropska unija.

Ta vprašalnik je popolnoma anonimen, z njim se ne zbirajo nobeni občutljivi osebni podatki, ki bi jih bilo mogoče zlorabiti.

Vprašalnik je na voljo v angleškem, nemškem, nizozemskem in slovenskem jeziku.

Če vas zanimajo rezultati s povzetkom vseh odgovorov v vseh štirih državah, dodajte svoj e-poštni naslov na koncu tega vprašalnika ali pišite na naslov: klapalov@econ.muni.cz.

Raziskava poteka v štirih državah: Avstriji, na Danskem, Nizozemskem in Sloveniji. Cilj krožnega gospodarstva je čim bolj zmanjšati količino odpadkov, zmanjšati negativen vpliv proizvodnje in prometa na okolje, pomagati podjetjem in družbi k trajnostnosti z ohranjanjem izdelkov čim dlje v uporabi (porabi) in ne spodbujati tako imenovane družbe »odmetavanja«.

Rešitve za krožno gospodarstvo so: 1. proizvodnja in dobava visokokakovostnih trajno vzdržnih izdelkov (ki so precej dragi); 2. popraviljanje izdelkov kolikor je mogoče dolgo časa (ZDA in nekatere druge države že imajo zakonodajo, ki spodbuja pravico do popravila, v EU se bodo taka pravila uporabljala od aprila 2021); 3. obnova izdelkov (da so kot novi); predelava izdelkov (skoraj enako kot obnova z več postopki); recikliranje izdelkov (uporaba materialov in sestavnih delov iz starih izdelkov pri proizvodnji novih). Daljše kroženje izdelkov se namesto nakupa, lastništva in zavrženja lahko doseže tudi z **najemom/delitvijo/združevanjem (t.i. delitveno porabo) ali plačilom po uporabi**. Te načine imenujemo »poraba po dostopu«.

V imenu raziskovalne skupine ReCiPSS z Masarykove univerze, Fakultete za ekonomijo in upravo v Brnem na Češkem,

Alena Klapalová

1. Izkušnje s porabo po dostopu:

- m) Kakšne so vaše izkušnje z najemom ali zakupom (lizingom) izdelkov (npr. gospodinjskih aparatov, avtomobilov, orodja, prenosnih računalnikov itd.)?
Brez izkušenj x Enkrat ali dvakrat x Pogosto najemam/zakupujem
- n) Kakšne so vaše izkušnje s plačevanjem po uporabi izdelkov (npr. gospodinjskih aparatov, avtomobilov, koles, orodja, prenosnih računalnikov itd.)?
Brez izkušenj x Enkrat ali dvakrat x Pogosto plačujem po uporabi
- o) Kakšne so vaše izkušnje s t.i. »delitveno porabo« (to je oblika delitve izdelkov z drugimi – izdelke lahko kupi skupina ljudi ali ena oseba ali celo institucija in jih ponudi v uporabo za nadomestilo (v obliki finančnega nadomestila, izdelka ali storitve)?
Brez izkušenj x Enkrat ali dvakrat x Pogosto uporabljam delitveno porabo

XVII. Najem pralnega stroja

13. Kaj bi vas prepričalo, da bi **lastništvo pralnega stroja zamenjali za najem?** (najem pomeni pogodbo za določen čas z obročnim plačevanjem) Če niste lastnik pralnega stroja, ampak ga imate v najemu, zakaj ste se za to odločili? Izberite med temi odgovori (lahko izberete tudi več odgovorov):

- u. Ni neposrednih stroškov nakupa (ni treba imeti denarja ali vzeti posojila za nakup)
ne deloma da
- v. Ne želim kupiti in imeti v lasti, in če »da«, zakaj? Razlog vpišite spodaj

ne deloma da...Zakaj?.....

w. Po mojem mnenju je to ceneje
ne deloma da

x. Možnost preizkusa pralnega stroja (npr. znamke, ki bi jo želel imeti)
ne deloma da

i. Ne želim se ukvarjati z vzdrževanjem pralnega stroja (če je vzdrževanje vključeno v najem)
ne deloma da

v. Manjše tveganje okvar zaradi strokovnega vzdrževanja servisnega podjetja in zaradi visoke kakovosti pralnega stroja (v najem se običajno dajejo kakovostnejši stroji)
ne deloma da

w. Okoljska vprašanja (najemajo se trajni izdelki, ki delujejo dlje časa)
ne deloma da

x. Prilagodljivost – nisem vezan na lastništvo
ne deloma da

y. Nekaj drugega... vpišite tukaj:
ne deloma da

14. Kaj bi vas prepričalo, da bi **plačevali po pranju**? Plačevanje po pranju pomeni, da pralnega stroja ne kupite, ampak ga uporabljate tako, da plačate za posamezno pranje, bodisi doma za lastno uporabo (ponavadi ga najamete ali zakupite) ali z delitveno porabo ali v pralnici. Če to možnost že uporabljate, označite, kaj vas je prepričalo... v tem primeru ne izberite »morda«. Izberete lahko več odgovorov.

ö. Ni neposrednih stroškov nakupa (ni treba imeti denarja ali vzeti posojila za nakup)
ne deloma da

dd. Po mojem mnenju je to ceneje
ne deloma da

ee. Možnost preizkusa pralnega stroja (npr. znamke, ki bi jo želel imeti)
ne deloma da

ff. Ne želim se ukvarjati z vzdrževanjem pralnega stroja (če je vzdrževanje vključeno v najem v zvezi s plačilom glede na pranje)

ne deloma da

gg. Manjše tveganje okvar zaradi strokovnega vzdrževanja servisnega podjetja in zaradi visoke kakovosti pralnega stroja (pri plačevanju glede na pranje se običajno uporabljajo kakovostnejši stroji)

ne deloma da

hh. Okoljska vprašanja (kot zgoraj – običajno se pri tem uporabljajo vzdržljivejši pralni stroji)

ne deloma da

y. Pregled nad plačili za vsako pranje

ne deloma da

ff. Vtis na druge (ljudje bi zaradi tega občudovali mojo inovativnost)

ne deloma da

p. Prilagodljivost – nisem vezan na lastništvo

ne deloma da

q. Nekaj drugega ... kaj?

ne deloma da

15. Bi vas pri razmišljanju o **plačevanju po pranju** namesto lastništva pralnega stroja ti dejavniki **odvrnili** od plačevanja po pranju? (pri plačevanju po pranju je treba namestiti modul, s katerim je stroj prek interneta povezan s ponudnikom in omogoča različne dodatne funkcije)

gg. Raje sem lastnik stvari

ne deloma da

ee. ponudnik plačevanja po pranju bi izvedel preveč o meni

ne deloma da

ii. ponudnik plačevanja po pranju ne more zagotoviti popolnega varstva podatkov

ne deloma da

gg. na koncu bi plačal več, kot če bi bil lastnik pralnega stroja

ne deloma da

hh. Še nikoli nisem slišal za sistem plačevanja po pranju ali o tem vem zelo malo

ne deloma da

ll. Strah pred neznanim (menim, da obstaja veliko ali nekaj tveganj s plačevanjem po pranju – izdelek lahko poškodujem, cene se lahko povišajo ...)

ne deloma da

mm. Plačevanje po pranju pomeni zame dodatno finančno breme, kar je stresno (npr. ne želim prejemati mesečnih računov)

ne deloma da

nn. Še kaj? Kaj?.....

XVIII. Delitvena poraba/uporaba pralnega stroja, ki se deli z drugimi in plačuje po pranju

4. Kaj bi vas prepričalo, da v svojem gospodinjstvu pralnega stroja ne bi imeli v lasti, ampak bi si uporabo delili, npr. en pralni stroj za več gospodinjstev ali v pralnici?

ll. Ni neposrednih stroškov nakupa (ni treba imeti denarja ali vzeti posojila za nakup)

ne deloma da

mm. Ne želim kupiti in imeti v lasti, in če »da«, zakaj? Razlog vpišite spodaj

ne deloma da...Zakaj?.....

qq. Po mojem mnenju je to ceneje

ne deloma da

rr. Možnost preizkusa pralnega stroja (npr. znamke, ki bi jo želel imeti)

ne deloma da

ss. Ne želim se ukvarjati z vzdrževanjem pralnega stroja (če je vzdrževanje vključeno v plačevanje po pranju pri delitveni porabi)

ne deloma da

tt. Okoljska vprašanja (v delitveni porabi so trajni izdelki, ki delujejo dlje časa)

ne deloma da

uu. Manjše tveganje okvar zaradi strokovnega vzdrževanja servisnega podjetja in zaradi visoke kakovosti pralnega stroja

ne deloma da

vv. Prilagodljivost – nisem vezan na lastništvo

ne deloma da

tt. Vtis na druge - ljudje bi me zaradi tega občudovali

ne deloma da

Možnost druženja z drugimi
ne deloma da

xx. Nekaj drugega.....vpišite tukaj:

ne deloma da

XIX. Obnovljen in predelan pralni stroj Obnovljen in predelan pralni stroj je rabljen pralni stroj, ki se predela tako, da je kot nov, tako da se glavni sestavni deli izdelka razstavijo, očistijo in zamenjajo ter nato ponovno sestavijo in preizkusijo. Deluje enako (z enako porabo električne energije in vode) in je enako kakovosten ali boljši kot nov izdelek. Pri predelavi je potrebnih več opravil, uporablja pa se več novih delov.

13. Imate izkušnje z obnovljenim in/ali predelanim izdelkom, predvsem kar zadeva gospodinjske aparate in elektroniko?
Ne Da

14. Kaj menite o obnovljenih in predelanih pralnih strojih?

- q) Obnovljen/predelan stroj je zame enak novemu
5) Nikakor se ne strinjam.....5) Povsem se strinjam
- r) Nakup obnovljenega/predelanega pralnega stroja pripomore k manjši porabi omejenih virov
5) Nikakor se ne strinjam.....5) Povsem se strinjam
- s) Nakup obnovljenega/predelanega pralnega stroja lahko zmanjša škodljive vplive na okolje.
5) Nikakor se ne strinjam.....5) Povsem se strinjam
- t) Skrbi me, da bi obnovljen/predelan pralni stroj deloval slabše delovanje novih
5) Nikakor se ne strinjam.....5) Povsem se strinjam
- q) Skrbi me zanesljivost pralnega stroja po koncu garancijskega obdobja
1) Nikakor se ne strinjam5) Povsem se strinjam
- r) Skrbi me higiena obnovljenega/predelanega pralnega stroja
5) Nikakor se ne strinjam..... 5) Povsem se strinjam
- s) Pri odločitvi za nakup predelanega pralnega stroja je bistven ugled blagovne znamke
5) Nikakor se ne strinjam..... 5) Povsem se strinjam

Spodnje kartice (profili izdelkov) predstavljajo različne možnosti pranja. Kartice razvrstite po želji (povlecite jih z miško in jih spustite v desno polje). Najprimernejša (najbolj zaželena) možnost pranja bo na vrhu vašega seznama, najmanj ustreza pa na dnu.

Cena za en cikel pranja

€ _____ € _____ € _____

trajanje veljavnosti pogodbe

prilagodljivo (mesečno) letno dolgoročno (5 let)

stanje pralnega stroja

Nov	Kot nov (približno 5 let)	Ponovno uporabljen (približno 10 let)
-----	---------------------------	---------------------------------------

servisna odzivnost

V enem dnevu	V 4 dneh	V 1 tednu
--------------	----------	-----------

način plačevanja

Predplačilo (in plačilo preostalega zneska)	Po obračunu	Takojšnje (neposredno po pranju)
---	-------------	----------------------------------

XX. Vaš idealen pralni stroj?
(navedite stopnjo strinjanja z navedenimi izjavami)

21. Želim pralni stroj, ki:

ll) je zanesljiv in trajen, da bo vzdržal dlje
1 (sploh ne).....5 (seveda)

mm) je pameten in povezan z internetom, da lahko pranje upravljam in spremljam po spletu
1 (sploh ne).....5 (seveda)

qq) mi vnaprej pove, če je treba kaj očistiti ali popraviti
1 (sploh ne).....5 (seveda)

rr) deluje prek mojega osebnega profila in mi zato priporoči, kako in kdaj naj perem (za optimizacijo porabe vode, energije in detergentov)
1 (sploh ne).....5 (seveda)

pp) ga ponudnik storitev nadgrajuje, tako da je ves čas posodobljen
1 (sploh ne).....5 (seveda)

tt) samodejno odmerja detergent(pralni stroji s samodejnim odmerjanjem stehtajo oblačila v bobnu in samodejno nastavijo ustrezno količino detergenta)
1 (sploh ne).....5 (seveda)

uu) ima povezavo s spletnim koledarjem
1 (sploh ne).....5 (seveda)

ss) omogoča spletno strokovno svetovanje (na voljo 24 ur/7 dni na teden – vodnik, videoposnetki itd.)
1 (sploh ne).....5 (seveda)

ww) me obvešča o porabi energije in vode
1 (sploh ne).....5 (seveda)

xx) me obvešča o ceni pranja
1 (sploh ne).....5 (seveda)

22. Ali po vašem mnenju pri sprejemanju in nakupovanju novih izdelkov ter sprejemanju novih trendov nasploh spadate med:

- e) inovatorje b) tiste, ki se zgodaj priključijo c) tiste, ki se zgodaj priključijo večini
d) tiste, ki se pozno priključijo večini e) zamudnike

23. Ste po vašem mnenju eko-prijatelj, eko-ljubitelj ali celo eko-promotor?

1 (sploh ne).....5 (seveda)

24. Kako je z lastništvom in nakupom pralnega stroja, ki ga uporabljate?

- ö) Kupil/dobil sem ga sam (smo ga, če ste v paru ali družini)
dd) Zakupil(i)/kupil(i) sem/smo ga na kredit (celoten znesek bom(o) plačal(i) postopoma)
ee) Najel(i) sem/smo ga (pogodba za določen čas)
ff) Pralni stroj uporabljam(o) v svojem/našem stanovanju, vendar je v lasti najemodajalca
gg) Pralni stroj uporabljam(o) v svoji hiši ali stanovanju (t.i. delitvena uporaba), vendar ni naš in za uporabo plačujem(o)
hh) Uporabljam(o) pralnico v mestu
ii) Drugo... vpišite, kako:

25. Kako pogosto perete perilo?

- q) Manj kot enkrat na teden
r) Enkrat do dvakrat na teden
s) Trikrat do štirikrat na teden
t) Več kot štirikrat na teden

Vaša starostna skupina:

- 18–23 24–30 31–40 41–50 51–60 60
ali več

Vaša izobrazba:



Vaš trenutni kraj bivanja:

Vas

majhno mesto

veliko mesto

Vaš status:

Živim sam

Živim s partnerjem brez otrok

Živim s partnerjem z 1–2 otrokoma

Živim s partnerjem s 3 ali več otroki

Živim s starši in/ali starimi starši (2–3 osebe)

Živim s starši in/ali starimi starši (več kot 3 osebe)

Živim s prijatelji/sošolci/sodelavci

Drugo:

Vaše življenjske razmere:

Živim v zasebni hiši/koči

Živim v stanovanju (večstanovanjska hiša)

Drugo:.....

Vaša dohodkovna skupina (xxx/osebo):

Appendix 4: Additional data from pilot survey for Gorenje

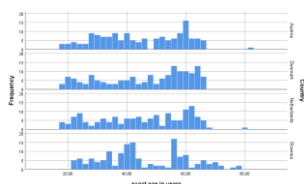


Figure: age structure for each country

	Austria	Denmark	NL	Slovenia	Total
alone	21.90%	36.00%	23.80%	9.90%	23.10%
partner without children	41.30%	30.40%	35.10%	29.80%	34.10%
partner with 1-2 children	25.80%	16.10%	19.20%	39.70%	25.10%
partner with 3 and more children	2.60%	6.80%	11.90%	2.00%	5.80%
parents and/or grandparents (2-3 persons)	3.20%	5.00%	4.60%	7.30%	5.00%
parents and/or grandparents (more than 3 pers.)	1.30%	2.50%	0.70%	7.90%	3.10%
friends/ schoolmates/colleagues	2.60%	1.90%	1.30%	1.30%	1.80%
other	1.30%	1.20%	3.30%	2.00%	1.90%

Table: living conditions

Renting	Austria	Denmark	The Netherlands	Slovenia	Total
No experience	52.5%	54.3%	52.9%	50.9%	52.7%
I did it once or twice	39.5%	39.3%	40.1%	42.8%	40.4%
often	8.0%	6.4%	7.0%	6.3%	6.9%
Pay per use					
No experience	73.5%	60.3%	61.9%	50.3%	61.6%
I did it once or twice	22.8%	33.3%	29.0%	45.2%	32.6%
often	3.7%	6.3%	9.0%	4.5%	5.9%
Collaborative consumption					
No experience	78.9%	68.4%	66.0%	72.2%	71.3%
I did it once or twice	14.9%	22.4%	23.1%	24.1%	21.1%
often	6.2%	9.2%	10.9%	3.8%	7.6%

Table: Experience with access-based consumption

		New product approach	Ecofriend	Washing frequency	Education	Location	Income	Gender
Renting	Spearman rho	-.185**	.142**	.142**	.122**	.084*	.133**	-.106**
Pay per use	Spearman rho	-.199**	.224**	0.078	.146**	.141**	0.068	-0.046
Co. con.	Spearman rho	-.245**	.198**	-0.022	.124**	.103*	0.024	-0.031

** Correlation is significant at the 0.01 level (2-tailed), * Correlation is significant at the 0.05 level (2-tailed).

Table: Experience with access-based consumption related to consumers characteristics

	owning pref.	provider knows too much	Insuff. data protection	more expensi.	missing knowledge	anxiety	financial liability	other
New product app.	0.047	-0.048	-0.051	0.009	0.051	-0.035	-0.034	-0.017
Eco-friends	-.128**	0.04	0.064	-0.018	-0.038	0.011	-0.002	0.027
Washing freq.	.111**	0.004	0.025	-0.013	0.018	-0.016	0.014	-.119**
Age	0.028	0.052	0.025	.116**	.100*	0.041	0.03	-.121**
Edu.	-.103*	-0.022	0.02	0.03	-0.048	-0.053	-.086*	0.035
Location	-0.035	0.04	0.007	0.042	-0.009	-0.039	-0.044	0.02
Income	0.009	-0.043	-0.067	0.063	0.053	-0.063	-0.052	-0.025
Gender	0.052	-0.071	-0.009	-0.008	0.039	0.054	.090*	-0.033
WM owners	.196**	0.047	0.054	.130**	.091*	-0.011	0.049	-.197**

Table: pay per wash - rank correlations between barriers and consumers characteristics

	reman valued as new	resources protection	less enviro. Impact	reman is inferior	reliability problems	concern about hygiene	brand reputation essential
New product app.	0.059	.083*	0.023	0.004	0.02	0.05	.107**
Eco-friends	-0.041	-.216**	-.167**	0.029	-0.047	-0.053	-0.076
Washing freq.	-0.01	0.007	0.015	-0.016	-0.074	0.044	0.028
Age	-.132**	-0.074	-.107**	-.095*	-.108**	-.088*	-0.079

circular business models

Edu.	.104**	-0.053	-0.016	0.037	.093*	-0.028	0.015
Location	0.005	-0.051	-0.03	-0.007	0.029	0.013	-0.055
Income	0.019	-0.006	-0.001	-0.06	0.045	0.015	-0.022
Gender	0.031	0.029	0.028	0.007	-0.03	-0.033	0.07
WM owners	-0.034	-.115**	-.103*	-0.053	-0.06	-0.001	0.005

Table: rank correlations between the approach to reman product and consumers characteristics

	New product app.	Eco-friends	Washing freq.	Age	Edu.	Location	Income	Gender	WM owners
robust WM	-0.023	-0.059	-0.026	-.174**	0.003	0.03	0.021	-0.017	-.245**
smart/online control	-0.079	0.026	-0.023	-0.078	0.052	0.042	0.018	0.049	-.101*
cleaning/repair warning	0.066	-.103*	-0.074	0.001	0.056	-0.047	-0.048	-0.038	-0.054
personalised recommendation	0.043	-0.038	0.035	-.086*	0.031	-0.008	-0.026	0.042	-0.033
upgrading up to date	0.047	-.087*	-0.04	-0.066	0.053	0.007	-0.047	-0.001	0.008
autodosing	0.045	-.125**	-0.033	-0.047	0.015	-0.043	-0.008	-0.023	-0.073
online calendar	-0.056	0.068	-0.033	-.105**	.082*	0.019	0.064	-0.008	-.082*
online expert advice	0.062	0.015	-0.058	-0.057	0.029	0.034	0.02	0.004	-0.051
energy/water consumption info	0.068	-.156**	0.004	-0.025	-0.028	0.021	0.041	-.081*	-0.003
price of washing cycle info	0.063	-.165**	0.005	-0.056	-0.013	0.001	0.007	-0.039	-0.033

Table: rank correlations between requirements for ideal washing machine and consumers characteristics

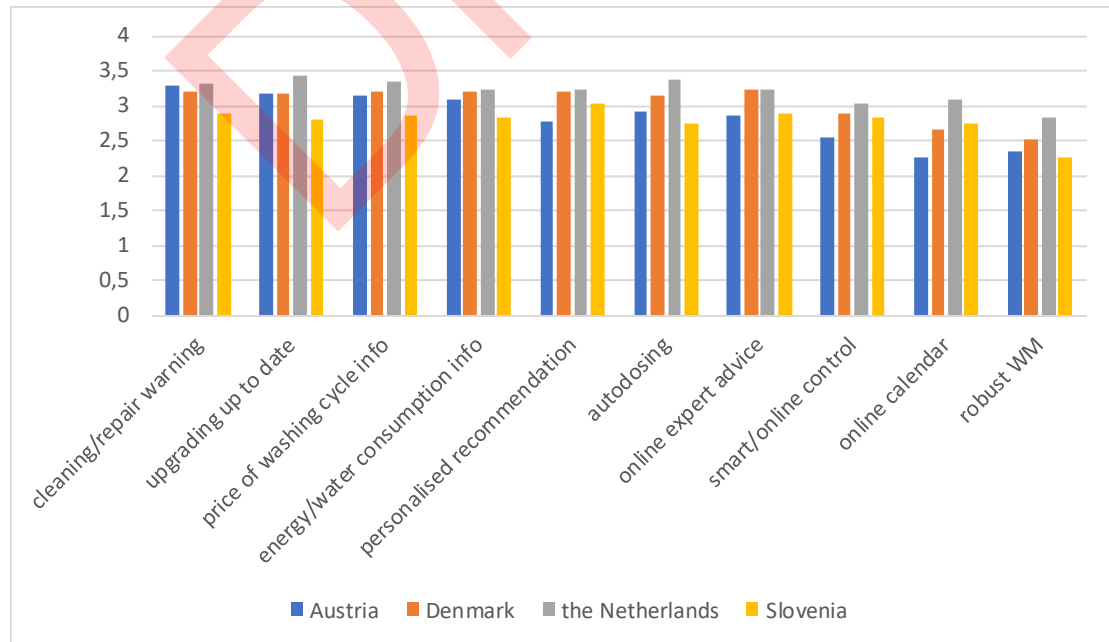


Figure: The ideal washing machine in the view of four countries

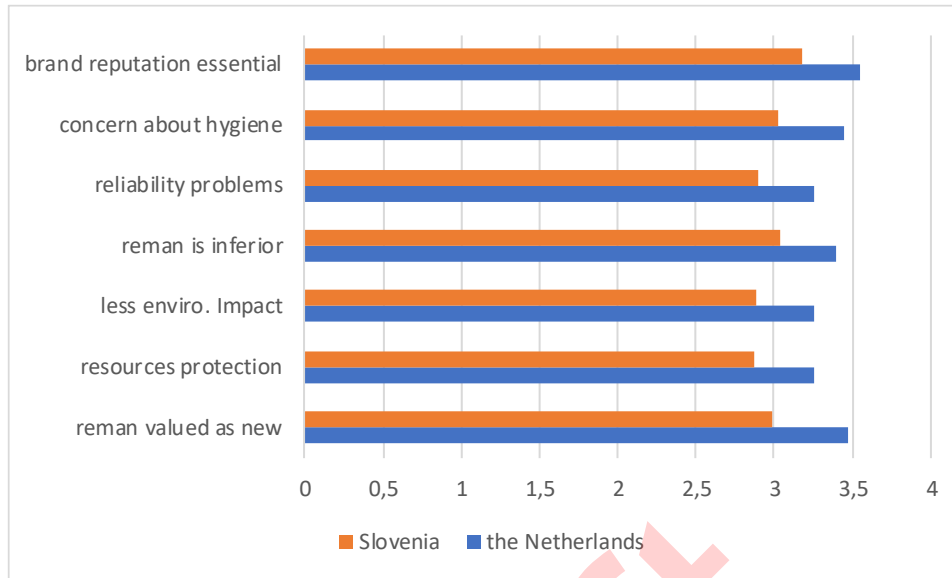


Figure: perception of remanufacturing/refurbishing in the Netherlands and Slovenia

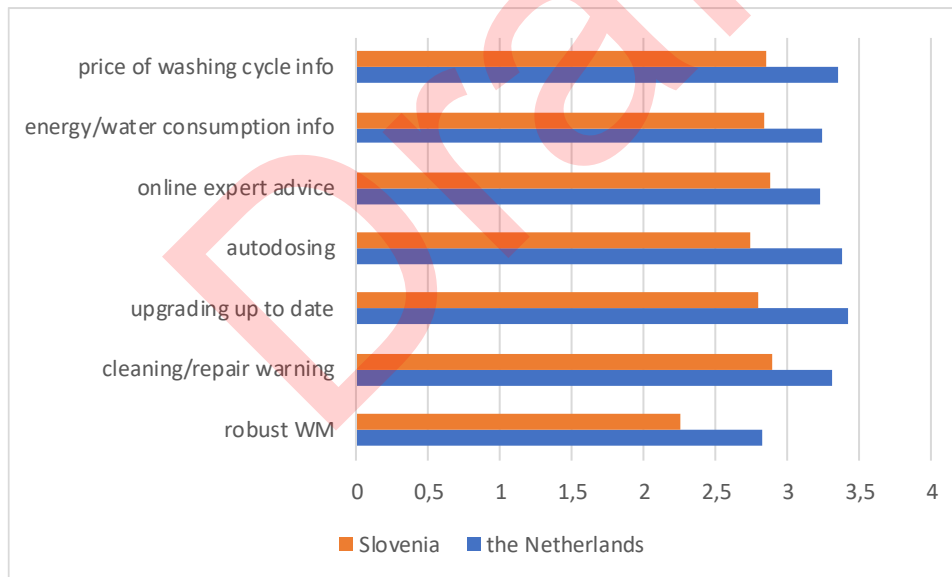


Figure: perception of ideal washing machine in the Netherlands and Slovenia

```

CONJOINT PLAN=profiles.sav'
/SEQUENCE=CA1 TO CA11
/SUBJECT=IDorder
/FACTORS= contract (LINEAR LESS)
MWstatus (discrete)
payment (DISCRETE)
Price (LINEAR LESS)
/PRINT=SUMMARYONLY
/UTILITY='Utility.sav'
/plot= all.
    
```

Table: Original conjoint model (script in IBM SPSS)

Profile 1	Vertragslaufzeit: monatlich; Waschmaschinenzustand: wie neu (ca. 5 Jahre); Abrechnungsschema: online - sofort (direkt nach dem Waschen); 1 Euro Preis für einen Waschgang
Profile 2	Vertragslaufzeit: jährlich; Waschmaschinenzustand: wiederverwendet (gebraucht) (ca. 10 Jahre); Abrechnungsschema: online - sofort (direkt nach dem Waschen); 0,40 Euro Preis für einen Waschgang
Profile 3	Vertragslaufzeit: monatlich; Waschmaschinenzustand: wiederverwendet (gebraucht) (ca. 10 Jahre); Abrechnungsschema: nachberechnet; 0,80 Euro Preis für einen Waschgang
Profile 4	Vertragslaufzeit: 5 Jahre; Waschmaschinenzustand: wiederverwendet (gebraucht) (ca. 10 Jahre); Abrechnungsschema: online - sofort (direkt nach dem Waschen); 0,40 Euro Preis für einen Waschgang
Profile 5	Vertragslaufzeit: 5 Jahre Waschmaschinenzustand: neu Abrechnungsschema: online - sofort (direkt nach dem Waschen) 0,80 Euro Preis für einen Waschgang
Profile 6	Vertragslaufzeit: jährlich; Waschmaschinenzustand: wie neu (ca. 5 Jahre); Abrechnungsschema: vorausbezahlt (und den Rest bezahlen); 0,80 Euro Preis für einen Waschgang
Profile 7	Vertragslaufzeit: monatlich; Waschmaschinenzustand: neu; Abrechnungsschema: vorausbezahlt (und den Rest bezahlen); 0,40 Euro Preis für einen Waschgang
Profile 8	Vertragslaufzeit: jährlich; Waschmaschinenzustand: wiederverwendet (gebraucht) (ca. 10 Jahre); Abrechnungsschema: nachberechnet; 0,80 Euro Preis für einen Waschgang
Profile 9	Vertragslaufzeit: 5 Jahre; Waschmaschinenzustand: wie neu (ca. 5 Jahre); Abrechnungsschema: nachberechnet; 0,80 Euro Preis für einen Waschgang
Profile 10	Vertragslaufzeit: jährlich; Waschmaschinenzustand: neu; Abrechnungsschema: nachberechnet; 1 Euro Preis für einen Waschgang
Profile 11	Vertragslaufzeit: 5 Jahre; Waschmaschinenzustand: wiederverwendet (gebraucht) (ca. 10 Jahre); Abrechnungsschema: vorausbezahlt (und den Rest bezahlen); 1 Euro Preis für einen Waschgang

Table: Full list of profiles – example of Austrian survey

	monthly contract	yearly contract	5-year contract	New WM	As new WM	Reused WM	Pre-paid	Post-paid	Instant pay.	Price
CI 1	0.1424	0.5762	-0.7186	0.2797	-0.4657	0.1859	0.1893	-0.742	0.5528	-1.3945
CI 2	-0.2339	-0.3038	0.5376	0.6613	0.2688	-0.9301	-0.1317	0.5376	-0.4059	-0.1142
CI 3	2.1379	0.3027	-2.4406	0.272	-0.0651	-0.2069	-0.0345	-0.2222	0.2567	-0.2471
Total	0.452	0.252	-0.7041	0.3935	-0.1585	-0.235	0.0447	-0.2447	0.2	-0.7638

Table. Cluster centres – average part-worth utilities

	monthly contract	yearly contract	5-year contract	New WM	As new WM	Reused WM	Pre-paid	Post-paid	Instant payment	Price
Cluster 1	1,1313	0,87788	0,92786	0,94959	0,98063	0,95848	1,04092	0,94007	1,23564	1,30828
Cluster 2	1,18404	1,07783	1,07169	1,56346	1,15679	1,66979	1,17087	0,93773	1,07325	1,13704
Cluster 3	0,80141	0,93956	0,72335	0,97452	0,76052	0,98469	0,69705	0,70007	0,7326	0,78498

Table. Standard deviation in part-worth coefficients across clusters

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