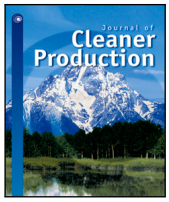
Journal of Cleaner Production 415 (2023) 137763

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro



Repair service convenience in a circular economy: The perspective of customers and repair companies

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ARTICLE INFO

Handling Editor: Govindan Kannan

Keywords:
Repair
Service convenience
Circular economy
Repair companies
Customers

ABSTRACT

Using repair services instead of new purchases creates local added value and contributes to a circular economy. The main aim of this research was to characterize repair service convenience for customers and to investigate ways to increase convenience to make repairs more attractive for customers, as the construct service convenience has neither been used nor adapted to a repair context until now. For this purpose, focus group interviews with potential customers of repair companies and interactive workshops with repair companies were conducted in the region of Styria (Austria). Findings state that a variety of factors like lack of information regarding repair services and product repairability, inconvenient store hours, or long waits reduce repair service convenience. However, due to skilled labor shortage, long delivery times of spare parts, or lacking financial resources for advertisements, repair companies can only partially improve convenience. Considering that, interventions from different actors, for example, the local government are needed as they can increase convenience by organizing awareness/information events, repair networks, or central repair-points. Hence, this study highlights once more the necessity to collaborate with different stakeholders (including customers, repair companies, local initiatives, and governments) to successfully transform the linear economy to a circular economy.

1. Introduction

Boosting demand for repair services not only leads to positive economic implications for repair companies but also has a positive impact on the environment (Boldoczki et al., 2020; Bovea et al., 2020). Repair is – among activities like 'recycling', 'refurbishing/remanufacturing', 'reusing/redistributing' and 'sharing' – also essential for a successful transformation towards a circular economy (Stahel, 2016), as this requires '…the strategy of keeping products and materials in use by prolonging their lifespan for as long as possible through designing for durability as well as maintenance and repair' (Ellen MacArthur Foundation, 2023).[1] Repair companies provide – as a possession processing service (Wirtz and Lovelock, 2015) – a service to return used products to working order (Thierry et al., 1995) and hence, are a foundation for effective circular economy activities (Stahel, 2016). In general, the behavior of users impacts the outcome of circular economy activities (like reuse or repair) (Parajuly et al., 2020), i.e. the acceptance of users regarding circular business models needs to be considered in research (Bressanelli et al., 2022). Most often a low consumer demand hinders the adoption of repair, remanufacturing or product-service systems (Muranko et al., 2019). Concerning repair Sonego et al. (2022) concluded in their literature review, that the percentage of consumers, who do not repair, is high. In addition, the role of consumers and consumer involvement in the context of the circular economy in general (Camacho-Otero et al., 2018) and also specifically for repair activities is often underestimated (Jaeger-Erben et al., 2021). Kirchherr et al. (2017) concluded in the course of the analysis of 114 circular economy definitions that most often 'consumers' and 'business models' are not outlined as enablers of the circular economy, even though both are key factors for a successful transformation. Hence, they developed a definition in which both aspects are specifically mentioned: *'A circular economy describes an economic system that is based on business models which replace the 'end-of-life' concept […] in production/distribution and consumption processes […]' (Kirchherr et al., 2017, p. 224)*. Until now only a small share of studies focused on the integration of users and the perspectives of consumers in a circular economy. This indicates that future research should focus on socio-material and cultural aspects

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[1] https://archive.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail

https://doi.org/10.1016/j.jclepro.2023.137763
Received 31 January 2023; Received in revised form 26 May 2023; Accepted 7 June 2023
Available online 9 June 2023

of consumption in the context of a circular economy and how to trigger change (Camacho-Otero et al., 2018). Regarding the change of consumer behavior, Wastling et al. (2018) argued that the design of products and services can also have an impact on user behavior in a circular economy. Analogously, the design of repair services needs to be analyzed.

1.1. The nature of (repair) services

Some key characteristics shape the nature of services in general and must be considered: services can be characterized by the variability of service quality, intangibility (i.e. it is difficult to evaluate repair services), the inseparability of production and consumption (i.e. repair services cannot be inventoried), and the importance of time (Wirtz and Lovelock, 2015). Especially concerning the importance of the time factor, service convenience plays a central role in service economies (Berry et al., 2002) and is critical for understanding and promoting demand. Service convenience refers to the consumers' time and effort perceptions concerning the service (Berry et al., 2002). The intention to have maintenance and to repair is influenced by these consumer perceptions and expectations about repair service convenience and repair service quality (Chang et al., 2013). A very convenient repair service is more attractive to consumers. Also engagement in the circular economy is (apart from price) driven by convenience (European Commission, 2018). Sabbaghi et al. (2016) tackled convenience for repairs with the overall question of the simplicity of repairing a product. Factors which reduce convenience – like unavailable and expensive spare parts, unavailable repair tools and manuals as well as time-consuming and complex repair processes – were considered. Having those factors in mind, it becomes clear that buying new products instead of repairing them is often more convenient: new purchases do not rely on spare parts, and often no waiting time occurs as compared to repair services. In addition, in comparison to purchasing a new product online it is necessary to visit a repair company during certain store hours, what also can reduce convenience (Berry et al., 2002). Thus, for improving the design of repair services the identification of the necessary service characteristics so that customers experience a high repair service convenience is essential in order to make the service more attractive and competitive compared to a new purchase.

1.2. Theoretical approaches to evaluate (repair) services

The most widely used service convenience scale was developed by Seiders et al. (2007) for traditional offline shopping: the SERVCON scale consists of a decision, access, transaction, benefit, and post-benefit convenience dimension, which were originally identified by the systematic literature research of Berry et al. (2002). The *decision convenience* refers to the decision whether to self-perform or purchase the service and which company to choose for the service (Berry et al., 2002). The decision whether to self-repair a product or to make use of a repair service is dependent on several factors, as for example the product type, required knowledge, skills, time, and effort (Terzioğlu, 2021). Also, the decision which repair shop to choose requires several convenience-related considerations, especially since there is a lack of repair offers (McCollough, 2010; Sabbaghi et al., 2017). Lack of information about the product failure (Pérez-Belis et al., 2017) can decrease repair decision convenience. *Access convenience* can be understood as the consumers' perceived required time and effort to request a service and to be available to receive it (Berry et al., 2002). The travel time is considered to be one crucial factor influencing the repair decision of consumers (Gerner and Bryant, 1980). Approaches that reduce the individual travel time of consumers, like a mobile acceptance point for various repair services (Forschungsforum, 2008) or remote diagnosis (Moeseke et al., 2022), could increase access convenience. This is made possible by the fact that for many product repairs customers do not need to be present during the repair. Hence, it is not necessary to synchronize the consumers' and the services' availability (Berry et al., 2002). In contrast, service convenience might increase especially for huge consumer products like washing machines if repair technicians repair the product at a consumer's residence. The consumers' perceived time and effort to make sure to have the right to use the service is defined as *transaction convenience* and the *benefit convenience* can be explained as the perceived time and effort of consumers to experience the core benefits of a service (Berry et al., 2002). One factor discussed in the repair literature which is mostly representing benefit convenience is the waiting time (McCollough, 2019). For repairing products, it is necessary to hand the product over to a repair shop for a longer period to fix it. Hence, the product cannot be used in that period, i.e customers need to find replacements or alternative solutions during repair time (Svensson-Hoglund et al., 2021). Considering products of daily life like a mobile phone or a laptop, the waiting time is especially crucial since those product types are typically used several times a day. The *post-benefit* convenience is the consumers' (perceived) time and effort when re-initiating contact due to service failure, maintenance, or exchange (Berry et al., 2002).

Beyond that, service convenience is a context-based concept. The perceptions of consumers regarding convenience aspects can vary depending on different settings (Jiang et al., 2013). The initial offline shopping-focused SERVCON scale (Seiders et al., 2007) has so far been adapted to contexts like self-collection (Wang et al., 2019), e-commerce (Lai et al., 2014; Stephens and McGowan, 2015), or commercial banks (Kaura, 2013). To the best of our knowledge, the construct service convenience and the SERVCON scale have neither been used nor adapted to a repair context until now. In comparison to traditional retail shopping experiences, the costumer's own product is brought to the repairer and at the end of the service the customer receives the same product. Therefore, in contrast to purchasing new products it is not possible to generate a positive shopping and service experience by new trends or sensory stimulation (Roozen and Katidis, 2019). Hence, in comparison to traditional offline shopping other or additional convenience aspects might play a central role in the repair context. Especially to increase repair demand, knowledge about characteristics of repair service convenience can be used for identifying existing strengths and weaknesses of repair services. This all leads to the first research question:

> **Research Question 1** (RQ1): What are the main characteristics of repair service convenience and strengths/weaknesses of repair services in terms of their convenience?

Altogether, the perception of consumers' service convenience is (among others) influenced by the service characteristics, the individual consumer differences, and firm-related factors (Berry et al., 2002). Especially the repair industry is dominated by small and medium-sized enterprises (SMEs) (Eurostat, 2019) with limited financial resources and number of workers. In that context, one might ask whether repair companies or more specifically SMEs in the repair industry, have and can provide the required infrastructure to ensure a satisfying and convenient service experience for consumers. For instance, in some situations a reduction of the waiting time could be achieved by hiring additional employees, however, it is questionable whether this is financially possible for an SME. Similar considerations apply to convenient locations and store hours. In addition to barriers that arise due to company size, repair companies face many challenges which are only marginally controllable by the repair companies and also limit repair convenience: lack of spare parts or repair tools (Sabbaghi et al., 2017; Tecchio et al., 2019) and high costs of spare parts (King et al., 2006), the presence of products which are non-repairable due to design reasons (Raihanian Mashhadi et al., 2016; McCollough, 2019), shortage of skilled workers (European Labour Authority, 2021), or decreasing prices and easy access to new products (Guiltinan, 2009; King et al.,

2006). All those considerations lead to the second research question examined in this study:

> **Research Question 2** (RQ2): (How) Can small and medium-sized repair companies meet the customers' requirements for high repair service convenience?

To sum up, the overall aim of this study is to characterize repair service convenience for consumers and to investigate ways to increase repair service convenience in the repair business-to-consumer context. To achieve this objective, the characteristics of repair service convenience and strengths/weaknesses of repair services in terms of their convenience are explored and the repair company's potential to meet the customers' requirements for high repair service convenience are identified. The remainder of the article is structured as follows: in Section 2, the research design and methods (focus group interviews and interactive workshops) are described in detail. The results are presented in Section 3, and in Section 4 the results are discussed. Conclusions, limitations and future research opportunities are outlined in Section 5.

2. Research design

According to the exploratory nature of the research questions, qualitative methods were chosen in this study. The different conducted steps and methods in this study are summarized in Fig. 1. First, focus group interviews with (potential) customers of repair companies (in the following referred to as "CustomerF") were conducted to identify characteristics of repair service convenience and existing strengths and weaknesses of repair services related to convenience (to tackle RQ1). Focus group interviews were conducted to evaluate experiences of potential customers with the help of a questionnaire guideline and by engaging discussions (Döring and Bortz, 2016). Second, interactive workshops with repair company owners (in the following referred to as "CompanyW") were organized, in which on the one hand the results of the focus group interviews with customers were presented, and on the other hand possibilities to increase convenience and to eliminate existing weaknesses were discussed. In that context also existing barriers that prevent an increase in repair service convenience were identified (to analyze RQ2). An interactive workshop environment was chosen to create a setting that is not tied to a questionnaire guideline, which should facilitate a broader discussion and should encourage participants to develop ideas.

In the course of this study, repairs of consumer products are considered. Consumer products are for instance smartphones, laptops, shoes, bags, clothes, or coffee machines. The repair process is very similar for all these products: first, customers have to take their broken product to a repair company, second, the product is repaired at the repair company and third, the customer picks up the repaired product again. Since the process is similar for all these different product groups, it can be argued that similar repair service convenience aspects are relevant for all those different product types. On the contrary, the repair service process of bigger consumer products (like washing machines) could differ since those bigger products are not easily transportable. In the case of washing machine repairs, the technician usually comes to the customer's home and repairs the product there. Since the repair process is different in this case, it can be assumed that the repair service convenience also differs. For this reason, in this study, repair service convenience was characterized only for repair services that take place at the repair facility on site, to use this characterization as a starting point. Future research can also look at the case of repairs where the technician comes to the customer's home.

All focus group interviews and interactive workshops were conducted in the region of Styria, a state of Austria. In Austria there is a growing focus on repairs. In April 2022, for instance, an Austria-wide funding for the repair of electrical products was introduced, which allows customers to get a repair funding (50% of the repair price) in over 3000 repair companies in Austria (BMK, 2022). In the year 2022 this repair funding was used by customers over 350,000 times (Kurier, 2023). The capital of Styria, Graz, also took measures to increase repair demand some years ago: a repair network was introduced and a repair funding scheme was implemented (Lechner et al., 2021). The repair network in Graz consists of 60 companies that offer repairs in the areas of IT, textiles, bicycles, household appliances, jewelry, furniture, and garden tools (GRAZ repariert, 2020). The funding scheme in Graz existed between November 2016 and April 2022. It granted an amount of 50% of the repair costs per household and calendar year up to a maximum sum of 100 Euro. In total, more than 13,000 subsidies were granted in Graz (Axmann, 2022). In addition, repair cafés take place regularly in Styria (Nachhaltig in Graz, 2021) and the local government of Graz also supports repair cafés financially. Voluntary, community repair initiatives, such as repair cafés, can claim an annual subsidy of up to 1200 Euro for tools or room rent for their activities (Stadt Graz, 2022b). Moreover, 'repair days' to raise awareness and to provide information are organized periodically (Stadt Graz, 2022a). The region of Styria is therefore a suitable place for this study. Still, there is a large upward potential to increase repair demand despite the good framework conditions (Fachbach et al., 2022). Insights of why many people in the region of Styria still often decide against repairs, can be used to improve existing and to design new measures in this and other areas.

In Sections 2.1 and 2.2 the two different steps (CustomerF and CompanyW) are explained in detail. Section 2.3 describes the data analysis process of the focus group interviews and interactive workshops.

2.1. Focus group interviews with (potential) customers of repair companies

To answer RQ1, nine focus group interviews with potential customers of repair companies were conducted. The flexibility of focus group interviews is considered to be effective for identifying diverse experiences and opinions on the repair topic. It is also useful for engaging discussions, brainstorming, and gaining more information than in traditional surveys (Döring and Bortz, 2016). The in-depth focus group interviews with potential customers in the region of Styria were held between May and October 2021. Each focus group interview had between three to six participants. Different locations in the region of Styria were chosen to guarantee a variety of participants living in urban and rural areas. Thus, the focus group interviews took place at the University of Graz (6x), the Montanuniversität Leoben (1x), the community hall in Gleisdorf (1x) and the community hall in Ludersdorf-Wilfersdorf (1x). The participants were selected to ensure diversity of interviewees in terms of demographic (age, gender, and residence) and repair experiences to foster discussions. Participants who repeatedly repair things themselves and/or have used a repair service more than once were characterized as having a higher level of repair experience. Persons who have used a repair service less than twice and who do not repair much themselves were characterized as having a lower level of repair experience. Of course, also the willingness of interviewees to participate in an one-hour session was the main selection criteria. It was additionally stimulated by giving participants the possibility to take part in a prize draw contest. Table 1 describes the participants in more detail. It was ensured, that the atmosphere was relaxing and pleasant by starting with small talk and a round of introductions at the beginning. A question guideline was prepared which was marginally adapted and improved after every focus group interview. As part of a pre-test and before the first focus group interview took place, these questions were presented to six Styrian citizens to check whether the questions are understandable. Questions primarily addressed the participants' experiences with repair services. The moderator made sure to ask about the satisfaction of the customers in every service stage starting from the pre-purchase, to the service encounter and finally the post-encounter stage (Wirtz and Lovelock, 2015). Since service convenience is related with all steps of the service process, this open formulation of questions

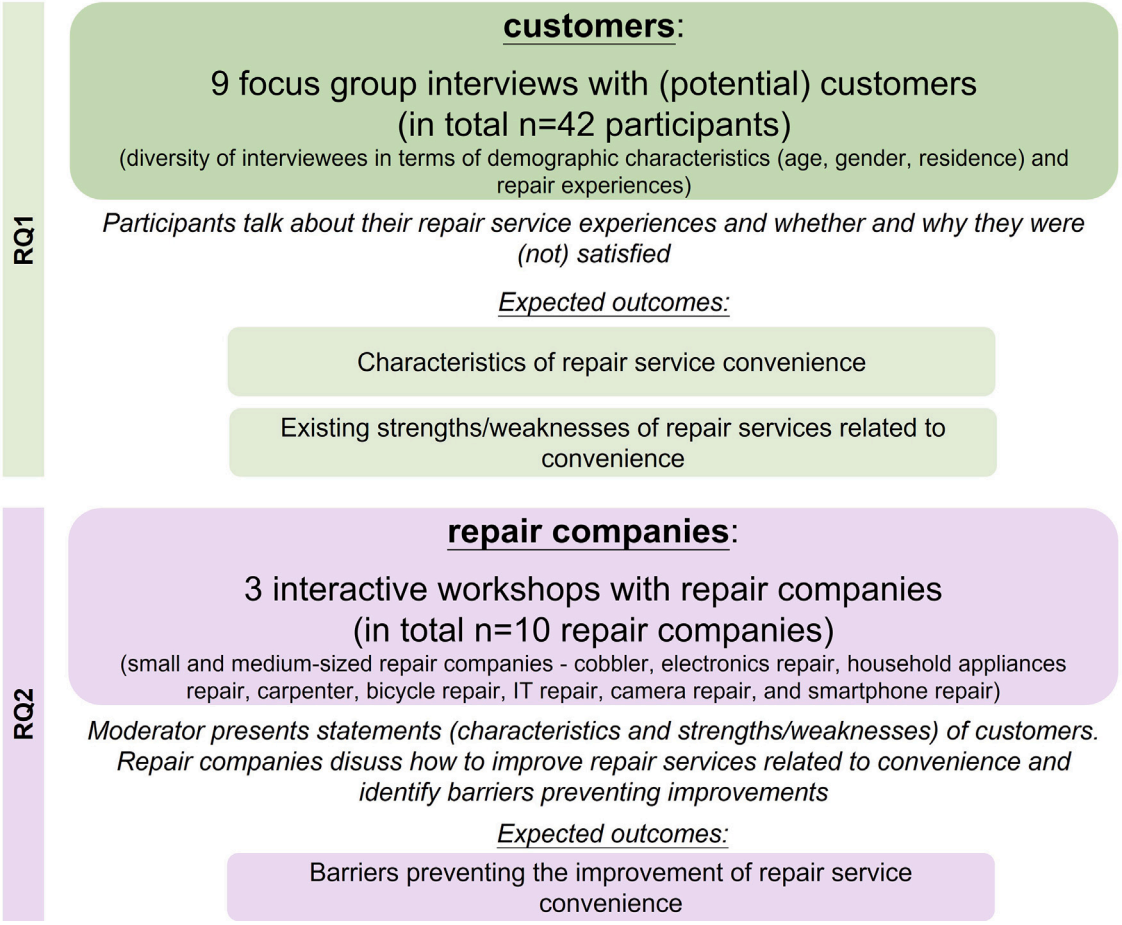

Fig. 1. Research design.

was useful to stimulate discussions about weaknesses of repair services without asking directly about time and effort perceptions. With that approach a confirmation bias, which could occur if a moderator asks whether a certain aspect is important or not, can be avoided. Hence, convenience aspects were raised and discussed by the participants and can thus be identified as being relevant. All customer focus group interviews took approximately 60 min. The focus group interviews were audio-recorded and conducted by the same researcher.

2.2. Interactive workshops with repair company owners

Three interactive workshops with repair company owners from different industries were conducted for analyzing RQ2. In these interactive workshops, the exploratory setting had the aim to evaluate the participants' opinions and experiences. Since during the interactive workshops there was no questionnaire guideline, the setting facilitated broader discussions and idea development. Moreover, the aim was to solve problems about repair service convenience in this interactive environment. Companies that are part of the repair network of Graz were asked to participate. Those repair companies are SMEs which are of interest in this study. Participants were selected to represent a wide variety of industries since repair services might differ depending on the repaired product type. Contributors of the first company interactive workshop (CompanyW1) were representatives of a cobbler, an electronics repairer, a household appliances repairer, and a carpenter. Also an organizer from a repair café participated, because some solutions adopted in repair cafés could also be replicated in repair companies. In the second interactive workshop (CompanyW2) representatives of household appliances repair and bicycle repair, and in the third interactive workshop (CompanyW3) representatives of smartphone repair, IT repair, and clock repair participated. Details about the participating repair companies are presented in Table 2. All these interactive workshops took place between November 2021 and February 2022, each of them lasted about 2.5 h. Two interactive workshops (CompanyW1 and CompanyW2) took place at the University of Graz and one interactive workshop (CompanyW3) was held (due to Covid-19-restrictions) online. Before the interactive workshop participants were informed about the agenda, i.e. about the presentation of research results of potential customers of repair companies and about the joint brainstorming and idea generation to improve repair services. Similar to the focus group interviews it was ensured that the atmosphere was relaxing by starting with small talk and rounds of introduction. During the interactive workshop, first repair service convenience characteristics, strengths/weaknesses of repair services related to convenience, and possible interventions (based on the customer focus group interviews) were presented by the moderator. Second, based on the presentation of the customer wishes, repair company owners (1) talked about their own experiences (related to convenience); (2) argued how they implemented or could implement certain customer requirements; and (3) reasoned why certain convenience-related customer wishes cannot be implemented in their repair company. Since there was no question guideline, the moderator ensured that everyone got a chance to speak and that the goal of the workshop is achieved. All interactive workshops were moderated by the same researcher. The topics discussed arose on the one hand from the presentation of the customer results and on the other hand on the basis of the discussions/topics raised from the participants in the workshop. In order to facilitate a post-workshop analysis, the workshop was audio-recorded.

Table 1
Overview of focus group interviews and participants.

	Date	Location	Age range	Gender split (female:male)	Repair experiences (high:low)	Occupation
CustomerF1	17/05/2021	Graz	25–61	1:4	2:3	Retiree (1), lawyer (1), shop owner (1), student (2)
CustomerF2	20/05/2021	Graz	20–80	2:1	1:2	Retiree (1), unemployed (1), student (1)
CustomerF3	26/05/2021	Graz	24–50	2:2	2:2	Dance instructor (1), office worker (2),student (1)
CustomerF4	24/09/2021	Graz	22–40	1:4	1:4	Student (2), researcher (2), software engineer (1)
CustomerF5	30/09/2021	Gleisdorf	22–40	3:2	2:3	Vocational teacher – gardening/office/ workshop (3), retiree (1), software engineer (2)
CustomerF6	01/10/2021	Ludersdorf	20–55	3:3	2:4	Surveyor (1), psychologist (1), salesperson (1), office worker (1), production worker (1), teacher (1)
CustomerF7	07/10/2021	Leoben	24–27	1:3	1:3	Student (4)
CustomerF8	08/10/2021	Graz	24–30	4:2	1:5	Waiter (1), nurse (1), policeman (1), graphic designer (1), student (1), research (1)
CustomerF9	15/10/2021	Graz	19–31	2:2	1:3	Researcher (2), student (2)

Table 2
Overview of repair companies.

	Date	Type of repair company	Amount of workers
CompanyW1	05/11/2021	Cobbler	48 workers
		Electronics repair	2 workers
		Household appliance repair	22 workers
		Carpenter	1 worker
CompanyW2	02/02/2022	Household appliances repair	36 workers
		Bicycle repair	1 worker
CompanyW3	23/02/2022	Smartphone repair	5 workers
		IT repair	1 worker
		Clock repair	3 workers

2.3. Data analysis

The language in all settings was German, and hence the transcripts were translated into English. To minimize translation bias the transcripts were then again backward-translated into German. The transcripts were coded and analyzed with MAXQDA (MAXQDA, 2023). Content analysis, the organization of large textual data into several (smaller) content categories (Weber, 1990), was used, following a step-by-step approach of the qualitative content analysis method introduced by Mayring (2015). The categories were developed by using a mixture of deductive and inductive coding. Deductive coding (pattern matching) was used regarding the five different convenience dimensions and inductive (open) coding was applied for the specific repair characteristics regarding every convenience dimension (Saunders et al., 2009). Specifically the following approach was used for the transcripts of the focus group interviews with (potential) customers: first, by using an inductive approach separate convenience aspects (like 'information where to find repair services' or 'possibility to send products per mail') were coded, and second, these individual aspects were classified according to the five convenience dimensions of Berry et al. (2002). Also, identified weaknesses and strengths of repair services related to convenience were assigned to the respective convenience dimensions. The transcripts of the interactive workshops with repair company owners were coded based on the characteristics, weaknesses and strengths of repair services related to convenience identified by the customers. Hence, barriers were allocated to the identified characteristics and weaknesses/strengths of the consumer focus group interviews. The coding was performed by a lead coder. In regular meetings the codes were discussed and improved by the research team. In the end, all analyses were cross-checked by another coder to ensure validation. The stopping criterion was data saturation: after each focus group interview and interactive workshop, the transcripts were analyzed and the new codes were counted (Guest et al., 2016).

3. Results

In this section we present the results of the focus group interviews and the interactive workshops. Please note that the results are summarized in Table 3. In Section 3.1, 3.2, and 3.3 the results are explained in detail.

3.1. Characteristics of repair service convenience

That convenience plays a major role for repair services was clear as it was mentioned repeatedly across all focus group interviews: *"It is important for me, this [. . .] convenience in principle, how long is the product gone, can I maybe repair something myself, is there a loan device"* (CustomerF1,3).[2] In this context, all focus group interviews emphasized the

[2] CustomerFX,Y: CustomerF=Focus group interviews with (potential) customers, X=Focus group interview number, Y=Person in the focus group.

Table 3
Summary of results.

		Decision	Access	Benefit	Transaction	Postbenefit
RQ1 (based on focus group interviews with (potential) customers)	Characteristics of repair service convenience	• information where to find repair services and whether it will offer the customer's needs (transparency) • repairability and price information on the website, investigations via phone/Skype • trust-indicators (web-based reviews, certifications, recommendations, or design store/homepage)	• easy access (nearby stores of daily life, parking possibilities, access via public transport) • late store hours, open on Saturday • possibility to send products per mail/box outside company • common drop-off and pick-up point	• advice and explanations of direct contact person • regulatory updates of the repair process • waiting time • loan device	• uncomplicated and fast cost estimates and down payment	• guarantee for repairs
	Existing weaknesses	• lack of information about the repair service • lack of (cheap and fast) ways to investigate products' repairability • lack of advertisement	• high travel times (in rural areas) • inconvenient store hours	• negative perception of transparency • too long waiting times	• risk that cost estimate fees are paid for nothing	• guarantee for the repaired part of the product only
RQ2 (based on interactive workshops with repair companies)	Barriers against the improvement of repair service convenience	• there is no accurate repairability and cost information for every failure which could be placed on the website (warranty implication) • investigations via phone/Skype not always possible and non-billable • missing financial and time resources for advertisement	• lack of repairers (shortage of skilled workers), missing training and education • different product sizes (make 'box outside company' and 'sending products per mail' difficult) • skilled and trained employees need to receive product	• high delivery times for spare parts • loan device is not brought back/is broken after return/requires space etc.	• cost estimates are necessary • collaborations with repair cafès not efficiently possible	• guarantee for the whole product is too risky for the company

need to make it easier to use repair services. The particular importance of convenience in the context of repair services arises especially because the basic mood of consumers is one of annoyance: *"A repair is something annoying [. . .] it [the product] just does not work and you have to take care of it, but you have absolutely no time and no desire and mood, therefore I think it is important that it is very fast and very flexible"* (CustomerF9, 3). Customers do not use the service voluntarily but because a product has failed and an (unintended) action is required.

A lack of consumers' knowledge is most determinant for the repair service *decision* convenience. On the one hand, there is a lack of technical knowledge whether the product is repairable: *"The problem [...] is I don't know what the problem is [...] it could be some small defect [. . .] or something more major"* (CustomerF7,3). This lack of knowledge also explains consumers' upset mood about repairs: *"If one has no knowledge about the failure at all and is completely dependent [on the repair person] then this is a totally bad feeling [...] one feels always fooled, one does not know how much it will cost, etc".* (CustomerF4,3). Hence, *decision* convenience in the repair context is mostly characterized by existing information: information on where to find repair services and whether those repair services will offer the customer's needs and information about the repairability of the broken product. Moreover, one proposal of customers was to clearly indicate on the repair company's homepage what the types of failures of products are and whether it makes sense to make that repair. Additionally, the efforts of consumers to assess if they can trust a repair company is relevant for convenience of *decision*: *"It depends on how I evaluate the competency of the repair shop, I wouldn't give everything to everyone"* (CustomerF4,1). In that context, several strategies for evaluating whether you can trust a repair company were proposed like Google reviews, social media groups, word-of-mouth communication, own experiences, or certifications/authorizations of repair companies. Also, the importance of a trustworthy atmosphere and store design was mentioned. To increase trust in the repair service provider, social media advertisements that focus on the repairer (so that customers can get to know the repairer) were proposed.

For repair service *access* convenience, aspects being representative for this dimension are the preferred low traveling time to the repair shop, the accessibility by public transport, convenient parking options, and the location of repair companies nearby stores of daily life. Moreover, convenient store hours were mostly highlighted as a key aspect in focus group interviews with prospective customers. Participants suggested that long opening hours and opening hours also on Saturday would be helpful since those are times where most of the customers don't have to work by themselves: *"Saturday would be the smartest day [. . .] because it is often difficult during working hours"* (CustomerF8,4). Different solutions were proposed in the focus group interviews to tackle the problems related to inconvenient store hours: a common drop-off and pick-up place for several repair shops of different industries which has convenient store hours, is easily accessible, and has parking spaces; a box outside the repair shop where you can place and take the products independent of the store hours; or the possibility to send the products by mail.

Another aspect, which was named several times and can be related to *benefit* convenience is the possibility to easily get advice from the repair company: *"A good consultation [. . .] also explains a little bit so that you understand that as a layman"* (CustomerF8,4). Moreover, a direct contact person and transparency regarding the repair process, waiting time, repairability, and the functionality after repair were mentioned. A little waiting time (especially for daily-life products) was highlighted to be crucial: *"You have to go there, he has to have time for you, and he has to fix it, these are things you need every day if something is broken you buy something new quickly - it has to go fast"* (CustomerF6,5). Provision of loan facilities during long waiting periods has been proposed. Also, regulatory updates concerning the repair process and reliable phone calls in case of changing repair costs in conjunction with the option to waive the repair were discussed to be important during the focus group interviews. Some focus group participants argued that it is very important for them that only the necessary and commissioned repairs are carried out, while others stated that: *"When I bring it to the repair*

shop it should not only be repaired but also [. . .] the condition [of the product] should be evaluated, [. . .] perhaps preventively something could be repaired" (CustomerF7, 1).

Price transparency was identified related to the convenience of the *transaction*: *"So I really need to know in advance what the repair will cost [...] it must then also be transparent so that you can see what it will cost so that you don't have any surprises"* (CustomerF5,4). Especially fast and uncomplicated cost estimates and down payments are crucial.

The concept of *post-benefit* convenience also plays a key role in the repair decision, since: *"You always have a feeling that when it is repaired it is not new anymore, and not like new, so it is simply used and one is afraid that an error will occur again in the near future"* (CustomerF1,3). Especially a guarantee for repairs is relevant and can improve *post-benefit* convenience.

3.2. Existing weaknesses related to repair service convenience

Only one strength was mentioned during the focus group interviews with customers: due to small company sizes, customers have the advantage of a direct contact person which strengthens trust. However, since only one strength was mentioned in relation to convenience the following analysis focuses on the existing weaknesses.

Most participants argued that there is a high perceived risk that the repair service does not meet the customers' expectations. In addition, a lack of knowledge of existing repair companies and of the repair process was also present in all focus group interviews. In all focus group interviews there was, for instance, a lack of knowledge that repair companies very often offer repairs at home, even though this is a standard component of the service (GRAZ repariert, 2020). Additionally, lack of price knowledge is a factor that negatively impacts the convenience of the *decision*: *"I was now for the first time at a cobbler [. . .] I did not know if this will cost 10 Euros or 80 Euros, it costs 6 Euros"* (CustomerF5,3). Moreover, some participants associated "creepy" and small stores and annoyed staff with repair services: *"Yes, but the atmosphere has a negative touch [. . .] some people are already moaning into the phone 'what's wrong, 'ahh pff'"* (CustomerF6,3), *"It has to look serious [...] there are some really small stores that look a bit creepy"* (CustomerF4,2).

In addition, inconvenient store hours are mostly highlighted as a barrier in the context of *access* convenience: *"May make it more difficult to repair when you know you have to be at home and you might have to take vacation time for the service technician"* (CustomerF6,3). Moreover, since there is a small number of repair shops in rural areas compared with urban areas the traveling time to repair shops is perceived in those areas to be the main weakness.

The waiting time is crucial related to the *benefit* dimension and is mostly considered as being inconvenient. Excessive waiting times lead to a situation, in which people prefer to buy a new product: *"Well, if he says yes, I'll come and have a look at it once a week and I'll get back to you in a week, then I think to myself 'no, I don't need that'"* (CustomerF7,2). Moreover, mostly due to lack of knowledge there is a certain negative perception of customers towards repairers, as they can claim anything and the customer cannot verify it: *"So if you have absolutely no idea about what's wrong, then he can say anything is wrong [...] 'you have to change that', but maybe you don't have to change all that"* (CustomerF9,1).

Cost estimates are also mostly perceived as barrier against using repair services and affect *transaction* convenience negatively: *"You often pay only for the fact that they check whether the product can be repaired and then he says at the end 'it is broken we cannot repair it' [. . .] so you paid [...] for nothing"* (CustomerF9,1). Even if the repairer can repair the product, then, it was argued, there might still be the situation that the repair is too expensive and then one paid the fee for the cost estimate "for nothing".

Regarding *post-benefit* convenience there is only a guarantee for the repaired part of the product: *"I repair that and the next damage is something else, which could occur tomorrow. If I just buy a new I have a warranty"* (CustomerF8,3). Some respondents said that they would rather repair if they get a guarantee for the whole product and not only for the conducted repair and/or spare part which was used.

3.3. Barriers repair companies face when it comes to increasing repair service convenience

Based on customer preferences regarding the convenience of repair service, repair companies encounter difficulties in implementing all these aspects as they face a variety of barriers in this regard. Most barriers were identified in the context of decision and access convenience. However, certain barriers also exist in the other convenience dimensions.

According to repair companies, it is becoming increasingly important that the people who speak with customers on the phone have a good technical understanding: *"The customers want to know on the phone what is broken and what the repair will cost and in the worst case they send you a video with the noise [of the machine]"* (CompanyW1,2).[3] However, in that regard it was also highlighted that *"It's a waste of resources to have a technician who could be repairing products sitting by the phone for technical information"*, especially since there is a lack of repair workers (CompanyW2,2). In addition, it was argued that it is sometimes possible to make assessments based on the verbal description on the phone, however not always: *"Notebook display exchange, I get a call and the people say they have a broken display what are the costs to exchange that: That is just pure crystal ball"* (CompanyW2,2). Regarding the suggestion to make investigations by asking customers to send pictures, repair company owners argued that if customers send pictures with the request to get informed whether the product is repairable only rough estimations are possible. In addition, in some situations, photos do not work at all because, for instance, the cobbler argued that he needs to feel the shoes. One organizer of repair cafés stated that he sometimes makes investigations whether a product is repairable via Skype calls because this allows him to ask the owner of the product to go on the other side of the product or press a certain button. However, on the contrary to repair cafés where repairs are free of charge, for repair companies the problem arises that it is not possible to charge this Skype call to the customer, even though this call is time-consuming and the customer might not place a repair order after all. In that context it was stated that repair companies often face situations in which customers speak with them a long time for getting advice and in the end do not use the repair service: *"I have that often enough, though, that people talk to me for 15 to 20 min on the phone [...] they just expect me to do it for free"* (CompanyW3,2). Repair company owners are aware of the customer wish to have information about the types of failure of product – and related repairability and repair costs – on the homepage of repair companies, however, they face the problem that if the information on the homepage is not correct for a special case, legal problems could arise. The weakness concerning the lack of information regarding the existence of repair companies was also mentioned by repair company owners: *"Exist now for 38 years or even longer but we have not really managed to find any advertising channel which can effectively call the customer's attention to us"* (CompanyW1,7). It was also highlighted by the repair companies, that their visibility has increased after the foundation of the repair network of Graz. Regarding advertisements, repair companies also mentioned that some original equipment manufacturers list them on their websites when they do warranty repairs for their products. There is also agreement among the participating repairers that Google Ads and social media advertising are very efficient, but also very time-consuming and expensive. The majority of repairers argued that this type of advertising does not pay off for their small and medium-sized businesses. On the contrary to the missing advertisement, repair company owners mentioned that there is a lot of information available on the Internet about how to repair products. This leads to several customer-related problems

[3] CompanyWX,Y: CompanyW=Interactive workshop with repair company owners, X=Interactive workshop number, Y=Person in the interactive workshop.

because customers think they know exactly what to do and how much it should cost at maximum: *"On the Internet, it is simply communicated that you can do everything yourself [. . .] there are so many tips and hints [..] and then the customer says that he knows what happened anyway or what to do and he says that therefore this 'cannot cost much'"* (CompanyW1,7).

The fact that convenient store hours attract more customers was also confirmed by some repair stores as they argued that they do not go on vacation on days on which most of the other Austrian citizens do not have to work because those are the most beneficial days. However, providing longer and/or more convenient store hours has several underlying difficulties: *"You then have the problem that everyone [employees] only wants to work four days and not on Fridays anyway"* (CompanyW1,3). There is a shortage of skilled workers in the repair industry, what is even exacerbated by the fact that suitable apprenticeships exist in only a few repair fields. Tackling the problem of inconvenient store hours with boxes outside the repair company or sending products per mail is only possible for some (smaller) product types and a liability problem arises if the product is damaged in that context. According to the company workshops, a common drop-off and pick-up place for several repair shops is almost impossible to implement due to the different procedures depending on the type of product and the fact that technical or specialized knowledge is required when receiving the product.

The weakness concerning the long waiting time cannot always be improved by repair companies because the waiting time is not always within the sphere of influence of the company: *"Difficult thing is just a bit we also suffer from the whole Covid there are certain spare parts with long delivery times"* (CompanyW1,2). A large number of different spare parts also prevents efficient stock management in this respect. Often a loan device which should be offered by repair companies was mentioned as a possible solution for long waiting times. However, it was stated by repair companies that they often did not get their loaners back and that regularly returned loan devices are dirty. In addition, customers often do not want to use a product which was already used by someone beforehand. Regarding loan devices, there is also a problem with a lack of space: *"My store has a size of 30 square meters. Every bike I have to store as a loan device takes away space for a bike I could repair and make a turnover with it"* (CompanyW2,1).

Concerning the problem of fees for cost estimates, a cooperation between repair cafés, who can make investigations free of charge, and repair companies might reduce this problem to a certain extent. This approach can also be used as an advertisement. However, since repair cafés in Graz only take place once a month this approach can contribute only partially to solve the problem.

Even though repaired products are not competitive compared with new products because new products feature a guarantee for the whole product, a guarantee for the whole product after repairs cannot be implemented because this is too risky for the repair company: *"It is not possible to give a guarantee for a more or less foreign product"* (CompanyW1,6).

4. Discussion

On the one hand, the importance of convenience within the repair decision was demonstrated in this study: it was addressed in all focus group interviews by the participants independent of moderator input, which also highlights the importance of considering customers' perceptions of service characteristics in a circular economy (Kirchherr et al., 2017). A central feature of repair services is that the decision to use the service follows a feeling of annoyance because the product suddenly became broken and now the action is necessary. This is a central difference to most retail services and to purchasing new products, as those situations are most often motivated by new trends or sensory stimulation, i.e. a positive feeling (Roozen and Katidis, 2019). Characteristics of repair service convenience could be allocated to the service convenience dimensions of Berry et al. (2002). This implies that the overarching dimensions are transferable to the repair context and only the individual items of the scale need to be adapted. Since the repair service process at the repair company for different product types is very similar, it was possible to characterize repair service convenience on a general level without a specific product focus.

According to the customer participants there are weaknesses, limitations and drawbacks of repair service convenience in all dimensions of service convenience:

- lack of advertisement as well as lack of (cheap and fast) ways to investigate products' repairability affect decision convenience negatively;
- inconvenient store hours impact access convenience negatively;
- long waiting times in comparison to a new purchase affect benefit convenience negatively;
- the necessity to charge cost estimates influences transaction convenience negatively;
- and the fact that a guarantee is only offered for the repaired part of the product, affects post-benefit convenience negatively.

A key finding that can be derived from all the partial results in Table 3 links several of those issues: lack of information, which induces great uncertainty associated with repair services. Several dimensions of uncertainty were identified like uncertainty about how much the repair will cost, whether the product can be repaired at all, whether the repairer can be trusted or whether the product will really work again after repair. Dimensions of uncertainty were also identified in other, previous repair studies: For instance, Pérez-Belis et al. (2017) found that more than 20% of the consumer participants did not have knowledge about the type of product failure and Sabbaghi et al. (2017) tackled uncertainty about repair labor cost. Uncertainty is a problem that is not only determinant for repair services but for almost all services since the concept of a service itself results in a variability of quality and intangibility (Wirtz and Lovelock, 2015). Furthermore, this uncertainty also has a significant impact on the return flow of a circular economy and thus, on the supply with returned products: uncertainty about whether one has access to spare parts, tools and information affects not only repairs (Sabbaghi et al., 2017), but also remanufacturing or refurbishing. There is, for instance, uncertainty about the availability of cores in remanufacturing (Goodall et al., 2014). Consumers also often decide against buying a remanufactured product because of the uncertainty about whether the product is equally good (Abbey et al., 2015). In addition there is a mistrust of consumers concerning second-hand equipment (Pérez-Belis et al., 2017). Especially in the context of right-to-repair movements, there are already approaches to help customers reduce this uncertainty, such as the French repair index for new products (Ministères Écologie Énergie Territoires, 2022), which aims to provide detailed information concerning the repairability of a product to customers through quantifying several dimensions related to repair. Repair networks which are supposed to guarantee certain quality standards (Lechner et al., 2021) also aim to reduce or eliminate this uncertainty since they act as trust-criteria similar as certifications or 'word of mouth' reputation (McCollough, 2009). In general, adopting a product design that emphasizes maintenance, modularity, and improved accessibility to spare parts can also reduce uncertainties related to repairs. For instance, Raihanian Mashhadi et al. (2016) discuss the relationship between product design features and repair convenience. By incorporating a modular design, components can be easily replaced or upgraded, streamlining the repair process. Moreover, ensuring better accessibility to spare parts enhances the convenience and efficiency of repairs, as technicians can readily access the necessary components. Also design for disassembly and reassembly can lead to more repair activities (De Fazio et al., 2021) and can reduce uncertainties. However, this study shows that despite these approaches uncertainty is still a major factor in the decision not to repair.

The results suggest that consumers' expectations of convenience do not match what repair companies can actually deliver. In this context,

it is necessary to reduce unrealistic expectations of customers in terms of expected service. This relates to the level of service customers believe they are likely to receive (Zeithaml et al., 1993). In the focus group interviews, it was generally found that individuals with more experience with repair services have more realistic expectations. This finding underscores the need to provide more information about repair services, especially for inexperienced customers. Another way to align customer expectations with the service provided is to adjust the repair company's business model as much as possible, especially in terms of convenience. In doing so, however, repair service providers face the classic trade-off between time, cost, quality, and flexibility in supply chain/operations management (Boyer and Lewis, 2002; Ketchen and Hult, 2007): they must perform repairs quickly, cost-effectively, and with the highest quality while remaining flexible, e.g., in terms of covering peak demand.

In addition, the obstacles mentioned in Section 3.3 prevent the establishment of a perfectly suitable service that meets consumer expectations. Especially long waiting times for the completion of a repair, are determined by factors being only marginally controllable by the repair companies. These include the lack of spare parts, lack of repair tools (Sabbaghi et al., 2017; Tecchio et al., 2019), or a shortage of skilled workers. Particularly the last issue is characterized by two facets. On the one hand, most repair companies are small- and medium-sized companies (Eurostat, 2019) often lacking financial resources to employ further workers. On the other hand, the contracted labor market is a key issue for many industries in Europe (cf. European Labour Authority, 2021). As a result, this limits the repair sector's capabilities to tap its full potential. In this context, the individual repair company cannot overcome this weakness without institutional help. Financial constraints also hinder repair SMEs in overcoming existing weaknesses of repair service convenience like limited store hours and lack of advertisement. Repair advertisements need to be present exactly at the moment when the consumer's product is broken. Approaches like Google Ads were discussed in the interactive workshops with repair companies to be an effective advertisement approach since most people first search the internet for a solution to fix their broken product. However, according to the company participants small and medium-sized repair companies usually lack the necessary financial resources to do so. Instead, repair companies often appear on manufacturers' websites as service providers for warranty repairs. This involves trade-offs: on the one hand, warranty repairs are not directly profitable, but on the other hand, they are essential for advertising and especially to get the specific tools and know-how for non-warranty repairs. This dependency on the product manufacturer was also pointed out by 'right-to-repair' movements (Right to Repair Europe, 2020). New regulations by the European Union about sustainable product design (European Commission, 2022) might counteract this dependence. An approach similar to the mobile acceptance point for various repair services (Forschungsforum, 2008) which was tested in Graz in the course of a project was outlined in the discussions: the idea of a common collection center in addition to the existing repair stores for broken products (e.g. with convenient store hours) to transport the products from there to the respective businesses. In fact, a so-called Resource Center was opened in Oldenburg (Germany) in March 2022 which follows a similar approach, as repair services and workshops are allocated together in the building (VABÖ, 2022). These approaches emphasize the importance of collaborations in the repair sector with all stakeholders involved, including public sector organizations, companies, third sector, and academia.

Collaborations are not only essential in the repair context but are also discussed in literature as an essential enabler for circular economy (Mishra et al., 2019). In the repair context collaborations with the local government or with local initiatives like repair networks or repair cafès could help repair companies making their service more attractive. Moreover, even though there are many strengths of repair services like the fact that repair services can be economically profitable for individuals (Brusselaers et al., 2019) or the positive impact on environment (Boldoczki et al., 2020; Bovea et al., 2020), only one particular strength related to repair service convenience was highlighted in the focus group interviews and interactive workshops: a direct contact person for getting advice what can strengthen trust. This imbalance between strengths and weaknesses in the area of time and effort perceptions of repair services is another reason why there is a great dependency on and need of repair companies for interventions and activities by the local government or local repair networks. This also goes in line with the conclusion of Arauzo-Carod et al. (2022) that most current circular economy policies lack the regional dimension. For instance, the local government has possibilities to intervene by introducing and funding repair networks and/or introducing a funding scheme (Lechner et al., 2021). Such interventions can, for example, increase decision convenience (since web pages of repair networks can provide a clear overview of possible repair services which all fulfill certain quality criteria) or transaction convenience (since a repair funding could also fund cost estimates). Additionally, a local government can assist in organizing a central repair-point (common drop-off and pick-up point), which can improve access convenience. Also, local awareness/information events about repairs (which can increase decision convenience as well) are best organized by local governments who normally have a certain knowledge about companies in the community which can be useful for the organization of such events. Moreover, the focus on repair services also creates (apart from the environmental benefits) local added value (Stahel, 2016), which in turn can further increase the value of a community. This also demonstrates that a circular economy also needs to incorporate the lowest levels of public administrations (Arauzo-Carod et al., 2022) as they are in direct contact with customers and repair companies.

The discussed barriers of improving repair service convenience in this study suggest that one solution can be to scale up repair companies' operations. In several emerging economies, for instance, the repair sector has already become a significant industry, partly due to the increase in exports of electrical and electronic equipment (EEE) from Western Europe and the United States. Stakeholders in these growing sectors are offering innovative solutions, for example, in terms of knowledge sharing through learning and collaboration (Ahmed et al., 2015) or overcoming technical barriers built into EEE by original equipment manufacturers (Jackson et al., 2012). This leads to impressive repair rates and thus high reuse rates and low recycling and landfill rates (Amankwah-Amoah, 2016), accompanied by significant (but regularly underestimated) environmental and social impacts (Lepawsky et al., 2023). The development in emerging markets can be mainly ascribed to the fundamentally different structure of labor income and cost in these countries. Given the higher labor cost in the western developed countries, similar effects can only be achieved by internalizing environmental cost into production. Apart from that two explicit barriers concerning the expansion of repair operations in Austria (being exemplary for a developed market) were identified during the interactive workshops in this study. First, repair companies may not wish to grow to begin with, this was explicitly indicated by one repair business owner. Second, growth is hindered by a lack of trained workforce as well as of the resources to adjust and optimize business processes for larger operations.

Finally, it is important to highlight that the focus should not only be on increasing convenience of repair services but for circular products/materials in general. This can increase the market share of circular services/materials, because those shares are driven – apart from price – by convenience (European Commission, 2018). Especially since circular products compete with new products (Hunka et al., 2021), circular services/materials need to minimize the gap on new products in terms of convenience.

5. Conclusions, limitations and further research

In this study, repair service convenience was characterized to gain a better understanding of customer's perceptions related with repair activities, which in addition tackles the need to focus on users and appropriate services in a circular economy. In addition, ways to increase convenience in the repair business-to-consumer context were investigated. The analysis revealed that currently repair services have many weaknesses in terms of convenience, and also repair companies face several barriers against overcoming these weaknesses. If the goal is to increase convenience – thus making repair services more competitive compared to new purchases to increase repair demand and to contribute to the transformation to a circular economy – interventions from, for example, the local government as well as collaborations with other initiatives like repair cafès, repair networks or the municipality itself are required. This also highlights the necessity of collaborating with different stakeholders (customers, repair companies, initiatives, and local government) for the transition towards a circular economy.

Although the study was conducted in the region of Styria, there are indications that the Styrian population has similar attitudes and thought processes regarding the repair topic as other European citizens (Fachbach et al., 2022). Hence, the characteristics of repair service convenience are transferable to other areas with similar norms and values. In that regard, future research should analyze repair service convenience in other contexts (i.e., in other geographical contexts, including political, institutional, social, economic, and cultural) to investigate potential differences. Also the identified vulnerabilities and barriers that small and medium-sized repair companies face can be transferred to other (repair) stores of similar size. In that context, future research can evaluate existing strengths/weaknesses of convenience of repair services with the help of quantitative research on a bigger scale by interviewing a larger number of repair companies. Even though the possibilities of a municipality depend on the political landscape and the laws in force, local governments can be a central player in terms of repairs, by helping repair companies meet the customers' requirements for convenient repair services. Thus, future research should also in detail explore how they can intervene and set an appropriate framework for repair companies.

CRediT authorship contribution statement

Ines Güsser-Fachbach: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Writing – original draft, Visualization, Project administration. **Gernot Lechner:** Validation, Writing – review & editing. **Tomás B. Ramos:** Methodology, Writing – review & editing. **Marc Reimann:** Writing – review & editing, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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