

Millennials' acceptance of product-service systems: Leasing smartphones in Flanders (Belgium)

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Abstract

This study aims to determine the main factors shaping millennials' willingness to consider leasing a smartphone in Flanders (Belgium). An innovative approach, namely a discrete choice experiment (DCE), is adopted to address this issue. A DCE is a quantitative, survey-based, technique used for eliciting individual preferences. The results show that support for leasing smartphones cannot be taken for granted. Three consumer classes had significantly different attitudes, revealing that a majority of respondents were not open to leasing smartphones. The main barriers were the uncertainty regarding the consequences of entering into a lease contract, financial considerations and the role smartphones play in determining the self-identity of young consumers. Environmental concerns, financial considerations and a desire to own the latest model were stated as possible drivers of adopting such a product-service system.

Keywords: Smartphones; Leasing; Product-service system; Discrete choice experiment

Highlights

- Support from consumers for leasing smartphones cannot be taken for granted
- Discrete choice experiments are useful in determining consumers' preferences
- Uncertainty and the extended self are important barriers
- Environmental concerns and a desire to own the latest model are important drivers
- Financial consequences are mainly determined by the smartphone's expected life span

1. Introduction

Interest in how to move from a linear towards a circular economy (Ellen MacArthur Foundation, 2012; European Commission, 2015; Geissdoerfer et al., 2017; Kirchherr et al., 2017; Prieto-Sandoval et al., 2018) is rapidly growing and several new business models¹ have been put forward to facilitate this transition and to encourage a ‘servitization’ of the economy (Vandermerwe & Rada 1988; Baines et al., 2009; Bocken et al., 2016). A shift from selling products to offering ‘products-as-a-service’ (Oliva & Kallenberg, 2003), or from buying products to using products (Lawson et al., 2016), plays an important role in this transition (Tukker, 2015). Various types of product-service systems (PSS) have already been identified (Mont, 2002; Tukker, 2004; Reim et al., 2015). The focus of this study is on use-oriented PSS, and specifically on leasing smartphones, which entail a right of use for the recipient of the product and the payment of a periodical fee. Producers retain ownership and the responsibility for the product during the entire life cycle.

The current study focuses on millennials’ preferences for leasing smartphones in Flanders (Belgium). The global market for smartphones is one of the most rapidly growing in the world (OECD, 2015) and young consumers will play a large role in buying and using smartphones over the next decades (Howe & Strauss, 2009; Young & McCoy, 2016). Millennials have been defined in a wide variety of ways. Recently a consensus is growing around the definition provided by the Pew Research Center and anyone born between 1981 and 1996 (ages 23 to 38 in 2019) is considered a millennial (Dimock, 2019). Yet, as our survey predates the Pew definition, it defines millennials as anyone aged 15 to 30 in 2016. Millennials have interacted with technology since birth and are thus much more digitally literate than previous generations; they are thought to be more concerned

¹ Following Geissdoerfer et al. (2018a, 2018b), a business model is defined as a “simplified representation of the elements of a complex organisational system and the interrelation between these elements. It determines the organisation's value proposition, value creation and delivery, and value capturing and aims at analysis, planning, and communication in face of increasing complexity. The organisational environment and value network is [typically] also considered...” (Geissdoerfer et al., 2018a, p.713).

about the environment, more global in their thinking, less brand-loyal, and to have a low tolerance for delays in technology services (Hanks et al., 2008; Harris et al., 2011). These people are the consumers of the future and previous studies have shown that, although they are more environmentally conscious, they are reluctant to change their consumption patterns. For example, ThredUp (2018) conclude that millennials are, on the one hand, wasteful impulse buyers who wear clothes only a couple of times, and on the other hand, hate to waste as they care most about environmentally conscious brands and buy second hand for environmental reasons. This contradictory behavior makes it interesting to study millennials' behavior towards leasing in the smartphone market as it cannot be easily predicted.

Moreover, the market of smartphones is characterized by a rapid replacement of older devices. For example, Suckling and Lee (2015) report a typical lifetime of two to three years for smartphones. Besides technological innovations that drive this rapid replacement rate, smartphones are often reported to be designed to become rapidly obsolete in several ways (Bossuet, 2014): by choosing product materials that have a much shorter lifespan than alternatives, by limiting software compatibility so that old phones will not support newer software, by using expensive parts, by stimulating perceived obsolescence due to rapidly evolving fashion trends, and by making phones hard to upgrade and impractical to repair. Note that the process of co-creation of apps, operating systems and smartphones can be seen as way to introduce servitization in the market of smartphones and is often mentioned as an important driver of the fast technological evolution in the market (West & Mace, 2010). Besides the high turnover rate, devices are often not discarded in a responsible manner. According to a consumer study done by Nokia in 2011, 40% of discarded mobile phones were kept as spares, 27% were re-used, and only 12% were collected or returned for recycling²

² Of the remaining phones 7% was lost, stolen or broken and 14% was otherwise disposed of.

(Tanskanen, 2013). These trends lead to a possible irretrievable loss of resources since smartphones contain many rare and precious (earth) metals such as indium, gallium and neodymium (Tanskanen, 2013). Besides material use, energy use is another important impact of smartphone production and use (Suckling & Lee, 2015).

Use-oriented product-service systems, such as leasing, are often suggested as a way to reduce material usage and environmental footprints of electronics such as smartphones (Greenpeace, 2012; Natarajan, 2013). However, firms' adoption of PSS can be motivated by a wide variety of other factors driven by ongoing innovation and digitalization. Firms can offer PSS on the market to differentiate their output and attract new customers, to increase the stability of revenues, to reduce costs, to create competitive advantages, or to get access to information about the product's performance during its use phase (Barquet et al., 2013; Amor et al., 2018). Yet, consumers often appear reluctant to adopt PSS (Mont, 2002; Mont, 2004; Martinez et al., 2010; Catulli, 2012; Edbring et al., 2016; Bardhi & Eckhardt, 2017; Hobson et al., 2018; Vaitinen et al., 2018), even when monetary benefits can be identified or when exhibiting pro-environmental attitudes. While some drivers and barriers, such as financial considerations, seem to apply broadly, other drivers and barriers, such as duration of use or social setting, seem to be context dependent.

While the fast innovation cycle, increasing environmental concerns and flexibility are all relevant drivers in the context of leasing smartphones (Edbring et al., 2016), the widespread concerns about data security of old phones as well as privacy concerns are likely to act as a barrier to adopt PSS (Speake & Yangke, 2015; Neunhoffer & Teubner, 2018). Moreover, smartphones often become part of one's identity, or extended self, which can act as a deterrent for adopting PSS in this market (Walsh & White, 2007). Recently, Poppelaars et al. (2018) explores the reasons why consumers rejected access-based smartphone services such as leasing or upgrading in the Netherlands through eighteen in-depth interviews. The findings of this small-scale qualitative study suggest that the main

reasons for the rejection of smartphone access services are a lack of awareness, misunderstanding of terms and conditions, and unsatisfactory compensation for consumers' sacrifice of not owning their phone. Hobson et al. (2018) performed a qualitative study for a small sample of UK consumers and find a similar reluctance to lease a modular smartphone that was not yet available on the market. Most recently, Mashhadi et al. (2019) used a survey with 112 respondents to learn more about consumers' acceptance towards leasing contracts for smartphones in Buffalo NY (US). They find a persistence in respondents' behavior: respondents who were already leasing their cell phones are more prone to lease again in the future, and vice versa. These studies rely on small sample sizes, and are unable to determine, and quantify, the relative impact of smartphone characteristics on respondents' willingness to lease smartphones.

The current study adds to this small, but growing, literature on consumers' acceptance of use-oriented PSS systems for smartphones. Its objective is to gain more insight into the main determinants of millennials' willingness to lease a smartphone in Flanders and to identify different consumer classes. The study's contribution is threefold. A first contribution lays in its focus on a consumer group, i.e. millennials, that has exhibited contradictory behavior regarding sustainable consumption depending on the product group, and that is likely to play an important role in future market development. A second contribution is the application of an innovative approach, which –to the best of our knowledge- has not yet been used in this context. A discrete choice experiment (DCE) is a quantitative, survey-based, technique that is used for eliciting individual preferences (Louviere & Hensher, 1982; Louviere & Woodworth, 1983). It is especially apt to deal with multidimensional choices and has been used in a variety of settings³. In a DCE, respondents select their preferred option out of a predetermined set of alternatives, which are described by their main characteristics

³ Discrete choice experiments are frequently used, among other disciplines, in marketing, psychology, transportation research, environmental economics, and health economics (Amaya-Amaya et al., 2008; Kwak et al., 2010; Rousseau & Vranken, 2013; Gundlach et al., 2018) for over thirty years.

(Johnston et al., 2017). Specifically, respondents are asked to select their most preferred smartphone based on phone characteristics, such as brand and battery quality, as well as the business model (buying vs. leasing). DCE can be used to recover respondents' preferences, the relative importance of specific PSS characteristics, and the willingness-to-pay for these PSS characteristics. Thirdly, and lastly, this study is able distinguish and identify three different consumer groups with markedly different preferences regarding smartphone characteristics and the leasing-versus-buying decision.

2. Materials and methods

First the setup and design of discrete choice experiments is described. Next the construction of the survey and the data collection process is presented and motivated.

2.1 Discrete choice experiment

Discrete choice experiments (DCE) allow researchers to uncover how individuals value selected attributes of a good or service by asking them to state their choice over different hypothetical alternatives presented to them in a survey (Amaya-Amaya et al., 2008; Johnston et al., 2017). According to random utility theory, the overall utility generated by an individual's choice is assumed to depend on the utilities associated with its composing attributes and attribute levels. It states that a respondent's utility function consists of a deterministic, observable component and a random, unobservable component ε_i (Amaya-Amaya et al., 2008). Further, the usual starting point is to assume that the utility U_i derived by an individual of choosing alternative i can be approximated by a linear function of the form (Amaya-Amaya et al., 2008):

$$U_i = ASC_i + X_i' \beta + \beta_M M + \varepsilon_i \quad (1)$$

where X_i represents an K-dimensional vector of attribute levels for alternative i , β is an K-dimensional vector of coefficients capturing generic marginal (dis)utilities of attributes, M

represents the monetary attribute, and ASC_i – the alternative specific constant – captures the effect of unobserved factors for each of the alternatives (i.e. options in the choice set).

In this study, individuals are offered several choice sets. A choice set S comprises four options: smartphone A, smartphone B, smartphone C and the opt-out (i.e. no smartphone). Choosing one alternative over the others implies that the utility of the chosen alternative exceeds the utility associated with the other alternatives. Thus the probability of a respondent choosing smartphone i from a particular choice set S can be expressed as:

$$Pr[i|S] = Pr[U_i \geq U_j, \forall j \neq i \in S] = Pr[ASC_i + X_i'\beta + \varepsilon_i \geq ASC_j + X_j'\beta + \varepsilon_j, \forall j \neq i \in S] \quad (2)$$

Under the assumption that the random terms are independently and identically distributed following a type I extreme value distribution, the choice probabilities have a convenient closed-form solution, the so-called conditional logit (CL) model (Mariel et al., 2013). The marginal willingness to pay (WTP) for a particular change in one specific attribute k – the marginal rate of substitution – can be estimated as a ratio of coefficients:

$$WTP_k \equiv \frac{X_M}{X_k} = -\frac{\beta_k}{\beta_M} \quad (3)$$

The data obtained from the choice experiment are first analyzed by such a conditional logit (CL) model. However, conditional logit models assume that preferences are homogeneous across respondents and only one fixed vector of parameters is estimated for the choice attributes (Hensher et al., 1998; Train, 2003). Thus, in order to allow heterogeneous preferences, a latent class (LC) model is estimated, as this type of model aims to distinguish consumer segments based on discrete observed measures (McFadden, 1986; Boxall & Adamowics, 2002). With the help of statistical criteria such as BIC and CAIC, the optimal number of these underlying groups is estimated. An LC model estimates consumers choices jointly with class membership based on the assumption that

utility functions are different between classes, but identical within classes (Boxall & Adamowics, 2002).

2.2 Survey design and data collection

In order to collect information millennials' attitudes towards leasing smartphones in Flanders, an online survey was developed. This survey consisted of four parts asking about 1) socio-demographic characteristics, 2) smartphone selection and use, 3) a discrete choice experiment, and 4) follow-up questions regarding respondents' willingness to lease a smartphone. The survey questions, including the DCE, were tested in two one-hour face-to-face sessions with 20 students each and several online tests were performed with different types of respondents (younger than 18, 18-25, older than 25).

For the DCE, the main determinants of smartphone purchase behavior needed to be identified. Six attributes were used to describe the smartphones to the respondents (Appendix A): price, brand (and operating system), release date, memory, warranty and battery type. Attribute levels were determined by findings from past studies such as Walsh & White (2007), Speake & Yangke (2015) and Sanoma (2016), the presentation of smartphones on online webshops such as Coolblue, Amazon, and Vanden Borre, as well as the feedback received during the different tests of the survey. According to Sanoma (2016), the top smartphone brands with younger people (15 to 35) in Belgium were Apple (37%), Samsung (34%), Huawei (8%) and Sony (6%). Besides these four brands, two other brands were included: Windows phone and Fairphone.

Several of these attributes are associated with drivers and barriers identified past studies (Edbring et al., 2016; Bardhi & Eckhardt, 2017; Hobson et al., 2018; Neunhoffer & Teubner, 2018; Vaitinen et al., 2018): the brand attribute is linked to brand loyalty and habits, the warranty attributed is linked to perceived uncertainty, and the model attribute is linked to innovativeness.

To study respondents' preferences for leasing versus buying smartphones, two different types of contracts were included: either buying the phone for a one-off price or leasing the phone for a

monthly payment. For the latter option, it was communicated to the consumers that these lease contracts could be terminated at the end of each month. Thus, using equation (3), respondents' willingness to pay (WTP) can be expressed as a one-off premium (when buying the smartphone) or as a monthly payment (when leasing) in this study:

$$WTP_{buy} = - \frac{\text{coefficient of attribute level}}{\text{coefficient of buy price}} \quad (4)$$

$$WTP_{rent} = - \frac{\text{coefficient of attribute level}}{\text{coefficient of rent price}} \quad (5)$$

Based on these two approaches to calculation respondents' WTP, implicit discount rates (IDR) can be calculated that equate the present value⁴ of the costs of leasing a smartphone for 2 or 3 years (T = expected life span) with the present value of the cost of buying a smartphone as follows:

$$WTP_{buy} = \sum_{t=1}^T \frac{WTP_{rent}}{(1+IDR)^t} \quad (6)$$

Since not every smartphone characteristic was included in the description, the survey text explicitly mentioned that the respondent could assume that other characteristics, such as camera, display and processor, perfectly matched their preferences. Moreover, it was highlighted that the respondent could only choose the device itself and that no package deals offered by communication providers (carriers) were included in the options. Mobile service costs were thus not included in the hypothetical offers.

To keep the number of choices for each respondent manageable⁵, a D-efficient design with fixed priors of two blocks with each nine choice cards consisting of three smartphone profiles was determined in Ngene.

⁴ Present value is the current value of a future sum of money or stream of cash flows given a specified rate of return. Future cash flows are discounted at the discount rate, and the higher the discount rate, the lower the present value of the future cash flows. (<https://www.investopedia.com/terms/p/presentvalue.asp>)

⁵ The full factorial design includes $8*6*4*4*4*2 = 6144$ possible profiles.

The online survey was distributed to a non-probabilistic sample in March 2016 via the Qualtrics software. Finally, 362 individuals started the survey leading to 325 useable responses. As there are approximately 1.1 million people between 15 and 30 years old living in Flanders⁶, this leads to a margin of error of 5%, assuming a 95% confidence level and a random sample.

3. Description of dataset

The sample consisted of 47% male and 53% female respondents. Unsurprisingly, a large fraction of the respondents was still studying for their high school or higher degree. The respondents were between 15 and 30 years old with an average of 22.5 years. 92% of respondents currently owned a smartphone. The most popular brand among respondents was Apple (36%) followed by Samsung (24%), Huawei (11%), OnePlus (8%), and Sony (5%). None of the respondents owned a Fairphone. When selecting a smartphone, several elements seemed to play a role. Price and battery were clearly two most prominent factors, followed by memory capacity, camera, technical reliability and visual appeal (design). Only 2% of the sample received a company phone from their employer and 13.4% bought their phone in a package deal with their communication provider.

More than 80% of the respondents currently owned a phone that was less than two years old and 37% had already owned four or more phones. So, in line with previous research, a high turnover rate for smartphones is found for this sample. In addition, the second-hand market for smartphones does not seem to be flourishing. Only 12% of respondents currently owned a second-hand phone: 8% received the phone for free from family or friends, while only 4% actually bought a used phone. Looking at the disposal of respondents' used phones, only 15% offered the phone for re-use: 9% gave it away for free, while 6% sold it. Further, in line with past studies, the disposal of used

⁶ <https://statbel.fgov.be/en/news/1st-january-2018-belgium-had-11376070-inhabitants>

smartphones is problematic: 73% kept it as a spare, while only 6% disposed their used phone in a way that recycling or re-manufacturing would be possible. This low level of recycling is in line with the information provided by Recupel⁷ (n.d.), which estimates that 5% of all smartphones in Belgium are currently recycled.

4. Results

4.1 Conditional logit model

In this section, respondents' preferences for smartphone characteristics based on the stated choice experiment are analyzed. All variables are dummy coded and the reference category is indicated in Appendix A. The reference category for the ASC's is the opt-out option. First a conditional logit model with the main effects is estimated (Table 1). The results show that respondents have a preference for Apple and Samsung over the other brands. Moreover, respondents prefer newer models over older models. The insignificant coefficient for 'always receiving the latest model' may be explained by observing that this option could only be included in the profiles that represented a leasing contract. Respondents also prefer phones with more available memory and with a higher quality battery. Regarding the length of the warranty period, respondents' preferences seem less clear cut. Still they seem to prefer some warranty over no warranty. Finally, as expected, they dislike higher prices.

Using equations (4) and (5), the estimated coefficients can be used to calculate respondents WTP in two ways (Table 1): (1) as a sum to pay once to buy a smartphone with a particular characteristic, or (2) as a sum to be paid every month to lease a smartphone. For example, respondents are willing

⁷ Recupel is a Belgian non-profit association that is responsible for organizing the collection and processing of discarded electr(on)ic appliances and light bulbs.

to pay a premium of 251 euro to buy, or a premium of 12.9 euro per month to lease, an Apple smartphone compared to a Windows phone with similar characteristics.

Table 1: Conditional logit results

Choice	coefficient	p-value	WTP buy (euro) Paid once	WTP rent (euro) Paid every month
apple	0.8524	0.0000	251.25	12.91
samsung	0.8690	0.0000	256.14	13.16
huawei	0.3914	0.0000	115.36	5.93
sony	0.5432	0.0000	160.11	8.23
fairphone	0.4468	0.0000	131.70	6.77
model 2015	0.7224	0.0000	212.92	10.94
model 2016	0.6713	0.0000	197.86	10.17
model new	0.1605	0.1810		
memory (in GB)	0.0816	0.0000	24.05	1.24
warranty 1 year	0.2045	0.0260	60.28	3.10
warranty 2 years	0.3250	0.0030	95.81	4.92
warranty always	0.1775	0.1830		
battery extra	0.3941	0.0000	116.16	5.97
Buy price	-0.0034	0.0000		
Rent price	-0.0660	0.0000		
ASC_A	-0.9731	0.0000		
ASC_B	-1.0055	0.0000		
ASC_C	-1.0800	0.0000		

4.2 Latent class model

Next a latent class model is estimated in order to see whether and how the market is segmented (Table 2). Based on the BIC and CAIC information criteria, several models were tested and three consumer classes could be distinguished in the dataset.

Table 2: Latent class estimates

	Class 1		Class 2		Class 3	
	coefficient	p-value	coefficient	p-value	coefficient	p-value
apple	1.409	0.000	-1.370	0.002	0.948	0.000
samsung	1.273	0.000	0.459	0.199	0.665	0.010
huawei	0.778	0.000	-0.106	0.790	-0.158	0.562
sony	0.713	0.001	0.223	0.502	0.098	0.730
fairphone	0.482	0.010	0.673	0.018	0.075	0.759
model 2015	0.665	0.000	2.042	0.000	0.388	0.098
model 2016	0.740	0.000	1.870	0.000	0.388	0.037
model new	-0.240	0.186	1.532	0.000	0.081	0.849
memory (in GB)	0.096	0.000	0.106	0.000	0.093	0.000
warranty 1 year	0.096	0.579	1.112	0.007	0.355	0.121
warranty 2 years	0.178	0.364	1.028	0.021	0.745	0.003
warranty always	0.154	0.481	1.811	0.000	-0.070	0.845
battery extra	0.336	0.000	1.003	0.000	0.604	0.000
Buy price	-0.004	0.000	-0.007	0.000	-0.004	0.000
Rent price	-0.048	0.000	-0.170	0.000	-0.155	0.000
ASC_A	0.715	0.018	-1.976	0.001	-1.727	0.000
ASC_B	0.538	0.092	-1.591	0.007	-1.721	0.000
ASC_C	0.556	0.069	-1.758	0.002	-1.850	0.000
Class share	0.470		0.197		0.333	
Membership function						
female	0.372	0.231	0.383	0.384		
province	0.006	0.957	-0.146	0.302		
brand	-0.069	0.201	0.258	0.001		
leasing	-1.281	0.000	-1.732	0.000		
_cons	4.513	0.000	3.503	0.003		

The first class has clearly ranked brand preferences: Apple and Samsung are valued highest and the Windows phone least. They prefer newer models, more memory and a better performing battery. However, they do not seem to care about the warranty conditions.

The second class has marked anti-Apple preferences and is indifferent between the other brands with a slight preference for the Fairphone. They prefer newer models, more memory, a better performing battery and also a longer warranty period. This second class seems to be more price sensitive than the first class.

The third class prefers an Apple or Samsung phone and is indifferent between the other brands. This class also prefers newer models, more memory, a better performing battery and to some extent a longer warranty period. It is also more price sensitive when it comes to the rent price, but not with respect to the buy price. Thus the main differences between the different classes center around brand preferences, warranty preferences and price sensitivity. A description of the respondents in each of these classes can be found in appendix B.

4.3 Implicit discount rate

Based on the DCE results, respondents' preferences can be expressed as a one-time willingness to pay (WTP buy in Table 1; equation (4)) as well as a monthly willingness to pay (WTP rent in Table 1; equation (5)). These two WTP measures are reflected the same underlying preferences and it is thus interesting to use them to calculate the implicit discount rate (IDR). The IDR is the solution to equation (6) and is equal to the discount rate that equates the present value of the costs of leasing a smartphone for an expected life span of two or three years with the present value of the cost of buying a smartphone once. The results are presented in Table 3 and show high implicit discount rates for the conditional logit models, but lower ones for some of the latent class estimates. A positive IDR implies that the sum of the nominal leasing payments is higher than the instantaneous

purchase price, while a negative IDR implies the reverse. Respondents with a negative IDR would thus require a discount to convince them to select a leasing contract rather than buying a smartphone.

Table 3: Implicit yearly discount rates

		Life span of 2 years	Life span of 3 years
Conditional logit	Complete dataset	21%	46%
Latent class logit	Class 1 (47%)	78%	93%
	Class 2 (19.7%)	-1.3%	28%
	Class 3 (33.3%)	-42%	-4.7%

4.4 Identification of barriers and drivers

Besides the DCE, respondents were also asked directly whether they would consider leasing a smartphone. The results of this direct question reveal that a significant group seemed hesitant to consider a lease contract: with 31% saying they would ‘certainly not’ and 41% saying they would ‘probably not’ consider leasing. Less than 30% indicated that they would be willing to lease a smartphone rather than buy one, of which only a small fraction (3%) was certain that they would enter in such a contract and a larger part (25%) would consider it.

When asked in an open-ended question about the main motivations for this answer, respondents revealed several reasons which can be classified as drivers or barriers towards leasing smartphones. These arguments were coded and categorized according to three dimensions: consumer characteristics, product characteristics and use characteristics (Table 4). The most stated barriers relate to financial impact, lack of control and perceived risks, while the most stated drivers relate to financial impact, convenience and flexibility.

Table 4: Arguments used by respondents as drivers or barriers towards leasing smartphones

Focus		Stated drivers (# resp.)	Stated barriers (# resp.)
Consumer	Environmental attitudes	5	0
	Innovativeness (latest model)	9	0
	Risk perception	1	34
	Lack of control	2	64
	Extended self (own my phone)	1	28
	(In)stability of income and cost flows	5	2
Product	Fast innovation cycle	8	0
	Environmental impact	1	0
Use	Convenience & flexibility	12	4
	Variety – more choice	7	0
	Duration of use	9	6
	Environmental impact	9	1
	Financial impact	40	74
	Safety (data security, privacy)	0	8
	Uncertainty (reduction of)	9	12
	Habits (no benefits from change)	0	8

5. Discussion

Based on the survey results, several critical issues regarding consumers' attitudes towards smartphones in Flanders can be identified. After discussing respondents' willingness to adopt a leasing system based on the DCE results, the role of possible barriers and drivers in this decision is examined.

5.1 Willingness to lease a smartphone

At first glance, the results seem to reveal some contradictory results when considering the findings from the DCE for the average respondent (Table 1) and the responses to a direct question. Looking at the average implicit discount rate over the complete dataset, an IDR of 21% is found assuming a

life span of two years for the smartphone, while the IDR increases to 46% for an expected life span of three years (Table 3). The high average IDRs imply that respondents seem to be quite willing to consider leasing rather than buying smartphones, as future lease payments are heavily discounted and do not weigh greatly on current decisions to obtain a smartphone. However, these results are not confirmed by the results of asking respondents directly whether they would consider leasing a smartphone. Less than 30% indicated that they would be willing to consider this, while 31% stated that they would ‘certainly not’ and 41% that they would ‘probably not’ consider leasing. This reluctance to consider leasing a smartphone for a large part of the sample is in line with the findings from qualitative studies for two of Belgium’s neighboring countries: the Netherlands (Poppelaers et al., 2018) and the UK (Hobson et al.; 2018).

These contradictory results disappear when we investigate a more detailed picture emerging from the latent class estimation (Table 2 and Appendix B). The presence of consumer classes with significantly different preferences is in line with the findings of Mashhadi et al. (2019) for smartphones, and has been found for many other sustainable consumption choices (e.g., for sustainable housing (Rid & Profeta, 2011); or for labeled chocolate (Rousseau, 2015)). While class 1 seems open to leasing (based on the high positive IDRs) and class 3 does not seem to be open to leasing (based on the negative IDRs), class 2 reveals a more ambiguous picture. Depending on the expected life span of the smartphone, respondents in class 2 can be seen as being open to leasing for a life span of three years, or as being averse to leasing for a life span of two years. So less than 50% of the sample (class 1) seems willing to select a leasing contract, approximately 20% (class 2) might consider leasing if the use period of their smartphone is sufficiently long, and approximately 30% (class 3) does not want to consider leasing. The importance of duration of use on the adoption decision of PSS confirms previous findings from, among others, Mont (2004), Edbring et al. (2016), and Mashhadi et al. (2019).

The pattern of answers according to the respondent class to a direct question regarding buying versus leasing (Appendix B) confirms that class 3 is clearly the most averse towards leasing a smartphone: with 50% stating they would ‘certainly not’ consider leasing compared to 21% in class 1 and only 11% in class 2. However, class 2 is now revealed as being the most open to leasing a smartphone: with 46% ‘certainly yes’ or ‘maybe yes’ answers compared to 37% in class 1 and 10% in class 3. These findings suggest that respondents in class 2 expect a use period of more than two years for their smartphone. This is in line with the fact that the current smartphone owned by respondents in class 1 (22%) and class 2 (18%) is significantly more likely to be more than two years old than the current phone of respondents in class 3 (12%) (Appendix B).

5.2 Drivers and barriers towards leasing a smartphone

In order to gain more insights into respondents’ main concerns when they are confronted with the option to buy or to lease smartphones, one open question was included in the survey. Table 4 presents the drivers and barriers that were most salient to respondents from a consumer, a product and a use perspective.

Firstly, focusing on the consumers’ perspective, respondents mainly identified barriers. In line with Poppelaars et al. (2018), the three dominant barriers are lack of control, perceived risk and elements related to the extended self. Many respondents indicated concerns regarding the lack of clarity with respect to, among other things, insurance, follow-up of defects and accidents, overall costs and final ownership at the end of the lease period. Given the risk averse nature of most consumers, the presence of uncertainty and imperfect information can clearly be considered as a barrier to adopt new business models such as leasing. This result is corroborated by the results of the latent class model (Table 2) in which the first class, that was found to be open to leasing based on the DCE, was also found to be indifferent towards the ‘warranty’ attribute. This indifference can be interpreted as a signal of indifference towards risks and thus the barriers ‘perceived risk’ and ‘lack of control’ may

be less salient to these respondents. The relationship between consumer and provider, seller and buyer as well as ease of access are often cited as key determinants for consumer satisfaction in PSS and the importance of open and trusting relations between providers and consumers is highlighted (Catulli et al., 2013; Raja et al., 2013; Edbring et al., 2016; Neunhoffer & Teubner, 2018).

Furthermore, several respondents mentioned that they want to own their own phone. This consideration was sometimes driven by privacy concerns, but several respondents simply stated 'my phone should be mine'. This is in line with observed possessiveness of consumers towards the things they own (Wallendorf & Arnould, 1988). This product attachment is strengthened if these possessions can be personalized (Mugge et al., 2009) and become part of one's identity (extended self) such as smartphones (Walsh & White, 2007).

Looking at the drivers within the consumer-dimension, some references to the environmental impact, to a desire to own the latest model and to have a predictable limited monthly cost associated with leasing are made. In general, past studies have stated that environmentally conscious consumers are more likely to participate in environmentally-friendly behaviors and PSS as long as the latter is perceived as being a green choice (Hamari et al., 2016; Lawson et al., 2016). Moreover, products with fast innovation cycles – such as smartphones – are more attractive for consumers to rent, but not to own (Rexfelt & Hiort af Ornäs, 2009; Cox et al., 2013).

Secondly, the respondents did not refer to many product-related characteristics. However, as mentioned before, the fast innovation cycle of smartphones is mentioned by some of the respondents as a driver. While the direct questions did not provide evidence of brand loyalty, the analysis of the DCE clearly shows the presence of significant brand preferences. Apple and Samsung are the two most preferred brands in the sample. Surprisingly, the class with the most explicit brand preferences (class 1 in Table 2) seems to be quite open towards leasing.

Thirdly, looking at the use characteristics, the financial impact is the most cited concern, both as driver and as barrier: several respondents thought leasing would be cheaper, while others were convinced buying would be cheaper. The underlying reason for one interpretation versus the other centered on the expected life span of a smartphone. Respondents assuming that they would be replacing their phones every one or two years perceived a possible financial benefit from leasing, while this benefit would turn into a cost with longer expected life spans. Other drivers that are mentioned by respondents are the flexibility and convenience of leasing, the larger variety of phones that can be leased, a reduction in uncertainty and a positive environmental impact. Looking at additional barriers, respondents mention data security and privacy issues (safety), increased uncertainty and a desire to stay with the status quo ('why would they change their behavior?').

To conclude, for the case of leasing smartphones, many drivers and barriers could be identified. For a majority of the respondents, barriers were more salient than drivers and their attitude towards leasing smartphones can be described as reluctant. Looking at the barriers that were mentioned most often, uncertainty, perceived risks, and lack of control can all be expected to be relevant for other product categories besides smartphones. For example, people's concerns about insurance, trust and responsiveness of the company also proved relevant in the context of leasing children's products, such as prams and car seats (Catulli, 2012). The desire to own a product, however, can be more or less relevant depending on the product. For instance, this desire may be less likely to act as a barrier towards leasing power tools or party tents, than leasing smartphones or clothes. Moreover, since the financial impact was strongly determined by the expected period of use, this factor is more likely to be a driver for short-term use and more likely to be a barrier for long-term use. Besch (2005), for example, showed that the difficulty in comparing the price of buying furniture to the total cost of renting it was the main barrier for adoption a PSS for office furniture. Looking at the main drivers,

the perception of a positive environmental impact, flexibility, and variety may each be an important driver for the adoption of PSS in different markets.

5.3 Limitations

The current study focuses on one specific use-oriented PSS and not all of its findings may not carry over to other product categories or PSS. Moreover, it uses a non-probabilistic sampling method, which implies that the sample is not representative for all millennials in Flanders. However, as more highly educated and more environmentally aware consumers are likely to participate, our results can be seen as providing an upper limit to the willingness to lease smartphones (Sagebiel et al., 2014). Finally, survey responses reflect behavioral intentions rather than actual behavior and may reveal the presence of an attitude-behavior gap (Kollmuss & Agyeman, 2002).

6. Conclusion

Finding the most effective measures in the transition towards a circular economy is still a challenge. Since some studies have suggested that use-oriented PSS such as leasing durables may be a good way to incentivize producers to optimize material use, design and end-of-life of their products, a survey was used to identify the crucial factors that may influence the decision of leasing a smartphone by millennials in Flanders. As producers will be more likely to implement new business models if the size of the market is sufficiently large, it is important to investigate whether consumers are willing to adapt their behavior and support new business models such as leasing.

Yet, the evidence collected among 15 to 30 year old Flemish consumers shows that support for leasing smartphones cannot be taken for granted. On the one hand, the results from the choice experiments indicate that, on average, respondents are quite willing to opt for lease contracts to acquire their preferred phones. Nevertheless, looking at different respondent classes, these averages cover some very different preferences. Three consumer classes had significantly different brand

preferences and attitudes towards warranty schemes, but also their willingness to accept leasing contracts turned out to be very different. In the end, slightly less than half of the sample seemed open to leasing, while the other half was much more cautious and refusing.

Looking at the main arguments underlying the attitude towards leasing a smartphone provided additional insight into the main drivers and barriers. Respondents indicate that they are not willing to take the risk of leasing a smartphone because of the uncertainty regarding the consequences of such a decision. They fear that unexpected costs will occur when phones need to be repaired, that phones will not be replaced when these are lost or stolen, that their privacy may no longer be sufficiently protected or that they will not receive the most trendy model. Moreover, smartphones have become part of the self-identity of young consumers, which makes the adoption of leasing schemes even more difficult. Therefore, in order to develop the market for leasing contract it seems important to eliminate as many of these uncertainties as possible. However, environmental concerns, financial considerations and a desire to own the latest model were stated as possible drivers of adopting a PSS in this context.

Furthermore, an interesting research topic for future research is to investigate the role of an individual's relation with others within a social community and social networking in the selection of a smartphone. Smartphones are increasingly used for text messaging, taking and posting photos and videos, and overall to connect with others (Belk, 2013). Participants in the digital world of communication are more connected than ever before and can access other users instantly and virtually anywhere. These social relationships through digital communications and social media increasingly help consumers in constructing an extended sense of self (Belk, 2013). Coupled with affinity groups, brand communities, and other virtual groups online, individuals can sustain an aggregate sense of self with a large number of others (Belk, 2013). Ownership and use of mobile phones also touch on factors that include issues of conspicuous consumption (smartphones as status

symbols) and may interact with the need to participate in social networking and be constantly connected (Campbell & Kwak, 2010; Hobson et al., 2018).

To conclude, a warning against an overly optimistic view regarding the potential of new business models such as leasing contracts to stimulate a transition towards a more sustainable economy seems relevant. While a large variety of innovations are being explored that may have great potential in theory, many consumers seem to be rather conservative and exhibit risk averse behavior in practice.

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Appendix A: Attributes and attribute levels used in DCE

Attribute	Attribute levels
Price	<ul style="list-style-type: none"> • Buy for 150 euro • Buy for 300 euro • Buy for 500 euro • Buy for 700 euro • Rent for 10 euro • Rent for 15 euro • Rent for 20 euro • Rent for 30 euro
Brand (Operating system)	<ul style="list-style-type: none"> • Apple - iOS • Samsung - Android • Huawei - Android • Sony – Android • Fairphone - Android • Windows phone - Microsoft (<i>reference</i>)
Model (Release date)	<ul style="list-style-type: none"> • 2013 (<i>reference</i>) • 2015 • 2016 • Yearly updated (only when leasing)
Memory (ROM read only memory)	<ul style="list-style-type: none"> • 2GB (<i>reference</i>) • 4GB • 8GB • 16GB
Warranty	<ul style="list-style-type: none"> • No warranty (<i>reference</i>) • 1 year • 2 years • Always and complete coverage
Battery	<ul style="list-style-type: none"> • Standard battery (<i>reference</i>) • High power battery

Appendix B – Descriptives of respondents in latent classes

Variable	Means			Significance one-sided t-test		
	Class 1 (C1)	Class 2 (C2)	Class 3 (C3)	C1 vs C2	C1 vs C3	C2 vs C3
female (%)	0.56	0.50	0.48	ns	ns	ns
age (years)	22.51	22.93	22.33	ns	ns	ns
over 25 years old (%)	0.19	0.21	0.22	ns	ns	ns
student (%)	0.75	0.75	0.76	ns	ns	ns
current brand Apple (%)	0.46	0.07	0.30	0.0000	0.0032	0.0004
price = important (%)	0.60	0.84	0.73	0.0006	0.0134	0.0501
reliability = important (%)	0.33	0.39	0.35	ns	ns	ns
last phone defect (%)	0.39	0.41	0.40	ns	ns	ns
last phone slow (%)	0.20	0.20	0.09	ns	0.0031	0.0168
last phone outdated (%)	0.24	0.11	0.16	0.0185	0.0443	ns
current phone > 2 years old (%)	0.22	0.18	0.12	ns	0.0137	ns
oostvlaanderen (%)	0.33	0.30	0.28	ns	ns	ns
westvlaanderen (%)	0.15	0.13	0.18	ns	ns	ns
brabant (%)	0.25	0.27	0.25	ns	ns	ns
Leasing certainly yes (%)	0.04	0.07	0.01	ns	0.0379	0.0072
Leasing maybe yes (%)	0.33	0.39	0.09	ns	0.0000	0.0000
Leasing probably not (%)	0.42	0.43	0.39	ns	ns	ns
Leasing certainly not (%)	0.21	0.11	0.50	0.0440	0.0000	0.0000

ns = not significant at 5% level