BEBAT – BATTERY PACKS

Drivers and Barriers to Battery Pack Collection by Belgian Households

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Executive summary

This research investigated the drivers and barriers to battery pack drop-off intention perceived by Belgian households. It is the first study looking specifically at this specific type of recycling. To this end, a standardized online survey, extending the framework provided by the Theory of Planned Behaviour by incorporating measures on objective knowledge, the perception of the consequences, moral norms, end-of-life habits and the perceived effectiveness of BEBAT's actions, was made. Data was collected during the 11/2014-01/2015 period and processed using partial least squares structural equation modelling. A moderate to strong R^2 of 0.62 was found, signalling that our model predicts the drop-off intention well. Based on the size of the path coefficients we can conclude that perceived behavioral control, moral norm, and consequences have the largest influence on the intention to drop-off battery packs as soon as they become unnecessary. Additionally, perceived policy effectiveness was found to negatively moderate the effect of subjective norm on intention. However, a multi-group analysis has revealed that significant differences exist between subgroups made by dividing the full sample based on an observed characteristic. Subgroups were made using the following features: bringing back the majority of battery packst (yes/no), education (high/low), pro-ecological worldview (high/low), gender (male/female), language (Dutch/French-speaking), living area (city/rural), and lifestage (young adult/family -12/family +12/medior/senior). The characteristics causing most heterogeneity are: ecological worldview and the lifestage: family -12. Moreover, statistically significant differences in path coefficients are regularly found for the latent variables: objective knowledge, subjective norms, the lack of habit, moral norms, and consequences.

1. Introduction

We are increasingly mobile, and therefore, so are our devices. Consequently, to feed our increasing energy hunger the use of portable batteries has been firmly rising (Li et al., 2013). Unfortunately, batteries may have a negative impact on the environment if they are not properly collected and recycled (Karnchanawong and Limpiteeprakan, 2009). The collection of portable batteries, both primary and rechargeable, in Europe is mandated by Directive 2006/66/EC which requires Member States to achieve a collection rate of 25% in 2012 and 45% in 2016 (EU, 2006). Therefore, OVAM has highly committed to the proper management of used batteries by enforcing a take-back scheme. Battery producers and importers, intermediaries, and the final seller are legally obliged to accept used batteries. To meet the legal obligation to collect 45% of used batteries by 2016 producers and importers have created BEBAT, which is the single nonprofit organization responsible for collecting, sorting, and recycling of portable batteries in Belgium. Belgium, having a longstanding tradition in separate waste collection, has passed this cap prior to this date achieving a collection rate of over 50% in 2012 (Perchards/Sagis, 2013). With such a collection rate, we are amongst the frontrunners in battery recycling in Europe. However, despite the efforts of both agents (i.e. OVAM and BEBAT), 45% of used batteries and accumulators are not properly collected. 27% of used batteries and accumulators are hoarded at home, whereas the remaining 18% end up in the incorrect bin. In absolute terms, a regular family has on average 107 batteries in its possession, be it used, new, or in use (OVAM, n.d.). According to prior market research ordered by BEBAT, used batteries are brought to a collection point on average 2-3 times a year. Furthermore, it was revealed that about 96% of the population is aware of BEBAT's collection system's existence (Coonen and Peeters, 2014). Seeing the environmental impact of the eluding batteries that may contain heavy metals and the issue of resource scarcity, it is important to identify the reasons for this recycling gap and how to bridge it.

Whereas the current collection rate is worthy of praise, it should be noted that it does not differentiate between types of portable batteries. One can differentiate batteries according to the type in: (l) loose batteries, (2) button cells, and (3) battery packs. According to personal communication with BEBAT the lowest collection rates in Belgium for households are currently found for battery packs. The latter are batteries which are used to power, for example, mobile phones, digital cameras, portable game consoles, and power tools (see Figure 1). A low collection rate is troublesome given that time literally is money. Battery packs that were hoarded for a long period of time are less valuable and hence more costly as the recycling industry has moved on to a recycling process optimized for other battery content. For instance, the amount of cobalt in lithium-ion driven battery packs is decreasing which causes the costs of recycling to increase. Hence, to minimize the costs of avoiding external costs people are to be stimulated to drop off used battery packs as quickly as possible. For these reasons, **this research aims to investigate the drivers and barriers to battery pack drop-off intention perceived by Belgian households**.

Figure 1.   Examples of battery packs

Our research can be situated within the wide branch of literature analysing pro-environmental behavior. The latter refers to behaviors that either harm the environment as little as possible or benefit the environment (Steg and Vlek, 2009). The stimulation of such conduct is necessary as many environmental problems, such as heavy metal leaching, are rooted in human behavior, such as not sorting correctly (Vlek and Steg, 2007). Our focus will be on a specific type of pro-environmental behavior, i.e. recycling, being the act of collecting, sorting, and depositing waste to a suited waste management provider. This is one of the most studied forms of environmentally responsible behavior because it mostly involves simple and economically feasible actions (Huffman et al., 2014). However, to the best of our knowledge, only a single study has explored recycling behavior concerning spent batteries. Hansmann et al. (2006) found that recycling knowledge, self-organization of recycling, and disagreement with justifications for non-recycling were positively related to recycling behavior, while attitudes towards ecological waste disposal and trust in waste disposal authorities were not directly related to respondents' self-reported battery recycling behavior. To come to these conclusions multiple regression was used based on responses to a survey taken in Switzerland. We add to the literature in this domain by looking at battery packs specifically. We argue that this is a specific type of battery, mostly used to power products in the higher end of the consumer electronics market and therefore different drivers and barriers may be at play. Different products may have different preferred end-of-life strategies.

The remainder of this report contains the following sections. First, we discuss the methodology used. In the next section we describe the collected data and the context. Section 4 contains an overview of the results of the different analyses. In section 5 we will discuss these results and in section 6 we will present the main findings of our work.

2. Methodology

To investigate the drivers and barriers on the intention of dropping off battery packs at a BEBAT collection point, we have decided to use the framework provided by the Theory of Planned Behavior (TPB) as a starting point. As recommended in literature, additional variables -besides attitude, subjective norm, perceived behavioral control, and past behavior- are included to be able to adequately explain behavior (Tonglet et al., 2004). Hence, an integrative (structural) model is being estimated (Bamberg and Möser, 2007). A standardized online survey was made in Dutch and French to collect data on the influence of (1) attitudes, subjective norms, perceived behavioral control, and past behavior after Ajzen (1991), extended with (2) the objective knowledge on how to recycle after Aertsens et al. (2011), (3) the perception of the consequences and moral norms after Tonglet et al (2004), (4) end-of-life habits after Knussen et al. (2004), and (5) the perceived effectiveness of BEBAT after Wan et al. (2014) on the intention to drop-off battery packs at a BEBAT collection point. Data was collected during the 11/2014-01/2015 period via a market research company. An overview of the analysed model and hypotheses is provided in Figure 2.
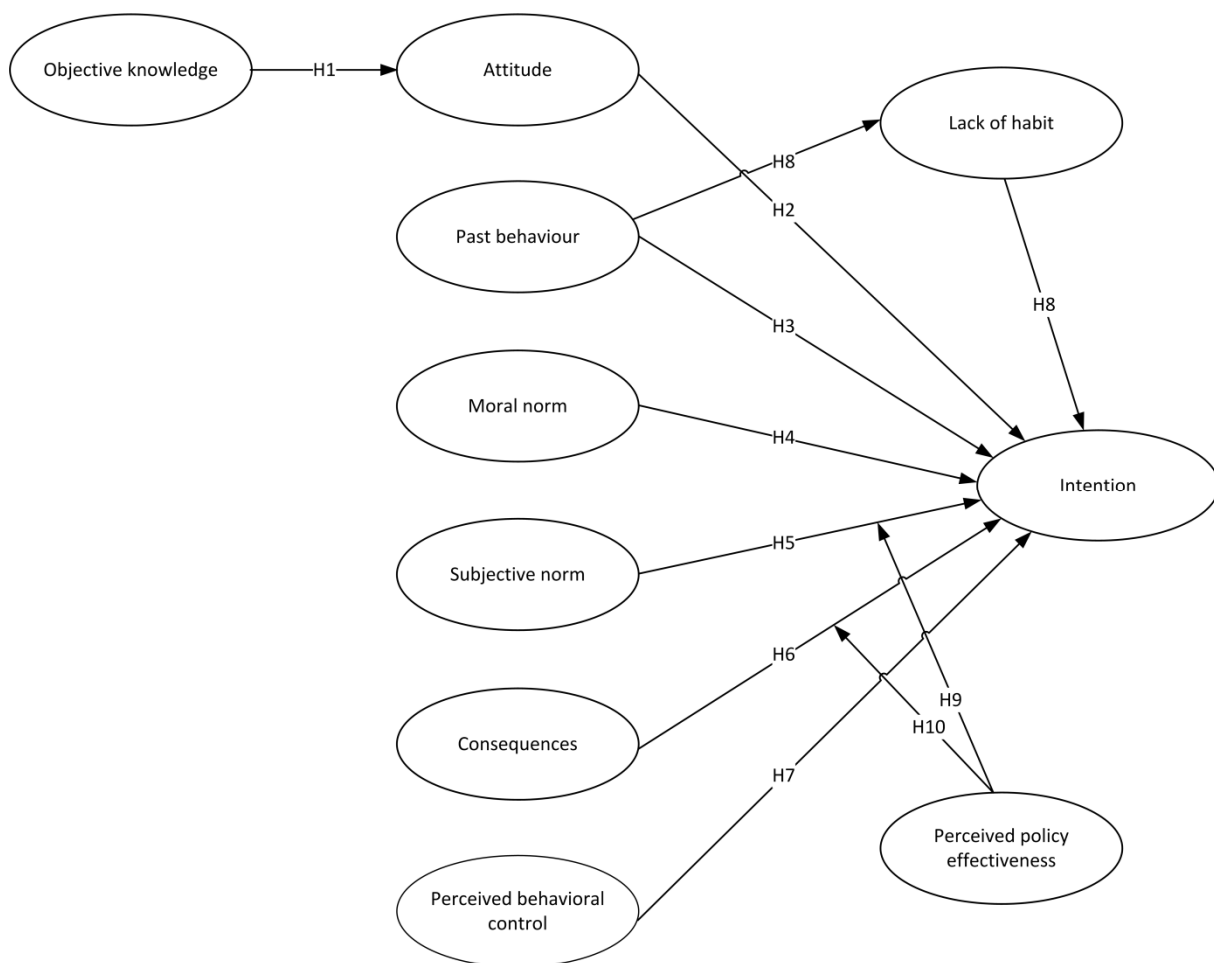

Figure 2.   Overview general model and hypotheses

The hypotheses, H1 to H10, can be described as follows:

H1: The **higher** one's objective knowledge on recycling battery packs, the **more positive** the attitude towards dropping off used, removable battery packs at a BEBAT collection point as soon as possible. (+)

H2: The **more positive** one's attitude, the **higher** the intention of dropping off used, removable battery packs at a BEBAT collection point as soon as possible. (+)

H3: The **more** one has properly recycled electronic waste streams in the past, the **higher** the intention of dropping off used, removable battery packs at a BEBAT collection point as soon as possible. (+)

H4: The **more** one feels morally obliged to recycle battery packs, the **higher** the intention of dropping off used, removable battery packs at a BEBAT collection point as soon as possible. (+)

H5: The **more** one perceives recycling battery packs as a socially desirable action by peers, the **higher** the intention of dropping off used, removable battery packs at a BEBAT collection point as soon as possible. (+)

H6: The **more** one perceives the positive consequences of recycling battery packs as being present, the **higher** the intention of dropping off used, removable battery packs at a BEBAT collection point as soon as possible. (+)

H7: The **more** one feels in control of the process of carrying out battery pack recycling, the **higher** the intention of dropping off used, removable battery packs at a BEBAT collection point as soon as possible. (+)

H8: The lack of a habit of dropping off battery packs at a BEBAT collection point mediates the influence of past behavior on the intention of dropping off used, removable battery packs at a BEBAT collection point as soon as possible. (-)

H9: The **more** people think that BEBAT is highly effective in stimulating people to recycle battery packs, the **lower** the influence of subjective norms on the intention of dropping off used, removable battery packs at a BEBAT collection point as soon as possible. (-)

H10: The **more** people think that BEBAT is highly effective in stimulating people to recycle battery packs, the **lower** the influence of perceiving the positive consequences of recycling battery packs as being present on the intention of dropping off used, removable battery packs at a BEBAT collection point as soon as possible. (-)

Using structural equations modelling (SEM) the underlying relationships between latent variables, measured indirectly by indicator variables can be assessed. The term "structural equation model" most commonly refers to a combination of two things: a "measurement model" that defines latent variables each being measured by one or more observed indicator variables, and a "structural model" that links the latent variables together. The two parts of a structural equation model are linked together by a

system of simultaneous regression equations. Within SEM one of 2 approaches can be chosen depending on the objectives of the research. Covariance based SEM is used to confirm or reject theories, whereas PLS-SEM is used when theory is less developed. In this research, PLS-SEM is chosen, because no former study has been executed. Additionally, PLS-SEM offers the following advantages: (1) it can handle formative, reflective, and single-item measurement scales, (2) it makes virtually no assumptions about the distribution of the data, (3) it does not require large sample sizes, (4) it allows for estimating higher order models, and (5) it works better for complex models, i.e. when the focus is on the interrelationships among a large set of factors and in case of many manifest variables (Chin and Newsted, 1999, Chin, 2010). PLS-SEM is an ordinary least squares (OLS) regression based method. The estimation procedure estimates the structural path coefficients that maximize the R^2 values of the target endogenous latent variables while accounting for measurement error. The sequence of latent variables in a SEM-model is based on theory, logic, or practical experiences observed by the researcher. Typically measurement approaches are used that are validated by prior research. Besides, explaining target latent variables, PLS-SEM also allows testing for differences between identical models for different subsamples divided using a categorical variable (Hair et al., 2013). Hence, the goal of this research is not only to find out the latent drivers and barriers to battery pack drop-off intention, but also to reveal if and where heterogeneity in relationships is present. All estimations and tests are performed using the statistical software program IBM SPSS version 22.0 and SmartPLS 2.0.

3. Data and context

In order to collect the necessary input to perform the PLS-SEM analyses, first, an online survey was designed by the authors of this report. The survey consisted of an opening page and five different sections, being:

(1) **Screening & profiling**: In this section it was decided whether or not to allow respondents to participate in the survey. For instance, individuals working in the battery sector were denied access. Hereafter, the respondents were profiled based on socio-demographical charasteristics, such as gender, household size, and education.

(2) **Introduction:** in a second phase they were carefully explained what the desired behavior entails. In this study the desired behavior was defined as: dropping off unneccesary, removable battery packs to a BEBAT collection point as soon as possible. To assure full understanding, it was verified whether the provided definitions of 'unneccesary and 'removable' were memorized by the respondents. In case they did not reveal full understanding of the desired behavior, the definitions provided earlier were repeated once more, before being able to continue.

(3) **Opinion**: In a third section the respondents were asked to fill in several previously validated 7-point Likert scales, whose scores give rise to the indicator variables (see rectangular shapes in Figure 3) that shape all of the latent variables under revision (see circles in Figure 3), except for objective knowledge and past behavior.

(4) **Knowledge and past behavior**: In a fourth section, respondents' objective knowledge on recycling battery packs was verified. Based on the responses a knowledge index was created, which was used as a single-item measurement. Additionally, respondents were asked to describe their past battery pack recycling behavior. If they did not drop off the majority of unnecessary, removable battery packs to a BEBAT collection point in the past, a set of more qualitative questions followed to find out why and how to persuade them to do so in the future. Additionally, respondents past recycling behavior of all types of household electronic waste was assessed. The scores on this series of questions gives rise to the indicator variables measuring the latent variable past behavior.

(5) **Environment**: In the final section, respondents' pro-environmental orientation was assessed using a previously validated scale.

The complete survey (i.e. Dutch version) is available in Appendix A. Note that the answer possibilities of some questions were randomized in order to prevent order effects.

Next, in order to obtain a sample of the Belgian population, a marketing research company was hired to carry out the data collection and survey translation into French. The online survey was taken from a panel of respondents during the 11/2014-01/2015 period. In total 1638 respondents aged between 18 and 64 participated in the survey. The primary sampling goal was to collect data that would subsequently allow investigating whether heterogeneity was an issue. We hypothesized that observed heterogeneity could be present in the following features: (1) whether the majority of battery packs was brought back to a BEBAT collection point (yes/no), (2) whether the living area is a rural or urban environment, and (3) what lifestage the respondent is in (young adult; family -12; family +12; medior; senior). As guidelines dictate that the minimum sample size is obtained by multiplying the maximum amount of arrowheads pointing at a latent variable times 10, 70 respondents are required per subgroup in our study. An overview of the obtained subgroup sample sizes is given in Table 1.

Table 1.   *Subgroup sample sizes (# respondents)*

Battery pack = No			Battery pack = Yes		
	Living area			Living area	
Lifestage	*City*	*Rural*	**Lifestage**	*City*	*Rural*
Young adult	98	85	*Young adult*	69	73
Family -12	73	87	*Family -12*	54	67
Family +12	102	87	*Family +12*	100	94
Medior	86	88	*Medior*	93	91
Senior	50	62	*Senior*	89	90

The respondents' mean age is 45. The youngest respondent was 18 years old and the oldest 79. The percentage of Dutch speaking respondents is 57%, the remaining respondents are French speaking. The majority (i.e.almost 42 %) of the respondents' households consists of 2 people. The percentage of respondents with a family size of 1, 3, 4 and 5 respectively amounts to about 19%, 18%, 14% and 6%. Only 2% of respondents indicate to have a family size of over 5 members. Almost 60% of respondents had no kids. Only 17% of respondents has kids under the age of 12 and 23% has kids older than 12. The number of respondents living in the city and rural area are equally divided. Also the number of respondents that brought battery packs back to a BEBAT collection point are roughly the same. From the respondents, 60% is living in Flanders, 32% is living in the Walloon part of Belgium and 8% is living in Brussels. In Table 2 and Table 3 the distribution of respondents' education level and income can be found. Almost 46% has a more than parttime job, whereas 7% has a parttime job. The percentage of respondents on retirement is equal to 21%. The percentage of students, housewife/man, unemployed and disabled is respectively 9%, 7%, 5% and 5%.

Table 2.   Education level respondents

Category	Percentage
Primary school	3.1%
Secondary school (general)	23.3%
Secondary school (technical and art)	28.3%
Higher education	31.6%
University	13.7%

Table 3.   Income level respondents

Income (€/month)	Percentage
0	3.4%
<500	0.7%
500-1499	21.3%
1500-2499	31.0%
2500-3499	24.4%
3500-4499	14.2%
4500-6000	4.0%
>6000	1.1%
Missing	19.0%

4. Results

4.1 Descriptive statistics

In this section the results of the different parts (i.e. opinion, knowledge and past behavior, and environment) of the survey will be described.

4.1.1 Opinion

In the first part of the survey statements are given to the respondents that gauge what encourages or deters them from bringing their removable battery packs to a collection point of BEBAT as soon as these are unnecessary.

The majority of the respondents indicate that bringing their battery packs to a collection point of BEBAT is good, useful, satisfying, responsible, smart, and safe. This indicates that the general attitude towards the collection of battery packs is positive.

Next, the respondents were given different statements concerning the consequences of collecting removable battery packs. The majority of the respondents disagreed with the statement that collecting the batteries would save them money. Concerning the statement that collecting the removable battery packs would lower chances of accidents at home, the opinions were more divided. An overview of the responses on the different statements can be found in Table 4.

Table 4.   Respondents' answer about consequences

	Totally disagree		Neutral				Totally agree
I save money.	14.3%	5.5%	6.7%	38.8%	10.1%	8.4%	16.3%
I contribute to the world for future generations.	0.7%	0.7%	1.0%	8.2%	11.5%	19.5%	58.5%
I help protecting the environment.	0.7%	0.2%	1.0%	6.2%	8.6%	18.0%	65.2%
I help to reduce the amount of waste.	0.9%	1.0%	1.6%	12.1%	11.1%	18.6%	54.7%
I lower the chance of accidents in my house.	3.5%	3.4%	4.5%	24.3%	15.1%	17.1%	32.1%
I am a good example for my children.	0.9%	0.3%	0.9%	11.7%	9.0%	17.4%	59.7%

Most of the respondents (i.e. 81.2%) think it is wrong if they didn't bring their used removable battery packs to a collection point of BEBAT. Furthermore, the majority of the respondents indicated they totally agreed with the statement that they would feel guilty (i.e. 40.5%) and would be violating their principles (i.e. 44%) in case they would not bring their unneccary, removable battery packs to a collection point of BEBAT. On the statement that the respondent feels that everyone should bring their used removable battery packs to a collection point of BEBAT 57% of respondents totally agreed. Therefore, in general respondents' moral norms are highly activated.

We calculated an agreement index for the statements concerning the beliefs of others (i.e. subjective norms). The agreement index is calculated as the total percentage of respondents agreeing minus the total percentage of respondents disagreeing with a statement. Based on the agreement index we can conclude that respodents strongly feel that family as well as friends would approve the fact that they bring their used removable battery packs to a collection point of BEBAT. Although most respondents also feel that family and friends would think this behavior is desirable, the opinions are more heterogenous.

The next four statements were chosen to assess respondents' perceived behavioral control (see Table 5). In general it can be concluded that the respondents feel to be in control of the process of dropping off their used removable battery packs at a collection point of BEBAT.

Table 5.   Respondents' answer about perceived behavioral control

	-3	-2	-1	0	1	2	3	
How much control do you have over returning used, removable battery packs to a collection point of BEBAT as soon as these become unnecessary: **Very little**	9.3%	3.0%	3.4%	19.5%	11.1%	19.7%	34.0%	**Very much**
The number of occasions out of your control that can prevent you from returning used, removable battery packs to a collection point of BEBAT as soon as these become unnecessary, are: **Very limited**	23.1%	10.6%	6.8%	33.3%	11.6%	8.6%	6.1%	**Very numerous**

	Totally disagree						Totally agree	
You have the feeling that, when you want, you could return your used, removable battery packs to a collection point of BEBAT as soon as these become unnecessary.	1.3%	1.0%	1.6%	17.4%	14.6%	22.0%	42.0%	
To you returning used, removable battery packs to a collection point of BEBAT as soon as these become unnecessary, is:	1.9%	1.5%	3.5%	17.7%	14.0%	19.9%	41.5%	

(Note: left label "Totally disagree" / "Difficult"; right label "Totally agree" / "Easy")

The next statements address respondents' lack of habit concerning the collection of battery packs. Responses are given in Table 6.

Table 6.   Respondents' answer about respondents' lack of habit

	Totally disagree		Neutral				Totally agree	Agreement Index
I usually try to sell used, valuable devices, including removable battery packs or return them for a financial compensation (e.g. discount when buying a new device).	22.6%	10.7%	6.3%	23.3%	16.2%	11.4%	9.5%	-2
I usually save old, used devices, including removable battery packs, as a back-up device.	27.8%	12.7%	10.0%	20.1%	15.3%	8.7%	5.4%	-21
I usually return used devices, including removable battery packs, to another collection point (e.g. RECUPEL) without receiving financial compensation.	10.2%	6.0%	5.0%	28.4%	17.7%	15.0%	17.7%	29
Removable battery packs could be collected more efficiently in my household.	18.2%	9.7%	7.1%	29.1%	14.9%	12.5%	8.5%	1

I often forget to return battery packs that were already removed from the device to a collection point.	31.6%	15.8%	10.2%	18.5%	11.4%	6.9%	5.7%	-34

The majority of the respondents indicate that BEBAT is effective in facilitating the collection of unnecessary, removable battery packs. The agreement index for all four statements are positive and above 55 as shown in Table 7.

Table 7.   Respondents' answer about the role of BEBAT

	Totally disagree		Neutral				Totally agree	Agreement Index
BEBAT provides clear guidelines for collecting removable battery packs.	2.0%	2.6%	4.4%	20.9%	19.0%	23.9%	27.2%	61
BEBAT clearly shows the (environmental) benefits of recycling removable battery packs.	1.8%	2.1%	4.0%	20.8%	18.8%	23,.%	29.2%	63
BEBAT encourages me to return removable battery packs during my next visit to a BEBAT collection point.	2.3%	3.3%	4.1%	22.9%	19.4%	20.6%	27.4%	58
BEBAT's current facilities are sufficient in facilitating the collection of removable battery packs.	2.0%	2.9%	7.5%	20.7%	19.0%	21.6%	26.4%	55

The last question in this section of the survey asked for respondents' intentions towards the recycling of used removable battery packs. It can be concluded that the intentions to recycle the batteries is very high for the majority of the respondents with more than 43% of the respondents totally agreeing with the different statements.

4.1.2 Knowledge

In the fourth section of the survey, questions were asked to gauge for the respondents' general knowledge level concerning the collection of battery packs.

The majority of the respondents (i.e. 63.3%) answered that they are not legally obliged to sort batteries. Also, 84% of the respondents indicated not to be legally required to return used, removable battery packs to BEBAT. Only 28.7% of respondents answered that they already pay a fee to sustain the current collection system of BEBAT. Almost 91% of the respondents is aware that no charge can

be asked at the collection point when returning used, removable battery packs that are in good condition.

More than 90% of the respondents know that both batteries and rechargeable batteries are collected by BEBAT. Most respondents also know that button cells, mobile phone batteries and laptop batteries can be returned to a collection point of BEBAT. Only 55.9% and 51.8% of the respondents are aware that respectively battery packs of drills and electric bikes are collected by BEBAT. More than 75% of the respondents indicated that ink cartridges, battery chargers and mobile phone' chargers cannot be returned to a BEBAT collection point.

We also asked the respondents where a collection point of BEBAT can be found. Table 8 shows the answer to this question. Remarkable is that most respondents don't know that batteries can also be collected in schools and toy stores.

Table 8.   Respondents' answer about battery collection points

	Yes	No
Supermarkets	82.3%	17.7%
Recycling center	88.6%	11.4%
Schools	31.3%	68.7%
DIY stores	59.8%	40.2%
Toy stores	27.6%	72.4%
Electronics retailer	65.5%	34.5%
Restaurants	5.5%	94.5%

The last question to assess the respondents' knowledge level was whether they could indicate in which devices a removable battery pack could be found. The majority of the respondents answered that in all of the devices a removable battery pack could be incorporated (see Table 9). However, this is only true for 8 out of the 15 devices.

Table 9.   Respondents' answer about removable battery packs' presence

	Yes	No
Digital cameras	85.6%	14.4%
Powertools	68.7%	31.3%
Gardening tools	59.5%	40.5%
Portable DVD player	72.2%	27.8%
Wireless headphones	56.2%	43.8%
Remote controled toy car	78.6%	21.4%
Portable game consoles	79.6%	20.4%
Wireless vacuum cleaner	65.8%	34.2%
Electric toothbrush	63.3%	36.7%
Shaver	65.9%	34.1%
GPS	58.7%	41.3%

Hearing aid	64.9%	35.1%
Remote control	76.0%	24.0%
Balance	69.8%	30.2%
Smoke detector	68.1%	31.9%

4.1.3 Past behavior

In this section we discuss the answers provided by the respondents on the questions related to their past behavior involving the collection of removable battery packs.

Regarding the question whether the respondents brought the majority of their used, removable battery packs to a collection point of BEBAT in the past, almost 78% answered positively. We also asked what the top three barriers were that caused people not to bring their majority of battery packs to a collection point. We found that the following reasons were provided the most:

(1) I returned the majority of my used devices, including battery pack, to the original selling point or passed it to a third person without financial return.
(2) I didn't know where the collection points for removable battery packs were.
(3) I didn't know that removable battery packs could be collected separately.

Next we asked the respondents whether something could make them return their used, removable battery packs to a BEBAT collection point. The following actions could be taken by BEBAT:

(1) A label on the device as a reminder to the removable battery pack.
(2) The existence of a combined collection point of RECUPEL and BEBAT on the same location. Here both residue streams can be collected separately (i.e. the device and the battery pack).
(3) Information about why it is useful to separately collect removable battery packs.

Note that the third action was given by fewer respondents in comparison with the first two actions.

Almost 70% of the respondents answered to bring their used, removable battery packs to a collection point of BEBAT less than 4 times per year. Also, 75% of the respondents answered that they would not change this frequency. The number of battery packs that were brought to a collection point per visit highly differs between the respondents.

The final questions, gauged for the respondent's past behavior concerning the collection of various types of electronic household waste. These were used as indicator variables for the latent variable 'past behavior'. The answers are provided in Table 10.

Table 10.   Respondents' answer about collection habits: how often do you bring

		-3	-2	-1	0	1	2	3	
Electric and electronic devices to a collection point of RECUPEL:	**Never**	6.9%	2.8%	3.1%	17.4%	16.8%	16.5%	36.5%	**Always**
Lose batteries to a collection point of BEBAT:	**Never**	2.3%	0.7%	0.8%	7.1%	11.2%	18.7%	59.1%	**Always**
Lose rechargeable batteries at a collection point of BEBAT:	**Never**	6.0%	2.0%	2.6%	11.8%	12.5%	15.7%	49.4%	**Always**
Button cells to a collection point of BEBAT:	**Never**	5.5%	1.9%	2.3%	14.6%	13.2%	14.8%	47.7%	**Always**
Battery packs to a collection point of BEBAT:	**Never**	7.7%	2.6%	3.1%	16.3%	16.1%	13.7%	40.5%	**Always**

4.1.4 Environment

In the last section of the survey, statements were provided to the respondents to assess their pro-ecological worldview. The revised new environmental paradigm scale of Dunlap et al. (2000) was used in order to measure this. Answers are provided in Table 11. In case of a strictly pro-ecological view the agreement index should have an alternating positive and negative sign.

Table 11.   Respondents' answer to new environmental paradigm scale

	Totally disagree			Neutral			Totally agree	Agreement Index
We are approaching the limit of the number of people the earth can support.	2.4%	2.4%	4.4%	24.3%	19.5%	20.6%	26.4%	57
Humans have the right to modify the natural environment to suit their needs.	13.5%	11.7%	15.1%	28.9%	17.5%	7.5%	5.7%	-10
When humans interfere with nature it often produces disastrous consequences.	1.6%	1.7%	3.4%	18.5%	21.4%	23.6%	29.9%	68
Human ingenuity will insure that we do not make the earth unlivable.	10.2%	9.5%	11.0%	29.4%	19.7%	11.3%	8.9%	9
Humans are severely abusing the environment.	1.7%	1.6%	3.3%	14.9%	22.0%	23.3%	33.2%	72
The earth has plenty of natural resources if we just learn how to develop them.	15.4%	12.5%	13.0%	22.3%	14.7%	11.8%	10.3%	-4

Statement								
Plants and animals have as much right as humans to exist.	0.7%	0.9%	2.2%	11.6%	11.8%	20.5%	52.3%	81
The balance of nature is strong enough to cope with the impacts of modern industrial nations.	26.4%	19.5%	16.3%	18.1%	9.3%	5.2%	5.1%	-43
Despite our special abilities humans are still subject to the laws of nature.	0.5%	0.6%	1.5%	13.1%	15.0%	25.6%	43.6%	82
The so-called 'ecological crisis' facing humankind has been greatly exaggerated.	23.0%	17.0%	14.6%	21.2%	11.6%	6.6%	6.0%	-31
The earth is like a spaceship with very limited room and resources.	2.4%	1.6%	2.8%	20.7%	19.8%	22.7%	30.0%	66
Humans were meant to rule over the rest of nature.	21.2%	11.1%	12.3%	26.1%	13.4%	8.5%	7.2%	-16
The balance of nature is very delicate and easily upset.	0.9%	0.7%	2.3%	14.4%	18.8%	23.9%	39.0%	78
Humans will eventually learn enough about how nature works to be able to control it.	14.2%	10.4%	13.4%	28.8%	16.8%	9.6%	6.9%	-5
If things continue on their present course, we will soon experience a major ecological catastrophe.	2.2%	1.6%	4.4%	21.4%	23.0%	19.9%	27.3%	62

Given the signs of the agreement index it can be concluded that the majority of the respondents had a pro-ecological worldview. Only for the statement 'Human ingenuity will insure that we do not make the earth unlivable.' we find a positive sign, whereas we would have expected a negative sign. However, it should be noted that a large proportion of the respondents gave a neutral answer to this question.

4.2 PLS-SEM

Having obtained detailed information on various indicators, PLS-SEM is performed to gain understanding of the relationship between the different latent variables or constructs (i.e. unobservable variables). SEM allows to simultaneously estimate the structural and measurement model. The structural model describes the relationships between the latent variables, whereas the measurement model describes the relationship between the indicators and the latent variables. Note that the indicators measure the latent variables.

The latent variables 'Past behavior', 'Consequences', and 'Perceived behavioral control' are assumed to be formative, whereas the latent variables 'Attitude', 'Subjective norm', 'Moral norm', Intention', and 'Objective knowledge' are defined as being reflective. Formative indicators are multidimensional in nature (i.e. a change in one indicator is not necessarily associated with a change in another indicator of that latent variable), whereas reflective indicators are unidimensional and thus highly correlated. An overview of the characteristics of reflective and formative latent variables is provided by (Jarvis et al., 2003). It is crucial to correctly define the relationship between the latent variables and its indicators in order to avoid biased parameter and standard error estimates for the structural model and inflated type II errors (MacKenzie et al., 2005).

An overview of the structural equation model is provided in Figure 3. The model is first estimated without moderating effects. These effects are tested after the structural and measurement model are estimated and confirmed and mediation is verified. A mediator is a variable that influences the strength or even the sign of a path coefficient which depends on the predictor variable. A moderator is a variable that influences the strength or even the sign of a path coefficient which does not depend on the predictor variable. Path coefficients are standardized values and represent the strength of the relationship between latent variables.
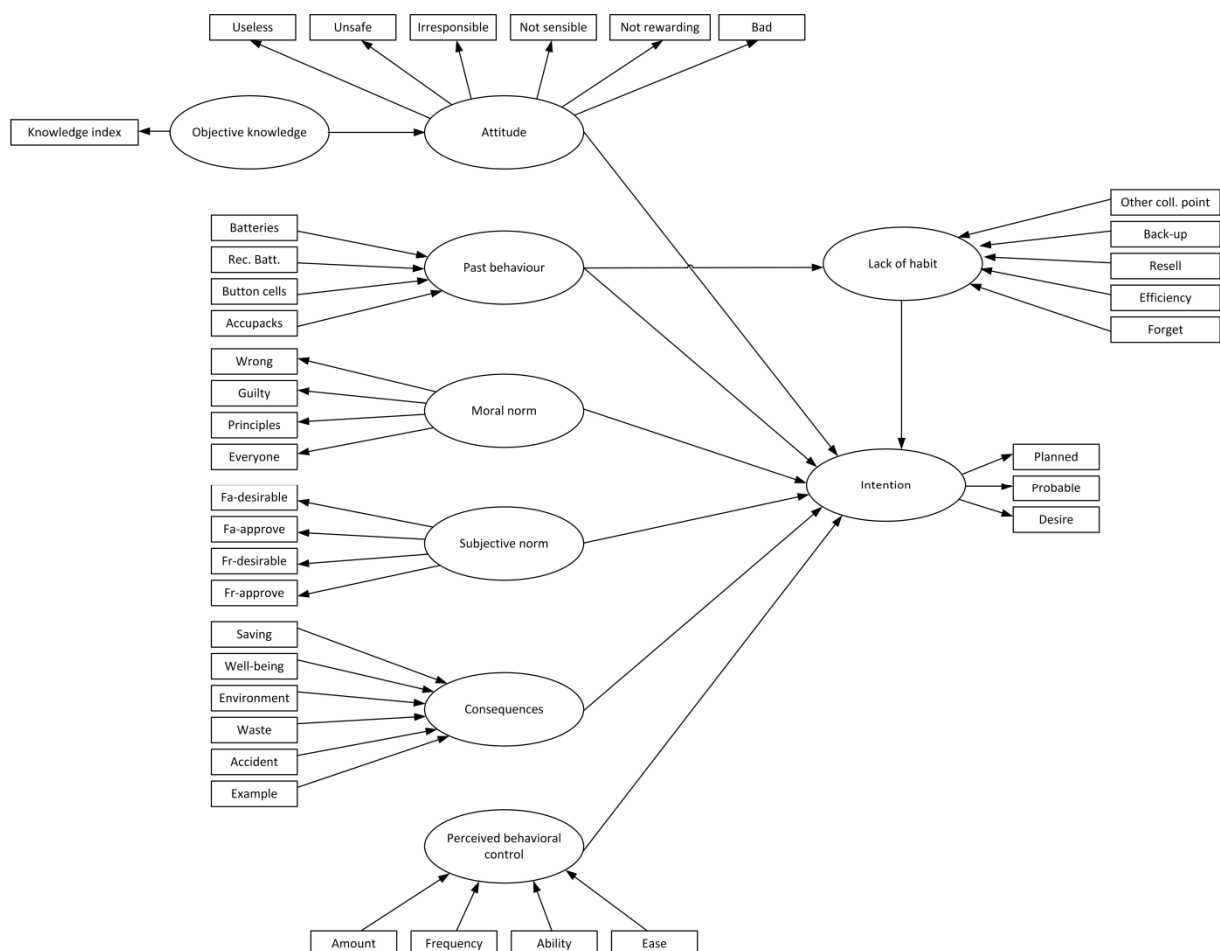
Figure 3.   Structural equation model

The results of the structural equation model are provided in Figure 4. However, these result cannot be interpreted yet. First, it should be tested whether the measurement and structural model are adequate and only then can one turn to verifying the significance of the obtained results. In the next sections, we will hence first discuss the results of the evaluation of the reflective measurement models. After that, we will show the results of the formative measurement models. Section 4.2.3 will contain the evaluation of the structural model and mediating effects. Afterwards, when the model is confirmed, we will evaluate the moderating effects in section 4.2.4. Finally, observed heterogeneity will be tested in section 4.2.5.
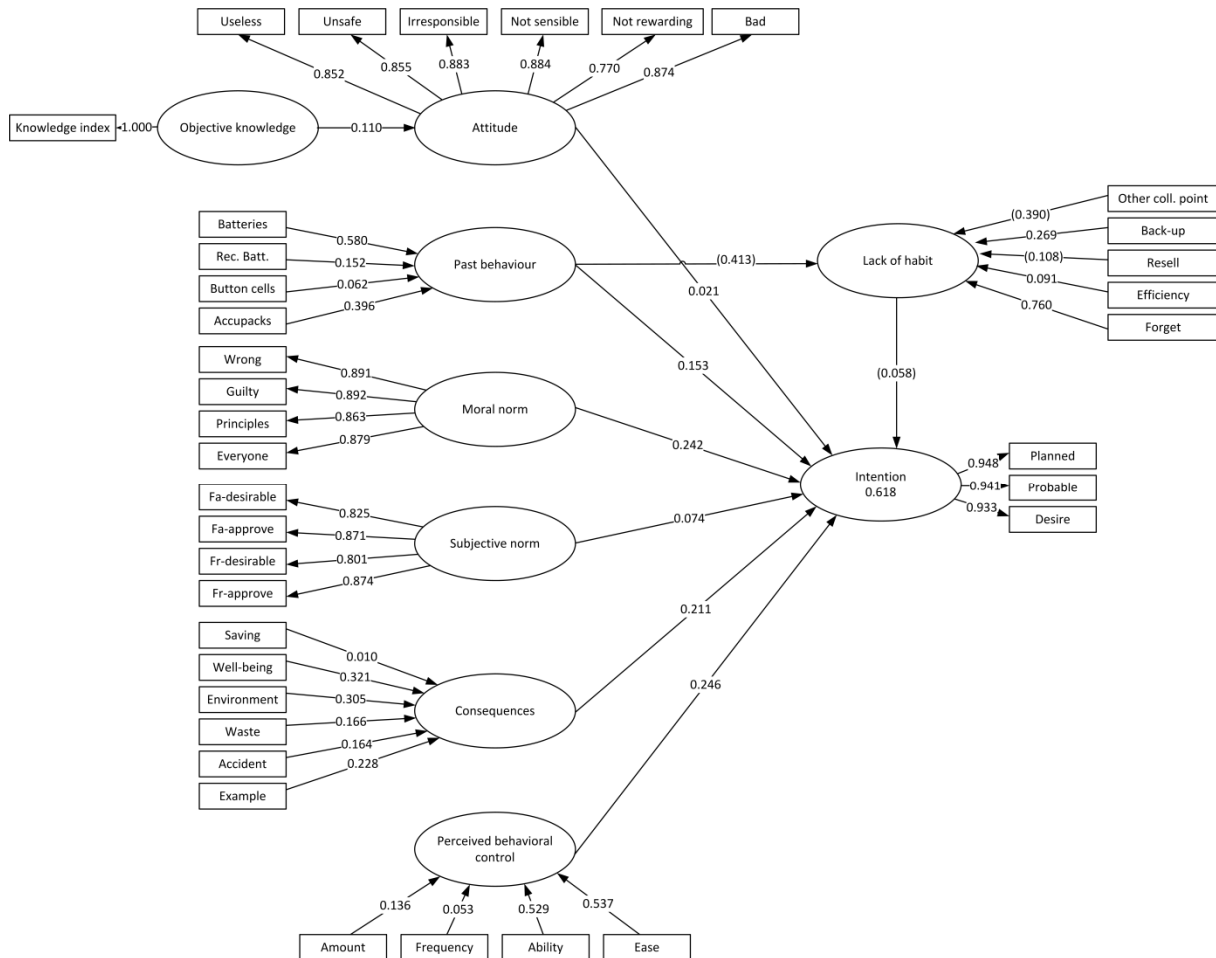
Figure 4.   Structural equation modeling results

4.2.1 Evaluation of reflective measurement models

When evaluating reflective measurement models, different aspects have to be tested, being: (1) indicator reliability, (2) construct reliability, (3) convergent validity, and (4) discriminant validity.

The <u>indicator reliability</u> specifies the part of an indicator's variance that can be explained by the underlying latent variable. At least 50% of an indicator's variance should be explained by the latent variable (i.e. loading above 0.70). For the <u>construct reliability</u> the composite reliability is used. Cronbach's alpha could also be used, but this measure is sensitive to the number of items in the scale

and is more conservative. Values for the composite reliability above 0.60 are acceptable for exploratory research. The <u>convergent validity</u> measures the extent to which a measure correlates positively with alternative measures of the same construct. Both the outer loadings and average variance extracted (AVE) can be used to test this. The outer loadings should be higher than 0.70. The AVE is calculated as the sum of the squared loadings divided by the number of indicators. An AVE of less than 0.5 is considered insufficient, because more variance is due to error variance than to indicator variance. Finally, <u>the discriminant validity</u> represents the extent to which a construct is distinct from other constructs, i.e. unique. The cross loadings may not exceed the indicators' outer loadings and the Fornell-Larcker criterion has to be met. The latter compares the square root of the AVE values with the latent variable correlations.

It can be concluded that all criteria are met. An overview of the results of the overall reflective measurement model is provided in Table 12.

Table 12.   Estimation results and psychometric properties of reflective measurement models

Latent variable	Indicator	Loadings	Indicator reliability	Composite reliability	AVE	Discriminant validity
Attitude	Useless	0.852	0.726			
	Unsafe	0.855	0.731			
	Irresponsible	0.883	0.780	0.942	0.729	yes
	Not sensible	0.884	0.781			
	Not rewarding	0.770	0.593			
	Bad	0.874	0.764			
Moral norm	Wrong	0.891	0.794			
	Guilty	0.892	0.796	0.933	0.776	yes
	Principles	0.863	0.745			
	Everyone	0.879	0.773			
Subjective norm	Fa-desirable	0.825	0.680			
	Fa-approve	0.871	0.759	0.908	0.711	yes
	Fr-desirable	0.801	0.642			
	Fr-approve	0.874	0.764			
Intention	Planned	0.948	0.898			
	Probable	0.941	0.886	0.958	0.885	yes
	Desire	0.933	0.870			

4.2.2 Evaluation of formative measurement models

Formative latent variables require a different evaluation of the measurement model as indicators are not supposed to be correlated. For formative measures we assessed the indicator reliability. Convergent and discriminant validity do not have to be evaluated since indicators do not have to be strongly interrelated.

Indicator reliability is examined by verifying whether high correlations exists between indicators. The variance inflation factor (VIF) is used to check whether multicollinearity poses a problem. The VIF should not exceed a value of 10. Using a bootstrapping procedure it is also evaluated which indicators are significant and relevant. The null hypothesis, stating that an outer weight equals zero (i.e. has no significant effect), is rejected when the interval does not include zero. When it seems that indicators are not significant, these are further investigated. In case the outer loadings of these indicators are significant, it can be opted to keep the indicator in the model.

The results of the overall formative measurement models are provided in Table 13. Based on the results, it is decided to keep all indicators within the model.

In order to check for construct reliability it is suggested to use a general question, which might be considered reflective, related to each of the formative constructs in order to evaluate formative measurement model's external validity. However, no question is taken into account in our survey as the questionnaire is already perceived as being quite long. As a consequence, the external validity of the formative constructs was not evaluated.

Table 13.   Results bootstrapping procedure

Latent variable	Indicator	Outer weights (outer loadings)	Significance level (* .10 ** .05 ***.01)	Confidence interval (10%)
Past behavior	Batteries	0.580 (0.905)	***	[0.493;0.667]
	Rec. Batt.	0.152 (0.732)	***	[0.072;0.232]
	Button cells	0.062 (0.733)	NS	[-0.023;0.147]
	Accupacks	0.396 (0.804)	***	[0.313;0.479]
	Saving	0.010 (0.296)	NS	[-0.043;0.063]
Consequences	Well-being	0.321 (0.925)	***	[0.196;0.446]
	Environment	0.305 (0.917)	***	[0.174;0.436]
	Waste	0.166 (0.795)	***	[0.079;0.253]
	Accident	0.164 (0.597)	***	[0.092;0.236]
	Example	0.228 (0.839)	***	[0.121;0.335]
Perceived behavioral control	Amount	0.136 (0.461)	***	[0.079;0.193]
	Frequency	0.053 (0.875)	*	[0.004;0.102]
	Ability	0.529 (0.868)	***	[0.446;0.612]
	Ease	0.537 (0.319)	***	[0.458;0.616]
Lack of habit	Other coll. Point	-0.390 (0.648)	***	[-0.472;-0.308]
	Back-up	0.269 (0.648)	***	[0.170;0.368]
	Resell	-0.108 (0.193)	**	[-0.191;-0.025]
	Efficiency	0.091 (0.512)	NS	[-0.004;0.186]
	Forget	0.760 (0.889)	***	[0.664;0.856]

4.2.3 Evaluation of the structural model

The main focus of a structural model in PLS-SEM analysis is on the predictive power in terms of variance explained, as well as on the significance of all path coefficients. To assess the hypotheses accompanying the various path coefficients, a bootstrapping procedure is again used to obtain the standard errors. The results of this procedure are shown in Figure 5.
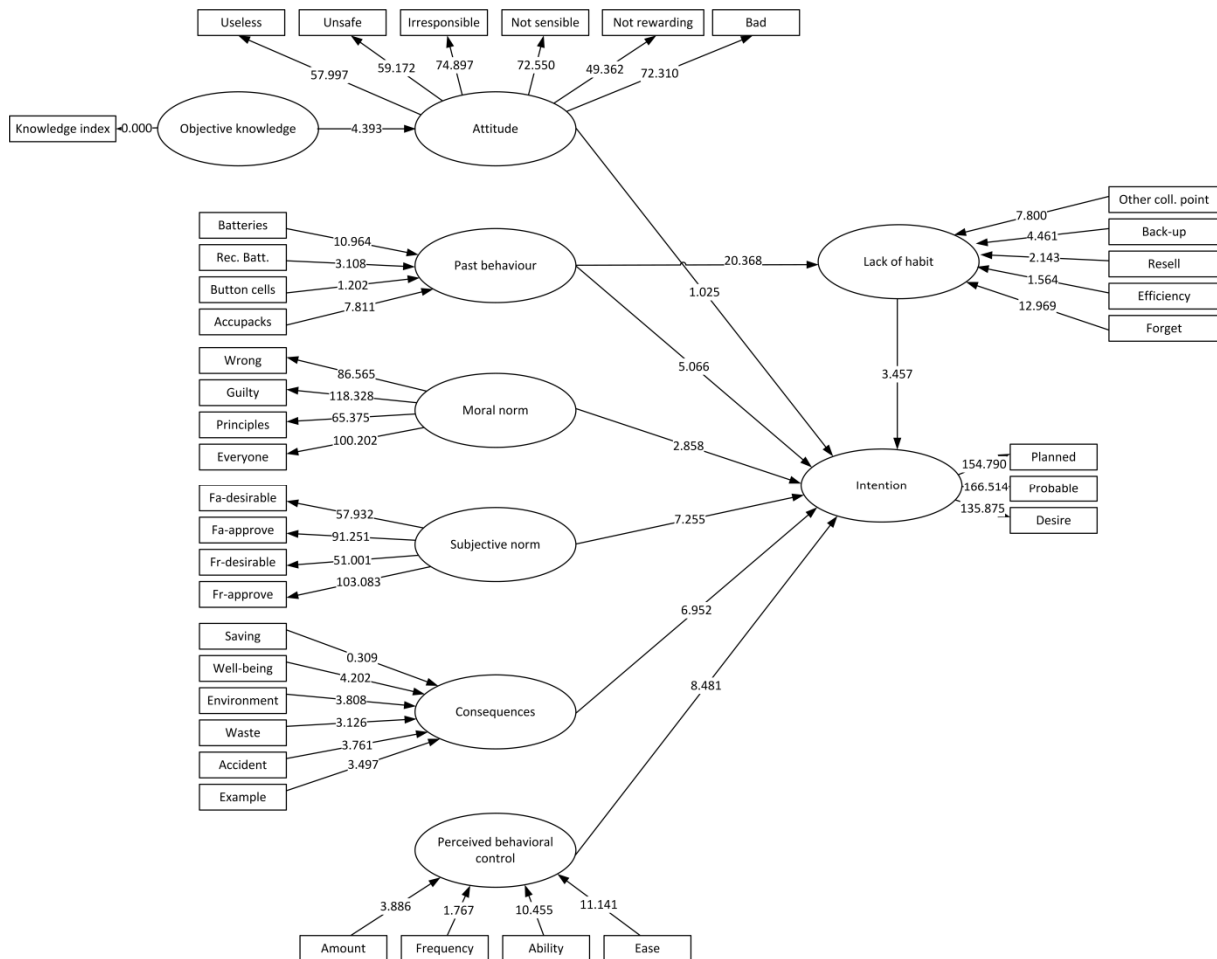

Figure 5.   Structural equation modeling bootstrapping results

In order to evaluate the structural model, the predictive accuracy is estimated, the relationships between latent variables is analysed, the effect size f^2, and the predictive relevance of the path model is interpreted, as well as the effect size q^2.

The model's predictive accuracy is evaluated using the R^2 values of the endogenous construct (i.e. intention). There is a lot of discussion about rules of thumb for acceptable R^2 values because they depend on the model's complexity and the research discipline. According to (Chin, 1998), R^2 values of 0.67, 0.33 and 0.19 can be considered as respectively strong, moderate and weak. It can be concluded that the R^2 value in our study (i.e. 0.62) is moderate to strong. To test for the R^2's significance, a bootstrap confidence interval is calculated by using the equation described in (Tenenhaus et al., 2005). The R^2 90% bootstrap confidence interval amounts to [0.39,0.74].

The significance of the relationship between the latent variables is analyzed using a bootstrapping procedure. All relationships are significant and positive, except for the relationship between 'attitude' and and 'intention'. Hence, the hypotheses H1 and H3 to H7 are confirmed.

The impact of omitting an exogenous construct on the R^2 value of the endogenous constructs can be evaluated. As such, the contribution of each exogenous construct in terms of explanatory power can be compared. The measurement is referred to as the f^2 effect size, with values of 0.02, 0.15 and 0.35 indicate the latent exogenous variable's weak, moderate or substantial influence on the latent endogenous variable (Cohen, 2013). It is concluded that the exclusion of one of the exogenous variables has no or only a weak effect on the R^2 value of intention.

In the following step a blindfolding procedure is run to have an idea of the predictive relevance of the path model. From the procedure in SmartPLS the Stone-Geisser's Q^2 value is obtained (Geisser, 1974). The Q^2 value for intention amounts to 0.54 which means the model has predictive relevance for intention. The relative impact of exogenous constructs can be compared by means of the q^2 effect size. Similarly, the q^2 effect size is lacking or weak for all exogenous variables.

4.2.4 Evaluation of moderating effects

A continuous moderator is a continuous variable that influences the strength or even the sign of a path coefficient. In this work the effects of the perceived policy effectiveness of BEBAT on consequences and subjective norms were investigated by means of the two-stage approach. The results of the estimation procedure on the model used in the second step of the approach are shown in Figure 6. Similarly, bootstrapping is performed to allow making statements about the path coefficients' significance. This led to the conclusion that the only significant moderating effect is that of the perceived policy effectiveness on the weight of the subjective norms. Hence, only hypothesis H10 is confirmed.
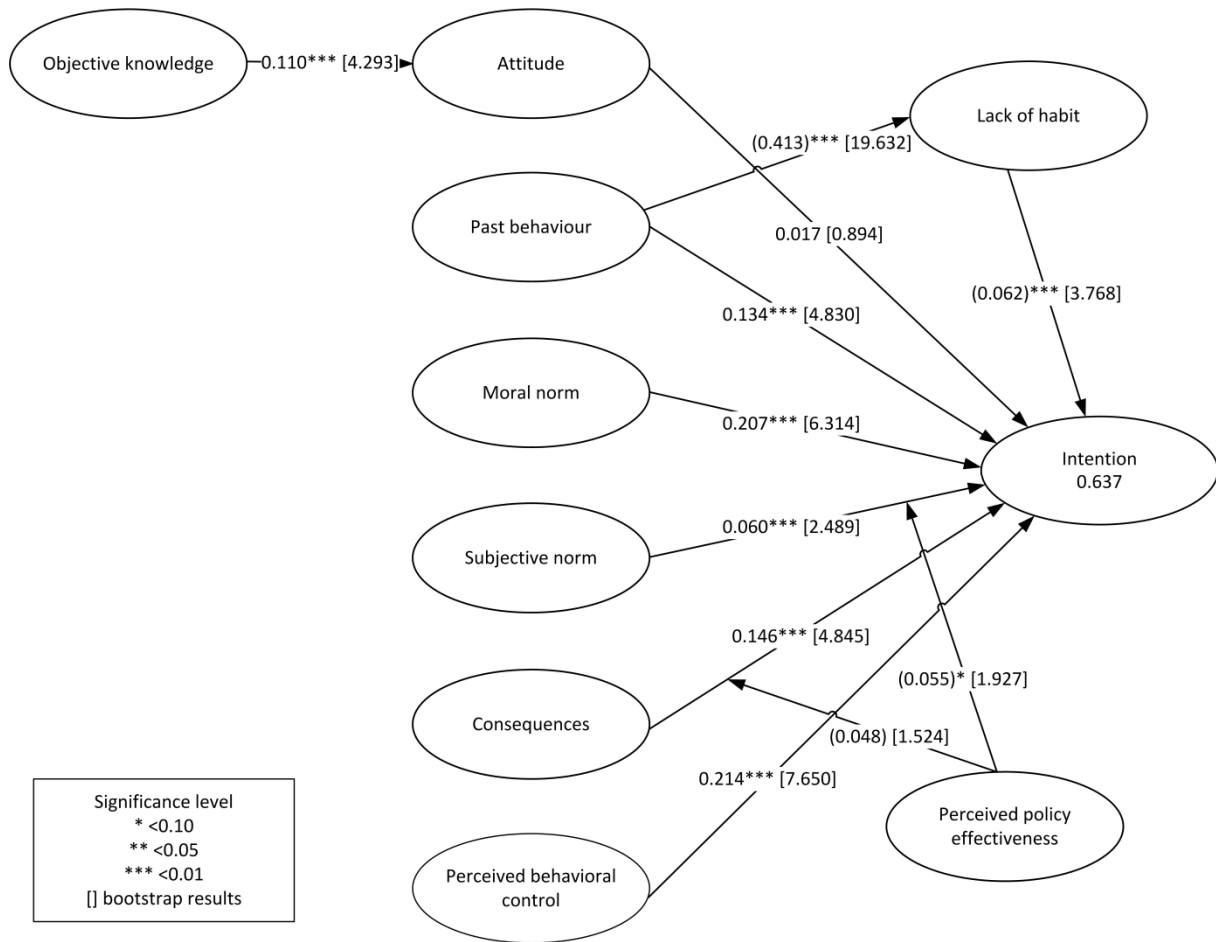
Figure 6. Structural equation modeling with moderating effects

4.2.5 Evaluation of observed heterogeneity

A multi-group analysis (MGA) is used to assess the impact of observed (categorical) variables, such as lifestage, living area, and past drop-off behavior, on the estimated path coefficients. Observed heterogeneity exists when significant differences are found between path coefficients when dividing the dataset into subgroups based on observed features. Seeing that PLS-SEM does not make any distributional assumptions, a non-parametric approach is used to test for differences between subgroups (Henseler, 2012). Such an analysis is meant to reveal the pitfalls of relying solely on the full sample's results. Nevertheless, it assumes measurement invariance, i.e. we assume that the subgroups do not require a different measurement model. In Table 14 we first present the results of the MGAs when dividing the dataset in subgroups based on a single feature. The p-value expresses the probability that the second subgroup has a larger population parameter than the first subgroup. Hence, if the path coefficient is positive a p-value smaller than 0.10 signals that the first subgroup has the largest impact, whereas a value larger than 0.90 indicates the opposite. In case the path coefficient is negative a p-value smaller than 0.10 signals that the first subgroup has the smallest absolute impact, whereas a value larger than 0.90 indicates the opposite.

Table 14.   Results MGA single feature based subgroups

Observed variable	Subgroup	Number	Significant difference	Sign	p-value
Accupack	Minority	818	Subjective norm -> Intention	+/NS	0.004
	Majority	820	Lack of habit -> Intention	NS/-	0.015
			Objective knowledge -> Attitude	+/+	0.050
Education	Low	895	Attitude -> Intention	+/NS	0.049
	High	743			
Ecological worldviev	Low	835	Moral norm -> Intention	+/+	0.991
	High	803	Past behavior -> Intention	+/+	0.082
			Lack of habit -> Intention	-/NS	0.965
			Objective knowledge -> Attitude	+/NS	0.000
Gender	Female	822	Moral norm -> Intention	+/+	0.090
	Male	816	Objective knowledge -> Attitude	NS/+	0.985
Language	Dutch	940	Subjective norm -> Intention	+/NS	0.025
	French	698	Past behavior -> Intention	+/+	0.0924
			Objective knowledge -> Attitude	+/+	0.993
Living area	City	814	/	/	/
	Rural	824			
Lifestage	Young adult	325	Subjective norm -> Intention	+/NS	0.081
	Familiy -12	281	Moral norm -> Intention	+/+	0.042
			Consequences -> Intention	+/+	0.982
			Objective knowledge -> Attitude	+/+	0.969
Lifestage	Young adult	325	/	/	/
	Family +12	383			
Lifestage	Young adult	325	Subjective norm -> Intention	+/NS	0.066
	Medior	358	Lack of habit -> Intention	NS/-	0.019
			Objective knowledge -> Attitude	+/NS	0.04
Lifestage	Young adult	325	Subjective norm -> Intention	+/NS	0.014
	Senior	291			
Lifestage	Family -12	281	Subjective norm -> Intention	NS/+	0.926
	Family +12	383	Moral norm -> Intention	+/+	0.904
			Consequences -> Intention	+/+	0.044
			Objective knowledge -> Attitude	+/+	0.013
Lifestage	Family -12	281	Consequences -> Intention	+/+	0.037
	Medior	358	Lack of habit -> Intention	NS/-	0.075
			Objective knowledge -> Attitude	+/NS	0.000
Lifestage	Family -12	281	Moral norm -> Intention	+/+	0.965
	Senior	291	Consequences -> Intention	+/+	0.025
			Objective knowledge -> Attitude	+/NS	0.009
Lifestage	Family +12	383	Subjective norm -> Intention	+/NS	0.059
	Medior	358	Lack of habit -> Intention	NS/-	0.010
			Objective knowledge -> Attitude	+/NS	0.032
Lifestage	Family +12	383	Subjective norm -> Intention	+/NS	0.007
	Senior	291			
Lifestage	Medior	358	PBC -> Intention	+/+	0.090
	Senior	291	Lack of habit -> Intention	-/NS	0.952

From the above the following trends can be derived additionally:

- There are only 2 groups without significant differences: city-rural and young adult-family+12.

- Differences are most common in the susceptibility towards objective knowledge, subjective norms, the lack of habit, moral norms, and consequences.

- Objective knowledge significantly differs between many subgroups. However, the attitude -> intention path coefficient is not significant for all of these subgroups.

- Subjective norms have a stronger impact on intention for people not bringing back more than 50% of their battery packs to a BEBAT collection point, for Dutch-speaking people, and for young adults and for families with kids older than 12 compared to families with kids younger than 12.

- Lack of habit has a stronger impact on intention for people not bringing back more than 50% of their battery packs to a BEBAT collection point, for people with a low pro-ecological worldview, and for mediors compared to young adults, families with kids older than 12, and families with kids younger than 12.

- Moral norms have a stronger impact on intention for people having a high pro-ecological worldview, for females, for young adults, for families with kids older than 12, and for seniors compared to families with kids younger than 12.

- Consequences have a stronger impact on intention for families with kids younger than 12 compared to all other lifestage categories.

- The features causing most heterogeneity are: ecological worldview and lifestage (family -12 <-> family +12 & family -12 <->family +12).

- Only the lower educated respondents display a positive relationship between attitude and intention, whereas the other display an insignificant relationship.

- The influence of perceived behavioral control on intention is larger for mediors than for seniors.

5. Discussion

In this study we have verified what the drivers and barriers to battery drop-off intention are and have located which observed characteristics cause significant heterogeneity using an integrative structural model based on the TPB. This implies that the study results presented here are based on self-reported statements. The latter do not necessarily have a high correlation with observed behavior. The strength of the relationship has been found to depend on the product under study, but typically one overestimates the degree to which one displays the desired behavior when self-reporting (Huffman et al., 2014). Hence, further study based on objective measurements of actual behavior is needed to

verify whether our findings hold in such a context. The importance of such a study is supported by the following conclusions that could be drawn from the survey. Almost 78% of the respondents said to bring back the majority of their battery packs to a BEBAT collection point in the past. This might be true, as there is no indication included here of the speed with which the battery packs are brought back. However, at the same time we found that (1) about half of the respondents are unaware that BEBAT collects all types of portable battery packs, (2) almost all respondents struggle to identify the devices that contain removable battery packs, (3) about half of the respondents admit to having the habit of bringing electric and electronic devices and their accupacks to another collection point, and (4) respondents do not perceive themselves as being guilty of hoarding devices including the battery pack or of forgetting to take battery packs with them to a collection point.

Aditionally, we are faced with the rather uncommon finding for TPB models that attitude does not significantly influence intention, except for the lower educated subgroup, if combined with other latent variables. On its own the path coefficient is significant with the expected positive sign. When combined with the other latent variables its significance disappears, however, not due to multicollinearity issues. Hence, further research should explore other types of theories that allow attitude to take on the role of a partial mediator.

6. Conclusion

This research aims to investigate the drivers and barriers to battery pack drop-off intention perceived by Belgian households. It is the first study looking specifically at this specific type of recycling. The gathered information may serve as guidance for the communication strategy of BEBAT, which is the single non-profit organization responsible for collecting, sorting, and recycling of portable batteries in Belgium. To this end, a standardized online survey, which extends the framework provided by the Theory of Planned Behavior (TPB) by incorporating measures on the objective knowledge, the perception of the consequences, moral norms, the lack of habits, and the perceived effectiveness of BEBAT's actions, was made. Data was collected during the 11/2014-01/2015 period and processed using partial least squares structural equation modelling (PLS-SEM). After verifying the adequacy of the measurement and structural model, it allowed verifying the following hypotheses: (H1) objective knowledge - attitude (+), (H3) past behavior - intention (+), (H4) moral norm - intention (+), (H5) subjective norm - intention (+), (H6) consequences - intention (+), (H7) perceived behavioral control – intention (+), (H8) lack of habit mediates, in this case weakens, the influence of past behavior on intention (-), (H9) perceived policy effectiveness negatively moderates the effect of subjective norm on intention (-). Based on the size of the path coefficients we can conclude that perceived behavioral control, moral norm, and consequences have the largest influence on the intention to drop-off battery packs as soon as they become unnecessary. However, a multi-group analysis has revealed that significant differences exist between subgroups made by dividing the full sample based on an observed characteristic. Subgroups were made using the following features: bringing back the majority of battery packst (yes/no) education (high/low), pro-ecological worldview (high/low), gender

(male/female), language (Dutch/French-speaking), living area (city/rural), and lifestage (young adult/family -12/family +12/medior/senior). The characteristics causing most heterogeneity are: ecological worldview and the lifestage: family -12. Moreover, statistically significant differences in path coefficients are regularly found for the latent variables: objective knowledge, subjective norms, the lack of habit, moral norms, and consequences. However, it should be noted that whereas the relationship between objective knowledge is generally significant, the relationship between attitude and intention is not. This is an unusual finding for a model based on the Theory of Planned Behavior. Nevertheless, as the direct effect is significant on its own and there is no multicollinearity issue future research might look into models in which attitude takes on the role of a partial mediator.

7. Bibliography

Aertsens, J., Mondelaers, K., Verbeke, W., Buysse, J. and Van Huylenbroeck, G. (2011). "The influence of subjective and objective knowledge on attitude, motivations and consumption of organic food." British Food Journal **113**(11): 1353-1378.

Ajzen, I. (1991). "The theory of planned behavior." Organizational Behavior and Human Decision Processes **50**(2): 179-211. DOI: http://dx.doi.org/10.1016/0749-5978(91)90020-T.

Bamberg, S. and Möser, G. (2007). "Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour." Journal of Environmental Psychology **27**(1): 14-25.

Chin, W. W. (1998). "The partial least squares approach to structural equation modeling." Modern methods for business research **295**(2): 295-336.

Chin, W. W. (2010). How to write up and report PLS analyses. Handbook of partial least squares, Springer**:** 655-690.

Chin, W. W. and Newsted, P. R. (1999). "Structural equation modeling analysis with small samples using partial least squares." Statistical strategies for small sample research **1**(1): 307-341.

Cohen, J. (2013). Statistical power analysis for the behavioral sciences, Routledge Academic.

Coonen, P. and Peeters, N. (2014). "BEBAT's prior research experience on the human-battery interrelationship." 01/04/2014.

Dunlap, R. E., Van Liere, K. D., Mertig, A. G. and Jones, R. E. (2000). "New trends in measuring environmental attitudes: measuring endorsement of the new ecological paradigm: a revised NEP scale." Journal of social issues **56**(3): 425-442.

EU (2006). "Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC." Strasbourg**:** 1-14.

Geisser, S. (1974). "A predictive approach to the random effect model." Biometrika **61**(1): 101-107.

Hair, J. F., Hult, G. T. M., Ringle, C. and Sarstedt, M. (2013). A primer on partial least squares structural equation modeling (PLS-SEM), SAGE Publications, Incorporated.

Hansmann, R., Bernasconi, P., Smieszek, T., Loukopoulos, P. and Scholz, R. W. (2006). "Justifications and self-organization as determinants of recycling behavior: The case of used batteries." Resources, Conservation and Recycling **47**(2): 133-159. DOI: http://dx.doi.org/10.1016/j.resconrec.2005.10.006.

Henseler, J. (2012). PLS-MGA: A Non-Parametric Approach to Partial Least Squares-based Multi-Group Analysis. Challenges at the Interface of Data Analysis, Computer Science, and Optimization. W. A. Gaul, A. Geyer-Schulz, L. Schmidt-Thieme and J. Kunze, Springer Berlin Heidelberg**:** 495-501.

Huffman, A. H., Van Der Werff, B. R., Henning, J. B. and Watrous-Rodriguez, K. (2014). "When do recycling attitudes predict recycling? An investigation of self-reported versus observed behavior." Journal of Environmental Psychology **38**(0): 262-270. DOI: http://dx.doi.org/10.1016/j.jenvp.2014.03.006.

Jarvis, C. B., MacKenzie, S. B. and Podsakoff, P. M. (2003). "A critical review of construct indicators and measurement model misspecification in marketing and consumer research." Journal of consumer research **30**(2): 199-218.

Karnchanawong, S. and Limpiteeprakan, P. (2009). "Evaluation of heavy metal leaching from spent household batteries disposed in municipal solid waste." Waste Management **29**(2): 550-558. DOI: http://dx.doi.org/10.1016/j.wasman.2008.03.018.

Knussen, C., Yule, F., MacKenzie, J. and Wells, M. (2004). "An analysis of intentions to recycle household waste: The roles of past behaviour, perceived habit, and perceived lack of facilities." Journal of Environmental Psychology **24**(2): 237-246. DOI: http://dx.doi.org/10.1016/j.jenvp.2003.12.001.

Li, L., Dunn, J. B., Zhang, X. X., Gaines, L., Chen, R. J., Wu, F. and Amine, K. (2013). "Recovery of metals from spent lithium-ion batteries with organic acids as leaching reagents and environmental assessment." Journal of Power Sources **233**: 180-189. DOI: http://dx.doi.org/10.1016/j.jpowsour.2012.12.089.

MacKenzie, S. B., Podsakoff, P. M. and Jarvis, C. B. (2005). "The problem of measurement model misspecification in behavioral and organizational research and some recommended solutions." Journal of Applied Psychology **90**(4): 710.

OVAM. (n.d.). "Batterijen." Accessed March 31/2014, from http://www.ovam.be/batterijen.

Perchards/Sagis (2013). "The collection of waste portable batteries in Europe in view of the achievability of the collection targets set by Batteries Directive 2006/66/EC." 234.

Steg, L. and Vlek, C. (2009). "Encouraging pro-environmental behaviour: An integrative review and research agenda." Journal of Environmental Psychology **29**(3): 309-317. DOI: http://dx.doi.org/10.1016/j.jenvp.2008.10.004.

Tenenhaus, M., Vinzi, V. E., Chatelin, Y.-M. and Lauro, C. (2005). "PLS path modeling." Computational statistics & data analysis **48**(1): 159-205.

Tonglet, M., Phillips, P. S. and Read, A. D. (2004). "Using the Theory of Planned Behaviour to investigate the determinants of recycling behaviour: a case study from Brixworth, UK." Resources, Conservation and Recycling **41**(3): 191-214. DOI: http://dx.doi.org/10.1016/j.resconrec.2003.11.001.

Vlek, C. and Steg, L. (2007). "Human Behavior and Environmental Sustainability: Problems, Driving Forces, and Research Topics." Journal of Social Issues **63**(1): 1-19. DOI: 10.1111/j.1540-4560.2007.00493.x.

Wan, C., Shen, G. Q. and Yu, A. (2014). "The moderating effect of perceived policy effectiveness on recycling intention." Journal of Environmental Psychology **37**(0): 55-60. DOI: http://dx.doi.org/10.1016/j.jenvp.2013.11.006.

8. Appendices

8.1 Appendix A. Questionnaire

Beste deelnemer,

Momenteel voeren wij in samenwerking met de Universiteit Hasselt een grootschalig onderzoek uit om na te gaan *wat Belgische huishoudens ertoe aanzet, of ervan weerhoudt, om hun **verwijderbare accupacks**, van zodra deze overbodig zijn, in te leveren bij een inzamelpunt van BEBAT.* Verwijderbare accupacks zijn (herlaadbare) batterijpacks uit toestellen, zoals bijvoorbeeld (foto)camera's, smartphones en laptops.

Informatie hierover is belangrijk zodat in de toekomst het selectief inzamelen en vervolgens recycleren van gebruikte, verwijderbare accupacks optimaler zal verlopen. Hierdoor draagt u bij aan het verhogen van het welzijn en de welvaart van onze maatschappij. Uw persoonlijke antwoorden zullen strikt vertrouwelijk worden behandeld.

Alvast bedankt voor uw tijd.

DEEL 1: SCREENING & PROFILING

Voor we van start gaan met de eigenlijk vragenlijst, willen we eerst nagaan of u voldoet aan de voorwaarden om te mogen deelnemen aan deze vragenlijst.

1. Bent u zelf tewerkgesteld in één van de volgende sectoren of kent u iemand in uw familie of nabije vriendenkring die in één van de volgende sectoren tewerkgesteld is?

   o Afvalverwerking
   o Batterijsector
   o Public relations
   o Reclame
   o Journalistiek
   o Milieuorganisatie
   o Bankwezen
   o Verzekeringswezen
   o Publieke sector (bpost...)
   o Geen van deze

2. Bracht u eerder al batterijen naar een inzamelpunt?

   o Ja
   o Nee
   o Weet ik niet

3. Samenvattend, hoe zou u uw huishouden omschrijven als u moet kiezen tussen de volgende types?

    o   Alleenstaande jonger dan 45 jaar (zonder kinderen of zonder thuiswonende kinderen)
    o   Alleenstaande tussen 45 en 60 jaar (zonder kinderen of zonder thuiswonende kinderen)
    o   Alleenstaande 61 jaar of ouder (zonder kinderen of zonder thuiswonende kinderen)
    o   Koppel zonder kinderen of zonder thuiswonende kinderen
    o   Eenoudergezin met kinderen, al dan niet thuiswonend
    o   Gezin met thuiswonende kinderen
    o   Geen van bovenstaande

4. Wat is de leeftijd van het gezinshoofd?

    o   Jonger dan 45 jaar
    o   Tussen 45 en 60 jaar
    o   61 jaar of ouder

5. Wat is de leeftijd van het oudste kind?

    o   Jonger dan 12 jaar
    o   12 jaar of ouder

6. Hoeveel kinderen jonger dan 12 leven in je huishouden?

    o   Geen
    o   1
    o   2
    o   3
    o   4
    o   Meer dan 4

7. Hoeveel familieleden ouder van 65 leven in je huishouden?

    o   Geen
    o   1
    o   2
    o   3
    o   4
    o   Meer dan 4

8. Welk van onderstaande beschrijft het best uw woonplaats?

    o   Grootstad
    o   Stad
    o   Gemeente of dorp
    o   Platteland

9. Wat is uw geslacht?

    o   Man
    o   Vrouw

10. Wat is uw beroepsstatus?

- o Werkzaam, meer dan half-time
- o Werkzaam, half-time of minder
- o Gepensioneerd of gelijkwaardig
- o Student
- o Huisvrouw/huisman
- o Andere: ………………………………

DEEL 2: INLEIDING

Voor het verdere verloop van de enquête is het van belang een duidelijk beeld te hebben van

(1) wat verwijderbare accupacks zijn en

(2) wanneer verwijderbare accupacks als overbodig worden beschouwd.

Hieronder kan u daarom 2 definities terugvinden. Gelieve deze aandachtig te lezen.

Verwijderbare accupacks zijn (herlaadbare) batterijpacks uit toestellen, zoals bijvoorbeeld (foto)camera's, smartphones en laptops, **die eenvoudig verwijderd kunnen worden**.

Verwijderbare accupacks kunnen overbodig worden omwille van volgende redenen:

(1) Het toestel is stuk;

(2) De accupack werkt niet meer naar behoren;

(3) U hebt een nieuw, vervangend toestel gekocht of gekregen waardoor het oude toestel, inclusief accupack, in onbruik raakt.

Deze informatie is CRUCIAAL omdat wij zullen peilen naar wat u ertoe aanzet of ervan weerhoudt om uw verwijderbare accupacks bij een inzamelpunt van BEBAT binnen te brengen van zodra deze overbodig zijn.

Ook indien u momenteel uw verwijderbare accupacks niet binnenbrengt bij een inzamelpunt van BEBAT, van zodra ze overbodig zijn, mag u de vragenlijst verder invullen. Het is uw mening over het uitvoeren van deze actie die belangrijk is.

11. Verwijderbare accupacks zijn:

- o (herlaadbare) batterijpacks uit toestellen waarbij deze eenvoudig verwijderd kunnen worden.
- o (herlaadbare) batterijpacks uit toestellen waarbij het mogelijk is, bijvoorbeeld door het toestel te ontmantelen, deze te verwijderen uit het toestel.

12. Wanneer kan een accupack overbodig worden:

Het toestel is stuk.
De battery pack werkt niet meer naar behoren.

U hebt een nieuw, vervangend toestel gekocht of gekregen waardoor het oude toestel, inclusief battery pack, in onbruik raakt.

DEEL 3: MENINGSVRAGEN

In dit deel worden aan u een aantal stellingen getoond die zullen peilen naar wat u ertoe aanzet of ervan weerhoudt om uw verwijderbare accupacks bij een inzamelpunt van BEBAT binnen te brengen van zodra deze overbodig zijn.

13. Het binnenbrengen van verwijderbare accupacks, van zodra deze overbodig zijn, bij een inzamelpunt van BEBAT, is:

	-3	-2	-1	0	1	2	3	
Slecht	❍	❍	❍	❍	❍	❍	❍	Goed
Onnuttig	❍	❍	❍	❍	❍	❍	❍	Nuttig
Geen voldoening gevend	❍	❍	❍	❍	❍	❍	❍	Voldoening gevend
Onverantwoord	❍	❍	❍	❍	❍	❍	❍	Verantwoord
Onverstandig	❍	❍	❍	❍	❍	❍	❍	Verstandig
Onveilig	❍	❍	❍	❍	❍	❍	❍	Veilig

14. Door verwijderbare accupacks, van zodra deze overbodig zijn, binnen te brengen bij een inzamelpunt van BEBAT:

	Helemaal niet akkoord			Neutraal			Helemaal akkoord
Bespaar ik geld.	❍	❍	❍	❍	❍	❍	❍
Draag ik bij aan de wereld voor toekomstige generaties.	❍	❍	❍	❍	❍	❍	❍
Help ik het milieu te beschermen.	❍	❍	❍	❍	❍	❍	❍
Help ik de hoeveelheid afval te verminderen.	❍	❍	❍	❍	❍	❍	❍
Verminder ik de kans op ongelukken in mijn huis.	❍	❍	❍	❍	❍	❍	❍
Toon ik mijn kinderen het goede voorbeeld.	❍	❍	❍	❍	❍	❍	❍

15. Beoordeel de volgende stellingen aangaande uw persoonlijke overtuigingen:

	Helemaal niet akkoord			Neutraal			Helemaal akkoord
Ik zou het verkeerd vinden om mijn overbodige, verwijderbare accupacks **niet** bij een inzamelpunt van BEBAT binnen te brengen van zodra deze overbodig zijn.	❍	❍	❍	❍	❍	❍	❍
Ik zou me schuldig voelen door mijn overbodige, verwijderbare accupacks **niet** bij een inzamelpunt van BEBAT binnen te brengen van zodra deze overbodig zijn.	❍	❍	❍	❍	❍	❍	❍
Ik zou mijn principes schenden door mijn overbodige, verwijderbare accupacks **niet** bij een inzamelpunt van BEBAT binnen te brengen van zodra deze overbodig zijn.	❍	❍	❍	❍	❍	❍	❍
Ik vind dat iedereen zijn overbodige, verwijderbare accupacks bij een inzamelpunt van BEBAT zou moeten binnenbrengen van zodra deze overbodig zijn.	❍	❍	❍	❍	❍	❍	❍

16. Beoordeel de volgende stellingen aangaande de overtuigingen van anderen:

	Helemaal niet akkoord			Neutraal			Helemaal akkoord
Mijn gezin denkt dat het binnenbrengen van overbodige, verwijderbare accupacks, van zodra deze overbodig zijn, bij een inzamelpunt van BEBAT wenselijk is.	❍	❍	❍	❍	❍	❍	❍
Mijn gezin zou goedkeuren dat ik mijn overbodige, verwijderbare accupacks, van zodra deze overbodig zijn, bij een inzamelpunt van BEBAT binnenbreng.	❍	❍	❍	❍	❍	❍	❍

Mijn vrienden denken dat het binnenbrengen van overbodige, verwijderbare accupacks, van zodra deze overbodig zijn, bij een inzamelpunt van BEBAT wenselijk is.		◯	◯	◯	◯	◯	◯	◯
Mijn vrienden zouden goedkeuren dat ik mijn overbodige, verwijderbare accupacks, van zodra deze overbodig zijn, bij een inzamelpunt van BEBAT binnenbreng.		◯	◯	◯	◯	◯	◯	◯

17. Beoordeel de volgende stelllingen aangaande de controle die u heeft over het binnenbrengen van accupacks:

		-3	-2	-1	0	1	2	3	
Hoeveel controle heeft u over het binnenbrengen van overbodige, verwijderbare accupacks, van zodra deze overbodig zijn, bij een inzamelpunt van BEBAT:	**Zeer weinig**	◯	◯	◯	◯	◯	◯	◯	**Zeer veel**
Het aantal gebeurtenissen buiten uw controle die u kunnen verhinderen uw overbodige, verwijderbare accupacks, van zodra overbodig zijn, bij een inzamelpunt van BEBAT binnen te brengen, is:	**Zeer beperkt**	◯	◯	◯	◯	◯	◯	◯	**Zeer talrijk**
U heeft het gevoel dat, als u zou willen, uw overbodige, verwijderbare accupacks, van zodra deze overbodig zijn, bij een inzamelpunt van BEBAT kan binnenbrengen.	**Helemaal niet akkoord**	◯	◯	◯	◯	◯	◯	◯	**Helemaal akkoord**
Voor u is het binnenbrengen van overbodige, verwijderbare accupacks, van zodra deze overbodig zijn, bij een inzamelpunt van BEBAT:	**Moeilijk**	◯	◯	◯	◯	◯	◯	◯	**Makkelijk**

18. Beoordeel de volgende stelllingen aangaande uw gewoonlijke omgang met overbodige accupacks:

	Helemaal niet akkoord			Neutraal			Helemaal akkoord
Ik probeer gebruikte, waardevolle toestellen, inclusief verwijderbare accupack, meestal eerst door te verkopen of terug binnen te brengen tegen een financiële vergoeding (bijvoorbeeld korting bij aankoop van een nieuw toestel).	○	○	○	○	○	○	○
Ik bewaar in onbruik geraakte toestellen, inclusief verwijderbare accupack, meestal als reservetoestel.	○	○	○	○	○	○	○
Ik breng gebruikte toestellen, inclusief verwijderbare accupack, meestal binnen bij een ander inzamelpunt (bvb: RECUPEL) dan dat van BEBAT zonder financiële vergoeding.	○	○	○	○	○	○	○
De inzameling van verwijderbare accupacks binnen mijn huishouden zou efficiënter kunnen verlopen.	○	○	○	○	○	○	○
Ik vergeet vaak reeds uit toestellen verwijderde, verzamelde accupacks binnen te brengen bij een inzamelpunt.	○	○	○	○	○	○	○

19. Beoordeel de volgende stelllingen aangaande de rol van BEBAT:

	Helemaal niet akkoord			Neutraal			Helemaal akkoord
BEBAT voorziet in duidelijke richtlijnen voor de inzameling van verwijderbare accupacks.	○	○	○	○	○	○	○
BEBAT toont duidelijk de (milieu-)voordelen van het recycleren van verwijderbare accupacks aan.	○	○	○	○	○	○	○

BEBAT stimuleert mij om verwijderbare accupacks bij een volgend bezoek aan een inzamelpunt van hen binnen te brengen.		○	○	○	○	○	○	○	
De huidige faciliteiten, aangeboden door BEBAT, volstaan om het binnenbrengen van verwijderbare accupacks makkelijk te maken.		○	○	○	○	○	○	○	

20.   Beoordeel de volgende stelllingen aangaande uw intenties:

		-3	-2	-1	0	1	2	3	
Ik wil mijn verwijderbare accupacks, van zodra deze overbodig zijn, bij een inzamelpunt van BEBAT binnenbrengen	**Helemaal niet akkoord**	○	○	○	○	○	○	○	**Helemaal akkoord**
Ik ben van plan om mijn verwijderbare accupacks, van zodra deze overbodig zijn, bij een inzamelpunt van BEBAT binnen te brengen in de toekomst.	**Helemaal niet akkoord**	○	○	○	○	○	○	○	**Helemaal akkoord**
Hoe waarschijnlijk is het dat u in de toekomst verwijderbare accupacks, van zodra deze overbodig zijn, bij een inzamelpunt van BEBAT zal binnen brengen	**Heel onwaarschijnlijk**	○	○	○	○	○	○	○	**Heel waarschijnlijk**

DEEL 4: KENNIS EN VERTOOND GEDRAG

De volgende vragen peilen naar uw kennis over het inzamelen van accupacks en uw vertoond gedrag. Gelieve zo juist en waarheidsgetrouw mogelijk te antwoorden.

KENNIS

21.   Bent u wettelijk verplicht batterijen selectief in te zamelen

- o   Neen
- o   Ja

22.   Bent u wettelijk verplicht verwijderbare accupacks bij BEBAT binnen te brengen?

- o   Neen
- o   Ja

23. Betaalt u momenteel voor het in stand houden van het inzamelingssysteem van accupacks van BEBAT onder de vorm van een bijdrage?

   o   Neen
   o   Ja

24. Mag men u wettelijk gezien kosten aanrekenen bij het inleveren van verwijderbare accupacks in goede staat bij een daarvoor bestemd inzamelpunt?

   o   Neen
   o   Ja

25. Welke van de volgende voorwerpen mogen momenteel worden binnengebracht bij een BEBAT inzamelpunt?

- o Andere (specifieer)
- o Geen van bovenstaande

26. Waar kan men overal inzamelpunten voor verwijderbare accupacks vinden?

Supermarkten
Containerpark
Scholen
Doe-het-zelf winkels
Speelgoedwinkels
Elektrowinkels
Horeca

27. Bij welke toestellen kunnen verwijderbare accupacks horen?

    Digitale fotocamera's
    Powertools
    Tuingereedschap
    Draagbare dvd-speler
    Draadloze koptelefoons
    Telegeleide speelgoedauto's
    Draagbare spelcomputers
    Draadloze stofzuiger
    Elektrische tandenborstel
    Scheerapparaat
    GPS
    Hoorapparaat
    Afstandsbediening
    Weegschaal
    Rookdetector

VERTOOND GEDRAG

28. Bracht u in het verleden de meerderheid van uw overbodige, verwijderbare accupacks binnen bij een inzamelpunt van BEBAT?

    o Neen
    o Ja

29. Waarom niet? Rangschik uw top 3 gegeven dat rang 1 belangrijker is dan rang 3.

    Ik heb de meerderheid van mijn overbodige toestellen, inclusief battery pack, teruggebracht naar het verkoopspunt of doorgegeven aan een derde zonder financiële vergoeding (bijvoorbeeld korting bij aankoop van een nieuw toestel)
    Ik heb de meerderheid van mijn overbodig toestellen, inclusief battery pack, doorverkocht of omgeruild tegen financiële vergoeding
    Ik wist niet dat er verwijderbare battery packs in die toestellen zitten
    Ik wist niet dat verwijderbare battery packs apart ingezameld kunnen worden
    Het was te veel werk om verwijderbare battery packs apart in te zamelen
    Ik vond dat dit de taak van RECUPEL is
    Ik wist niet waar er ophaalpunten voor verwijderbare battery packs zijn
    Ik zag het nut niet van het apart inzamelen van verwijderbare battery packs
    Ik deed het niet omdat anderen het ook niet doen
    Andere: specificeer:……………………………………………..

30. Wat zou u kunnen overtuigen dat wel te doen? Rangschik uw top 3 gegeven dat rang 1 belangrijker is dan rang 3.

    Een label op het toestel als herinnering aan de verwijderbare battery pack
    Een checklist met de identificatie van de toestellen waarin verwijderbare packs zitten
    Informatie over waarom verwijderbare battery packs apart inzamelen nuttig is

Incentieven voor de inzameling van battery packs onder de vorm van inzamelwedstrijden met prijs, tombola's, …

Externe herinneringen aan de inzameling van battery packs met behulp van een sms-service, app of (digitale) kalender

Het bestaan van een gezamenlijk inzamelpunt van RECUPEL en BEBAT op dezelfde locatie. Hier kan je dan de 2 afvalstromen, zijnde het toestel en de battery pack, afzonderlijk inzamelen.

Andere dan een directe financiële vergoeding: specificeer:……………………………………………

31.   Hoe vaak brengt u gemiddeld per jaar uw overbodige, verwijderbare accupacks binnen, bij een inzamelpunt van BEBAT?

32.   Bent u van plan deze frequentie in de toekomst te veranderen?

   o   Neen
   o   Ja

33.   Hoeveel verwijderbare accupacks brengt u per bezoek aan een inzamelpunt van BEBAT ongeveer binnen (vul een getal in)?

34.   Bent u van plan dit aantal te veranderen?

   o   Neen
   o   Ja

35.   Hoe vaak brengt u de volgende zaken binnen?

		-3	-2	-1	0	1	2	3	
Elektrische&elektronische apparaten bij een inzamelpunt van RECUPEL:	**Nooit**	❍	❍	❍	❍	❍	❍	❍	**Altijd**
Losse wegwerpbatterijen bij een inzamelpunt van BEBAT:	**Nooit**	❍	❍	❍	❍	❍	❍	❍	**Altijd**
Losse herlaadbare batterijen bij een inzamelpunt van BEBAT:	**Nooit**	❍	❍	❍	❍	❍	❍	❍	**Altijd**
Knoopcellen bij een inzamelpunt van BEBAT:	**Nooit**	❍	❍	❍	❍	❍	❍	❍	**Altijd**
Accupacks bij een inzamelpunt van BEBAT:	**Nooit**	❍	❍	❍	❍	❍	❍	❍	**Altijd**

DEEL 4: MILIEU

We zijn aan de laatste vraag van deze vragenlijst gekomen. Deze peilt naar uw houding ten opzichte van het milieu.

36.   Beoordeel de volgende stelling over het milieu.

	Helemaal niet akkoord			Neutraal			Helemaal akkoord
We naderen de limiet van het aantal mensen die de aarde kan verdragen.	○	○	○	○	○	○	○
De mens heeft het recht zijn omgeving aan te passen om aan zijn noden te kunnen voldoen.	○	○	○	○	○	○	○
Wanneer de mens zich met de natuur bemoeit, heeft dit vaak desastreuze gevolgen.	○	○	○	○	○	○	○
Menselijke intelligentie zal ervoor zorgen dat we de aarde niet onleefbaar maken.	○	○	○	○	○	○	○
De mens maakt drastisch misbruik van het milieu.	○	○	○	○	○	○	○
De aarde heeft voldoende natuurlijke grondstoffen, zolang we maar weten hoe deze te ontginnen.	○	○	○	○	○	○	○
Planten en dieren hebben even veel bestaansrecht als mensen.	○	○	○	○	○	○	○
De natuur is sterk genoeg om met de impact van moderne industriële naties om te kunnen.	○	○	○	○	○	○	○
Ondanks al onze gaven, is de mens nog steeds gebonden door de wetten van de natuur.	○	○	○	○	○	○	○
De milieucrisis, die we zogezegd doormaken, is overdreven.	○	○	○	○	○	○	○
De aarde is zoals een ruimteschip met beperkte ruimte en middelen.	○	○	○	○	○	○	○
De mens is voortbestemd om over de rest van de natuur te heersen.	○	○	○	○	○	○	○

De balans van de natuur is zeer delicaat en makkelijk te verstoren.	❍	❍	❍	❍	❍	❍	❍
De mens zal uiteindelijk genoeg leren over de werking van de natuur opdat wij haar kunnen controleren.	❍	❍	❍	❍	❍	❍	❍
Als het verder gaat zoals nu, zullen we snel een grote milieuramp meemaken.	❍	❍	❍	❍	❍	❍	❍