Master Thesis
- Sustainable Business and Innovation -

Consumer Behaviour in a Circular Economy

Testing consumer willingness to participate in Circular Business Models

In collaboration with
Canon Europe and the University of Utrecht

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Abstract

Due to the rapidly increasing magnitude of waste generation, collection and recycling of waste have broadly received attention. Unfortunately, previous research has shown such take-back systems are currently poorly developed. To overcome and prevent further waste accumulation and resource scarcity, a shift should be made to Circular Business Models (CBM), which focusses on the re-use and recycling of materials. However, little is known about consumers' willingness to participate in such CBMs. Therefore, three different Circular Business (*Take-Back Management, Product Lease* and *Pay-per-use*) models have been examined over which the key characteristics (*Ownership, Responsibility and Payment Structure*) have been examined. With the use of an extended version of the Theory of Planned Behaviour, also including *Environmental Attitude* and *Habits*, consumer behaviour, or *Intention*, has been mapped for the key characteristics of the CBMs. Results show consumers are more likely to take part in the *Take-Back Management* CBM and seem to dislike the other proposed models. This was mostly due to negative measured attitudes towards alternative payment structures and responsibility distributions, making these characteristics the most influential predicters of consumer *Intention*. These results could guide companies in the design and implementation of circular strategies to reclaim products after use. Furthermore, future research should aim to more deeply understand the relation between consumers and the *Responsibility* and *Payment Structure* characteristics of a CBM.

1. Introduction

Over decades, society has been designed in a linear way. We make products, we use them, and afterwards we throw them away (Ellen MacArthur Foundation, 2015; Ghisellini et al., 2016). Due to the rapidly increasing magnitude of waste generation, collection and recycling of waste have broadly received attention. Unfortunately, previous research has shown such take-back systems are currently poorly developed (Lu et al., 2015). Large amounts of waste are shipped to developing countries, where unsound and unsustainable recycling practices result in human health problems and pollution (Ibid.). Next to environmental benefits, the take-back of old products or components for re-use and recycling might yield tremendous economical potential, as valuable material is currently lost in such linear system (Ibid.). In the recycling process, precious metals and materials could be extracted. These newly gained resources could be used as material input and, herewith, diminish the need for virgin materials and the impact on the environment (Ruan et al., 2011).

To overcome and prevent further waste accumulation and resource scarcity, a shift should be made to a production system which is restorative by design and focusses on the re-use and recycling of materials: The Circular Economy (CE) (Ellen McArthur Foundation, 2013). In the past two decades, research has focused on defining a CE and its characteristics through the use and development of Circular Business Models (CBM) (Ellen MacArthur Foundation, 2015). The take-back of old products is of essence in a CE and therefore CBM should facilitate such practises (Ellen McArthur, 2013; Ellen McArthur, 2015; Lewandofski, 2015; Ghisellini et al., 2016; Nussholz,

2017). The theoretical development of CBM has received widespread attention in the scientific community, as previous research identified an abundant number of parameters should be redesigned (Tukker, 2004; EllenMcArthur, 2013; Ghisellini et al., 2016). Examples of such parameters are Product Ownership, Product Responsibility and the Payment Structure and would all fundamentally change in a CBM (Ibid.). Within all these studies, however, the consumer attitude towards these changing parameters remains an underexposed aspect of a CE (Planning, 2015).

This research will address two gaps identified in the scientific literature. First, the role of consumer behaviour in a CE is presently unexplored (Planning, 2015; Ghisellini et al., 2016). Various individual case studies developed CBM, but they approached consumers from a corporate perspective, neglecting the consumers whishes' and their behaviour in a CE (Thøgersen, 1995; Rexfelt & Hiort af Ornäs, 2009; Lewandowski, 2015; Planning, 2015; Kirchherr et al, 2017). In their analysis of CE definitions, Kirchherr et al. (2017) noticed a research gap in consumer perspective towards the CE and support the claim by citing Borrello et al. (2017, page 1), who states that "little is known about consumers' willingness to participate in a CE". Moreover, Catulli (2013) states consumer acceptance of suchlike CBMs is heavily under researched, Gullstrand Ebbring (2015) mentions the need for research on consumer attitudes towards consumption models, and Ramani et al. (2010) highlight the demand for research on the motivation of consumers in such CBMs. Some previous studies did measure and map the attitudes of people towards recycling, but focused on initiatives like public waste collection points, not on the CE itself (Kok & Siero, 1985; Thøgersen,

1995; Qu et al., 2013; Botelho et al., 2016). These studies have shown the unawareness of consumers towards, and the immaturity of, these initiatives. So, it can be concluded that there is a lack of knowledge concerning consumer behaviour in its relation to Circular Business Models and take-back systems in scientific literature. This will result in the creation of suboptimal or incomplete business models which are unable to grasp the full potential of a Circular Economy.

Second, as consumer behaviour has abundantly been researched in other research fields, a variety of models have been developed. Studies measuring behaviour, centred around attitudes and intentions, made abundant use of the framework proposed by Ajzen (1985), called the Theory of Planned Behaviour (TPB) (Ajzen, 2011b; Ajzen, 2015). Over the years, Ajzen's theory was further developed and tested many times in many research fields (Ibid.). However, the TPB still struggles with the assessment of environmental related behaviour. The inclusion of environmentally rooted behaviour might enrich the TPB, and therewith, make it a proper framework to map consumer intention towards a CBM. This might provide new insights in the engagement and involvement of consumers in the CE.

This research will address both previously described gaps. Therefore, this research will focus on the behaviour of consumers towards new CBM characteristics which include the take-back of old products, by making use of an extended TPB framework. Therefore, the research question addressed in this thesis will be:

"To what extent do Product Ownership, Product Responsibility and Payment Structure affect consumer Intention to participate in Circular Business Models which incorporate product take-back?"

In order to answer this research question, the current research will first list CBM derived from previous research, which will focus on retrieving the old products at end-of-life. Afterwards, key changes in CBM compared to regular BM will be mapped. Next, consumer behaviour towards the new identified CBM characteristics will be mapped using the TPB framework and finally it will be concluded to what extent the CBM characteristics influence the willingness of consumers to participate in CBMs.

These business models will be applied to the case study of Canon Europe. Canon Europe is a global producer and retailer of electronic devices. Herewith, Canon contributes to, according to some, the fastest-growing subdomain in the make-use-disposal pattern, e-waste (Awasthi et al., 2018). E-wastes, or waste electronic and electric equipment (WEEE), are products, such as computers, telecommunications, printing and lighting equipment which are categorized as obsolete or unwanted by its user (Qu et al., 2013). With the introduction of Directive 2012/19/EU from the European Union, introduced in 2012, cartridge should be treated as WEEE (European Parliament and of the Council of the European Union, 2012). This entails mandatory collection, recycling, and recovery of all WEEE, and therefore cartridges. As cartridges and toners form a significant share of Canon's revenue stream and sales volume, these new legislations have profound impact. Therefore, this research will examine the case study of CBM dealing with the retrieval of cartridges. With the introduction of CBM, Canon

will be able to reduce its impact on the environment and the accumulation of WEEE, retrieve part of the original material value still present in its products, and comply with new legislations. In order to successfully implement CBM, the behaviour of the customer base of Canon towards these new Circular Business Models must be mapped. Herewith, pitfalls and opportunities related to consumers will be identified, which might generate essential knowledge, for Canon and other actors within the electronics industry, to successfully implement CBMs.

This thesis will first introduce Circular Business Models and their characteristics, followed by an introduction and extension of the Theory of Planned Behaviour. Afterwards it will be discussed how the TPB will be used to assess consumer behaviour related to CBMs in the methods. Sequentially, the results of this study will be listed and analysed, based on which conclusions will be drawn. This thesis will conclude with discussing the limitations encountered during this study and the relevance of the obtained results.

2. Theory

In the current chapter, the circular economy and its impact on business models will be discussed in section 2.1 and 2.2. Afterwards, Circular Business Models used in this study will be listed and the characteristics of these models will be explained in section 2.3.

2.1 The Circular Economy

In the previous section, a system of linear consumption was described following a make-use-dispose pattern. A circular economy (CE) aims to shift from a linear system to a circular one in which waste no longer exists (Ellen McArthur Foundation, 2013). The definition of a CE is "*an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations*" (Kirchherr et al., 2017, page 4). A CE ultimately strives to decouple environmental pressure from economic growth and vice versa (Ellen McArthur Foundation, 2013). CE focusses on the looping of materials in order to reduce virgin material input and make longer use of materials. Hereby stimulating businesses to make use of a closed loop design and recycled materials.

2.2 Business Models

In order to create closed systems, attention should be spent on the way businesses do business (Preston, 2012; Bocken et al., 2014; Ghisellini et al., 2016). All core aspects of a business, can be redirected to the business model canvas (BMC) (Osterwalder & Pigneur, 2010; Lewandofski, 2015).
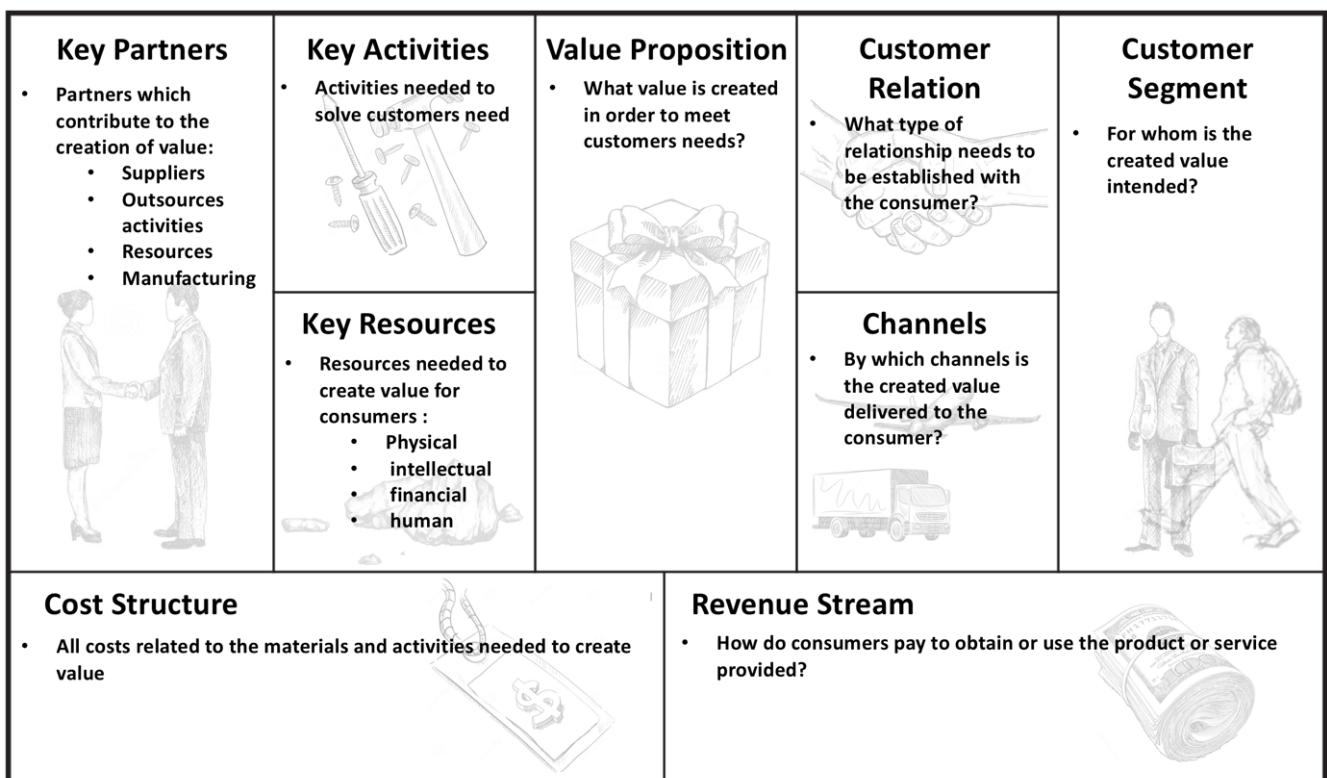

Figure 1: Business model canvas developed by Osterwalder and Pigneur (2010)

Osterwalder and Pigneur (2010) developed this framework to analyse and display business models (figure 1). According to their research, a business model "describes the rationale of how an organization creates, delivers and captures value" (Osterwalder and Pigneur, 2010). The BMC is known for its easiness of use, its worldwide recognition, and its preceding role in the creation of CBM (Lüdeke-Freund, 2010; Barquet et al., 2013; Mentink, 2014). Before it can be identified which elements of the BMC will be adjusted in the shift from a linear to a Circular Business Model, it is first needed to identify these elements individually. In the following paragraphs, all 9 elements of the BMC from Osterwalder and Pigneur (2010) will be addressed. Meanwhile, possible interventions to these elements, to shift to a CBM, from other studies will be presented. Used examples are illustrations which come easily to mind and could be substituted by numerous other products or services.

The first element of the BMC by Osterwalder and Pigneur (2010) is the *customer segment*. Businesses always have a target audience in mind who's needs they try to solve (Osterwalder & Pigneur, 2010). A producer of racing bikes won't target elderly people but young and athletic ones, while a producer of electric bikes will likely have the complete opposite strategy. Environmentally engaged consumers could favour sustainable products and services over less sustainable alternatives (Peattie & Crane, 2005). However, some scholars reject this statement and claim products with a sustainable image only causes aversion (Ibid.).

What a company tries to create in its own unique way, is a product or service to meet the customer's needs; the value proposition (Chesbrough & Rosenbloom, 2002; Tukker, 2004; Osterwalder &

Pigneur, 2010). Originally, many companies tried to create value in the form of a product. A CBM might provide a service or access to a product, instead of a product, to deliver the same value (Tukker 2004; Bocken et al., 2014; Lewandofski, 2016; Nussholz, 2017). This gives rise to new ownership structures (Planning, 2015). One well-known example of a new ownership structure is leasing, in which customers make use of the product but do not own it, like car leasing (Johnson et al., 2014). As ownership, and therefore responsibility over the product, will lie with the service provider, the incentive arises to create products that require less maintenance, have a longer lifespan, and are easy to repair (Bakker et al., 2014). Moreover, as companies remain ownership during use and at end-of-life, recycling possibilities are enlarged (Ibid.).

The *revenue stream* represents the way in which a company earns money form offering its service or product (Osterwalder & Pigneur, 2010). When an individual buys a car, there will be a one-time transaction. But when shifting to more circular BM, like leasing a vehicle, a monthly payment will be more likely. Customers pay a monthly fee to gain access to a product or a delivered service, or, as in the pay-per-use models, every time the service or product is used (Barquet et al., 2013). Additionally, new revenue streams can be created as a CE creates the additional potential for repair and maintenance services (Nussholz, 2017). Furthermore, pricing can even be adjusted to performance, which will be applicable in so called guaranteed performance models (Ibid.).

The *customer relation* segment describes the relation a company tries to establish with its customers. This can range from an automatic transaction up to daily and personal communication (Osterwalder & Pigneur, 2010). A

CE promotes the enhanced and prolonged relationship between these both actors (Ghisellini et al., 2016). The adjusted revenue stream in a CBM can already support a prolonged relationship due to regular payments. Moreover, an intensified relation might reduce waste as production could be based upon customer orders or tailor-made solutions (Van Renswoude et al., 2015).

The next step is the *distribution channel* used to deliver the created value to the customer. Road, rail, water and air transport possess significant threats to human health and the natural environment (WHO, 2008). As CBMs can focus on meeting needs through the use of services, needs could be met in various ways. The virtualization of services is a clear example which will downscale the need for transportation (Ellen McArthur, 2015). However, reversed logistics is an additional factor needed to create CBMs, as products should be returned to the producer at end of life to enable recycling options, herewith potentially increasing the logistics needed.

To be able to deliver or create a product, assets and resources are needed. The *key resources* section sums up all the physical, intellectual, financial and human resources (Osterwalder & Pigneur, 2010). When businesses shift to a more circular service-based economy, new types of resources must be explored. For example, when selling a service instead of a product, companies will need additional human resources for customer support. Furthermore, materials can be substituted by recycled alternatives, herewith changing its key resources (Planning, 2015; Van Renswoude et al., 2015).

Other activities, like production, problem solving and networking, are addressed in the *key activities* section of the BMC (Osterwalder & Pigneur, 2010).

New activities, like customer support, will increase in importance in a CBM. Lobbying for better regulations, product redesign, in-house management to increase efficiency, and good housekeeping are examples of such activities (Joustra et al., 2013; El-Haggar, 2007; Ellen McArthur Foundation, 2015; Lacy et al., 2015; Scott, 2015).

However, almost for all activities, *key partners* are a vital component for success. Alliances with (non-)competitors and suppliers provide economies of scale, a larger infrastructure and risk reduction (Osterwalder & Pigneur, 2010). Furthermore, companies rely on partners for their additional resources, as a company rarely possesses all the resources needed to enable all *key activities* (Osterwalder & Pigneur, 2010; Joustra et al., 2013). A clear example along the lines of a CBM is recycling, which is a very often outsourced activity (Lacy et al., 2015). Moreover, partnerships and collaboration enable the creation of true production cycles, in which the waste of a company might be the input for another (Sheu, 2014; Van Renswoude et al., 2015). Roos (2014) goes even further, claiming that without collaboration, the creation of a Circular Business Models is hardly possible.

As the revenue stream describes the cash inflow, so does the *cost structure* describe the cash outflow. Previous research highlighted the value created by use of a service is central in the CE (Tukker, 2004). When selling a service, the cost structure within a BM will shift away from a one-time transaction to an over-time payment form (Sundin et al., 2009; Tan, 2010; Grönroos, 2011). Herewith, the cost stucture becomes more structured and predictable due to the reoccurring monthly monetary income (Tan, 2010).

2.3 Circular Business models

Circular Business Models aim to create and capture environmental, social, and financial value which meets the need of consumers, without harming the environment, other stakeholders and future generations (Ellen McArthur,2015; Lawandofski, 2015; Nussholz, 2017). They can facilitate corporate innovation towards sustainability and create competitive advantage at the same time (Bocken et al., 2014). Contrary to linear BMs, which downgrade the value of materials and products after use, CBMs tend to preserve this value at the highest possible state (Velte & Steinhilper, 2016). The preservation of this value is made possible

through the take-back of the used products (Ellen McArthur, 2015; Lewandofski, 2015).

In recent literature, CBM categorizations have been made in several publications (Nussholz, 2017). Among them is the study from Bocken et al. (2014) which makes a categorization of CBMs based on their *Technological, Social* or *Organizational* nature, called groupings (figure 2). Furthermore, Bocken et al. (2014) identified 9 archetypes which are covered under their specific group. The *Technological* group focusses on technical innovation and efficiency. Under the *Social* grouping, archetypes which incorporate innovations in consumer offering and changing

Figure 2: Figure adopted form Bocken et al. (2014) showing different Circular Business Model archetypes. Archetypes in red did not include take back schemes and were thus excluded from the study. Business Model examples marked green were used in this study

consumer behaviour are listed. BM targeting firm responsibility and the supply chain, are grouped in the *Organisational* group. Among these 9 archetypes, 7 do not focus on the take-back of materials and product and were therefore excluded in this research. The remaining 2 archetypes are *Create value from waste,* from the *Technological* grouping, and *Deliver functionality rather than ownership*, which is a *Social* archetype. The Circular Business Models that will be used in this study will be listed and discussed below (figure 2).

2.3.1 Take Back Management

Create value from waste is defined as a BM in which "the concept of 'waste' is eliminated by turning waste streams into useful and valuable input for production" (Bocken et al., 2014, page 9). By closing material loops and substituting virgin material by waste streams, this archetype tries to reduce the need for new resources. Bocken et al. (2014) categorize several BM under this archetype, *such as closed-loop systems, take-back management* and *industrial symbioses*. As industrial symbioses, and other models within this archetype (for example Cradle-2-Cradle), do focus on the reuse and recycling of used materials, they do not necessarily include a customer's perspective. Therefore, these models are excluded from this research. The model which does incorporates both the consumer and the take-back of materials, within this archetype, is *Take Back Management* (TBM). TBM can be defined as a system in which a manufacturer or retailer provides customers with the option to return their product at end of use, in return for a monetary compensation or a discount (Heese, 2004). In the next paragraph, TBM will be applied to the BMC (figure 3).

According to Guide et al. (2003) there are several key differences in a business models facilitating take-back schemes in comparison to business models which do not. One of these differences is the need for the creation and management of *reversed logistic channels*, which is of essence in TBM. *Reversed logistics* is "*the design, control, and operation of a system to maximize value creation over the entire life cycle of a product with dynamic recovery of value from different types and volumes of returns over time*" (Govindan et al., 2015, page 603). After the product is retrieved from the customer, it needs to be transported to facilities capable of recycling or remanufacturing these products. Herewith, the *Channel* segment of the BMC must be extended, from only forward logistics which focus on the delivery of a product to the customer, to a system which is both capable of delivering and retrieving the product after use (Pokharel & Mutha, 2009; Govindan et al., 2015). New *Key Partners* are deemed necessary to enable *reversed logistics* through collection points and additional transportation, as it appears difficult to facilitate all these services in-house (Wells & Seitz, 2005). After collection and transportation, these products can be either resold on the second-hand market, remanufactured or recycled (Heese et al., 2004). These new activities can be listed in the *Key Activities* segment or outsourced and therefore placed in the *Key Partner* segment. Additionally, recycling might enrich the *Revenue Stream* due to the sale of recycled materials, mitigating the costs and use of virgin materials in the *Cost Structure* and *Key Resources*, while also affecting the *Value Proposition* (Heese, 2004; Botelho et al., 2016). Additional revenue can partly be passed on to the consumers by means of price reduction or discounts. Herewith, a company is able to offer a same quality product, made from recycled materials, for a lower price. This price advantage

can also be used to reward customers for returning their products at end of use in terms of discounts on future purchases or monetary compensation. This results in voluntary participation of customers, as they share in the benefits of TBM, and strengthens *customer relation* with a prolonged relation and increased customer loyalty (Heese et al., 2004; Pokharel & Mutha, 2009)*.*

2.3.2 Product-Service-Systems

Another archetype described by Bocken et al. (2014) is *Deliver functionality, rather than ownership*, which entails BMs which surpass the need for product ownership and meet customer needs by the provision of services. The sustainable benefits of these type of BMs are abundant (Catulli, 2013). In more classical BM, businesses profit most from the direct sales. So, in order to maximize revenue, businesses will strive to increase the

number of sales. This has led to a decrease in product life span, planned obsolescence and increased resource usage (Guiltinan, 2009).

BMs which *deliver functionality, rather than ownership* can shift away from this dogma by breaking the link between production, sales volume and profit (Bocken et al., 2014). Product-Service-Systems (PSS), also known as *servitization* or service-dominant logic, make revenue by the provision of services, which is payed over-time or per use (Van der Merwe & Rada, 1988; Tukker, 2004; Vargo & Lusch, 2004). A common example is the need of a person to be transported from location A to B. Classical business models would try to sell this person a car, focusing on the sale of a product. Service based BMs, like car rental in which the customer might pay on a weekly base, or public transport in which a pay per use model, take different approaches. Herewith, a single car or train
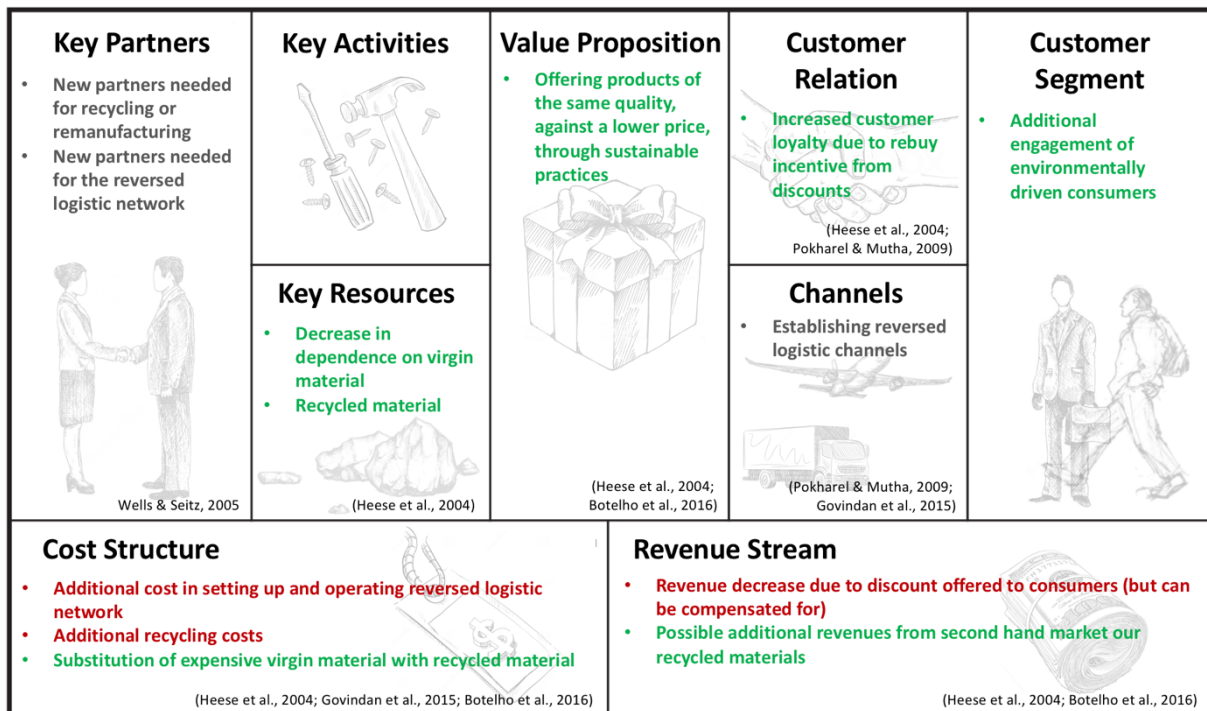
Figure 3: Business Model Canvas of Osterwald and Pigneur (2010) applied to the business model of *Take-back Management*. Additions with a direct possitive effects on *Take-back Managment* are marked in green, negative effects are red, and effect which do not result in direct consequences are marked grey. Activities like recycling and operating the reversed logistics network are outsourced and shown in the *Key Partner* section in this display but could also be listed as *Key Activities* if executed in-house.

can meet many temporal transportation needs, being more efficient in use and material (Bocken et al., 2014). Product design will focus on the durability of products, as repair costs are now shifted to the service provider, which is often the producer, resulting in enhanced product durability, longevity and quality (Tukker, 2015). Moreover, as consumers only make use of the provided product but never own it, reuse and recycling are more easily accomplished as producers easily keep track and ownership of all products. By such practices, communication between supplier and customer is encouraged and results in a more fruitful learning relationship (Catulli, 2013). Within PSSs, there are three main categories: *Product-orientated, use-orientated* and *result-orientated* models. Bocken et al. (2014) briefly addresses these categories, but for a more extensive review and description, we consult Tukker (2004; 2015). Tukker differentiates the 3 categories based on the *tangibility* of the product (figure 4).

Product-oriented models still have an indispensable product component in their *value proposition*. Herewith, they still sell ownership, upgraded with additional services. Product take-back can, in these models, only be realized through TBM, and are therefore not classified as a new CBM in this research. Product take-back can, in these models, only be realized through TBM, and are therefore not classified as a new CBM in this research. The second PSS category is *use-oriented* models. Here, the product is still of importance, but the business model is no longer focused towards selling products (Tukker, 2004). Tukker identifies 3 subdomains or BM within this second category. The first is *Product Lease*, in which the provider will remain the owner of the product during- and at end-of-use. Furthermore, the consumer pays an over-time fee in order to gain unlimited and

individual access to the product, without baring the responsibility for repair, maintenance and the necessities to let a product operate (Ibid.). *Product renting,* the second BM within this category, entails the same specifications but does not guarantee unlimited and individual access. The product can be used sequentially by multiple users and is often more based on short time usage. Lastly, Tukker describes *product pooling*, in which a product is not rented to a single person but to a group of individuals (Ibid.). In the next paragraph, the BM *product leasing* will be mapped to the BMC of Ostwald and Pigneur (2010) (figure 5). Afterwards, the third category of PSS will be discussed.

As mentioned above, use-oriented PSS, meets customer needs through services, while not shifting responsibilities. *Leasing models* are a common form of use-oriented PSS, therefore this term will also be used in the case study. In such models, the *value proposition* entails the unburdening of customers from responsibilities (Alonso-Rasgado et al., 2004; Tukker, 2004; Kowalkowski, 2010). Also, as customers are not bounded to a single product, they can benefit from new and emerging technologies (Bohnsack et al., 2014). Furthermore, Tukker and Tischner (2006) state the possibility of PSS to adapt to specific customer needs through the use and adjustment of services. As customization might lead to increased customer satisfaction, it also influences the *customer relationship* (Tan, 2010). Additionally, the provision of necessities, together with repair and maintenance services, will intensifies the frequency of interaction with, and the feeling of trust from the consumer. Together with new legal ties, this will result in a prolonged and intensified relation (Matthyssens and Vandenbempt, 2010). The prolonged relationship is also highlighted by the way in which customers pay for the access to the

provided services, which will be a description based or over-time payment (Tan, 2010).
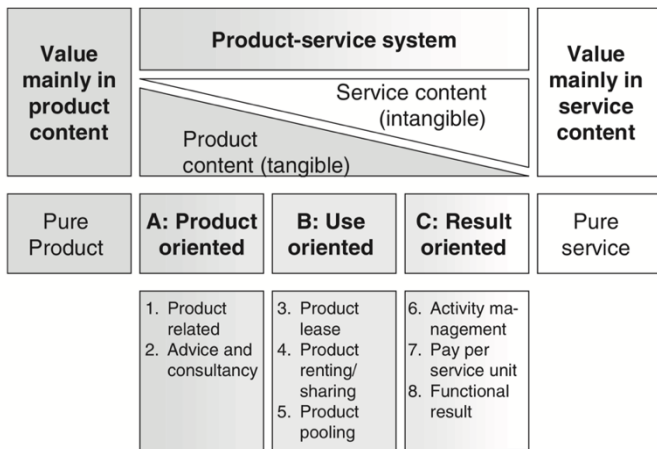
Figure 4: Three main type of Product-Service-System configurations with corresponding business models according to Tukker (2004)

The *revenue stream* will benefit from this shift as it becomes more structured and predictable once it no longer relies on one-time transactions (Ibid.). However, once such a structure is implemented, cash flow changes from a direct return (one-time transaction), to a smaller over-time payment (Mont, 2004). This might result in a monetary gap during the start of such payment structures. This monetary gap, together with additional costs for the repair and maintenance services, makes the *cost structure* the most critical segment for a PSS (Sundin et al., 2009; Grönroos, 2011). However, tax benefits and a decrease in demand for storage space, due to on-demand production and a decreased need for products, might decrease the lifetime cost of products overall (Bohnsack, 2014). New *key partners* and *key resources* might be needed in order to facilitate the offered services (Tan, 2010). The need for additional human resources, to deliver the imagined services and create customer awareness for these new initiatives via marketing, is highlighted by Cook et al. (2006). Cook et al. stresses the need for people

recruitment and training, which will result in additional costs. But PSS offer the possibility to target new *customer segments* as well. Such models can service people who were previously unable to meet the upfront investment linked to product purchase but can afford a monthly payment (Orsato & Wells, 2007; Bocken et al., 2014). Lastly, as companies remain the owner of the product, they have the responsibility to collect them at end of use, in order to facilitate reuse and recycling. Therefore, the *channels* segment has to be extended with reversed logistics, and other segments should be likewise equipped with recycling attributes as TBM (Roy, 2000; Nussholz, 2017).

The third category within PSS are *result-oriented* BM or Pay-per-Print (PpP) in the case study (Tukker, 2004). In such BMs, the consumer does only pay for the result delivered by a product and service combination (Barquet et al., 2013). Example wise, the consumer does not pay for the ownership of a printer, and neither for the ability to print, as in use-oriented BM. He or she pay for the result, the printed sheets, only (Barquet et al., 2013). Again, companies remain owner of the product and maintain responsibility. BMs incorporating these aspects are *pay per unit use* and *functional result* (Tukker, 2004). As ownership still remains with the service provider, after use treatment can easily be established. Such like BM, are very similar to the *use-oriented* BM, however, they do differ in some aspects of the BMC (figure 6). The *value proposition* is even more customized to customer needs (Tukker, 2004). In *use-oriented* models, the customer pays a fixed amount of money over a specific period of time, but, in *result-oriented* BM, the consumer is only obliged to make a monetary transaction the moment the need is fulfilled. *pay per unit* use and functional result BM reform the

Key Partners
- New partners needed for repair and maintenance
- New partners needed for service provision

(Tan, 2010)

Key Activities
- Service provision
- Retrieving products at end of use

(Cook et al., 2006)

Key Resources
- Additional and trained human resources needed

Value Proposition
- Meet customer needs through customized tailor made services
- Unburdening customers from responsibilities like maintenance and repair

(Alonso-Rasgado et al., 2004; Tan, 2010)

Customer Relation
- Prolonged relation due to payment structure
- Intensified relation due to increased sense of trust

Matthyssens and Vandenbempt, 2010

Channels
- Establishing reversed logistic channels

(Roy, 2000; Pokharel & Mutha, 2009; Govindan et al., 2015)

Customer Segment
- Reach and serve new customers which were unable to meet the upfront invest by shifting to a smaller over-time payment

(Orsato & Wells, 2007; Bocken et al., 2014)

Cost Structure
- Prolonged payback period which might result in monetary gap
- Additional cost for (repair and maintenance) service provision
- Additional cost for human resource recruitment and training
- Tax benefits in leasing models
- Less storage space and production needed due to on-demand production

(Mont, 2004; Sundin et al., 2009; Grönroos, 2011; Bohnsack, 2014)

Revenue Stream
- More structured and predictable cash flow

(Tan, 2010)

Figure 5: Business Model Canvas of Osterwald and Pigneur (2010), illustrated for *use-oriented* Product-Service-System, focused on *product lease*. Product-Service-Systems Business Models are able to facilitate recycling practices but recycling related parameters have not been included in this figure, to remain comparable opposed to *Take-back Management*.

Key Partners
- New partners needed for repair and maintenance
- New partners needed for service provision

(Tan, 2010)

Key Activities
- Service provision
- Retrieving products at end of use
- Gather data on product performance

(Barquet et al., 2013)

Key Resources
- Additional and trained human resources needed

(Cook et al., 2006)

Value Proposition
- Meet customer needs through customized tailor made services
- Unburdening customers from responsibilities like maintenance and repair
- Perfect customization to customer needs without additional costs
- Guaranteed performance

(Tukker, 2004; Shuh et al., 2009; Alonso-Rasgado et al., 2004; Tan, 2010)

Customer Relation
- Intensified relation due to increased sense of trust and perfect fulfilment of needs
- Complete unburdening

(Tukker, 2004; Matthyssens and Vandenbempt, 2010)

Channels
- Establishing reversed logistic channels

(Roy, 2000; Pokharel & Mutha, 2009; Govindan et al., 2015)

Customer Segment
- Reach and serve new customers which were unable to meet the upfront invest or the over-time payment
- Lowering the uptake threshold due to use related payment

(Orsato & Wells, 2007; Barquet et al., 2013; Bocken et al., 2014)

Cost Structure
- Prolonged payback period which might result in monetary gap
- Additional cost for (repair and maintenance) service provision
- Additional cost for human resource recruitment and training
- Less storage space and production needed due to on-demand production

(Mont, 2004; Sundin et al., 2009; Grönroos, 2011; Bohnsack, 2014)

Revenue Stream
- Less structured payment stream and small transactions related to single uses

(Tan & Mcaloone, 2006)

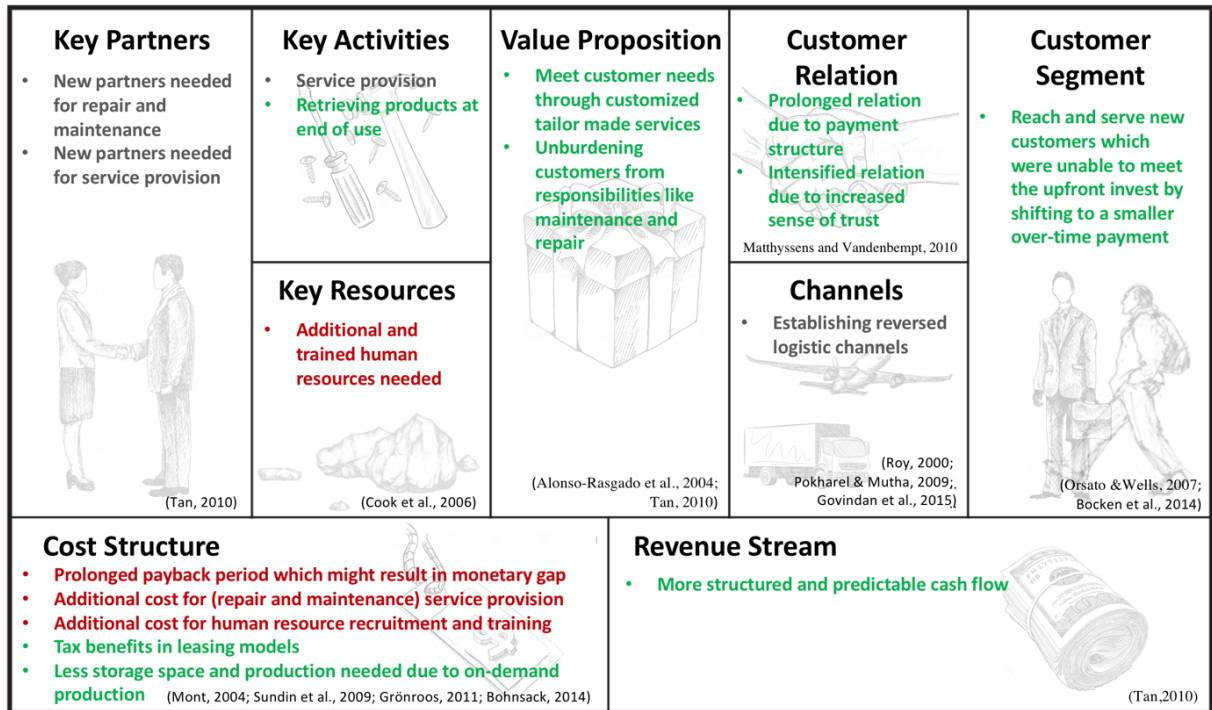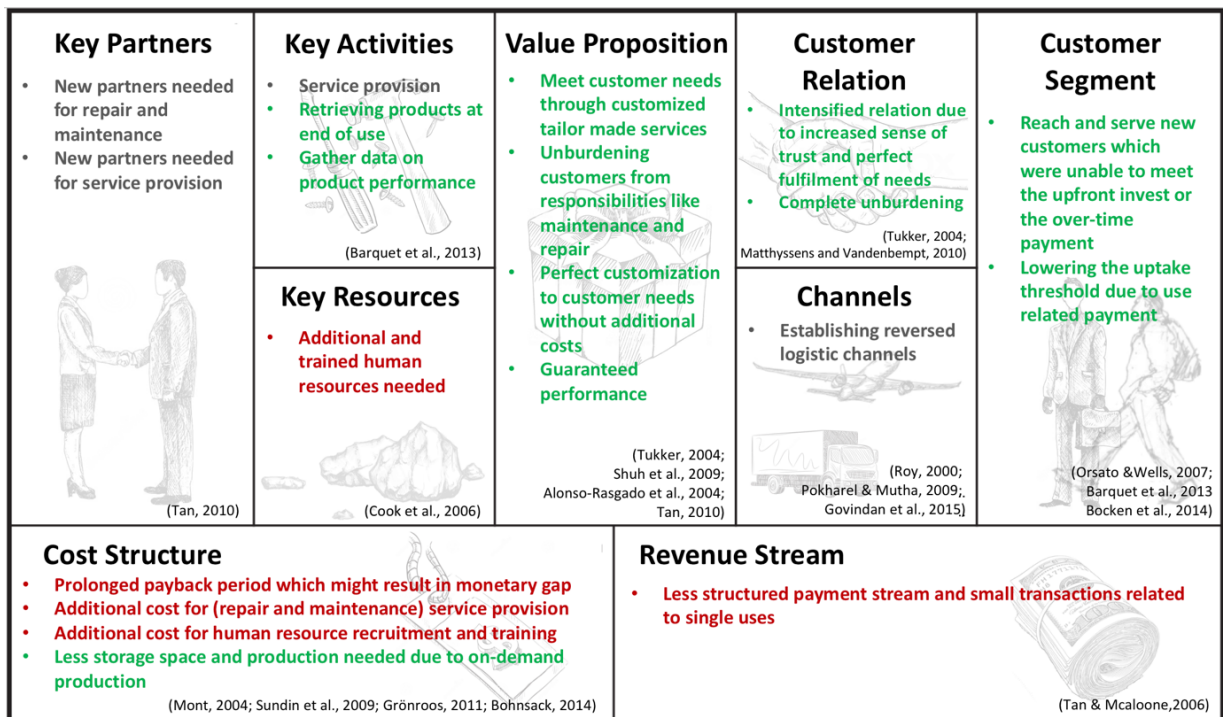**Figure 6**: Business Model Canvas of Osterwald and Pigneur (2010), illustrated for *result-oriented* Product-Service-System.

payment structure to the exact customer need and takes away all unnecessary cost for the consumer (Ibid.). Moreover, by use of this system, companies gather a great deal of data during their product use-phase (Barquet et al., 2013). As they monitor when the product is used, because payment is linked to direct usage, they gather insight in the frequency and intensity of use, and can prevent brake down by preventive maintenance, herewith guaranteeing product performance (Schuh et al., 2009). The revenue stream, however, is affected by this change as well. Cash flows become less predictable and pay-back-time is extended, as they do not rely on time, but on product use (Tan & Mcaloone, 2006). This introduces a greater risk to the cost structure as the return on the relatively larger investment, is delayed (Tukker, 2004). Lastly, as *result-oriented* models do not require an upfront investment or bind customers to a monthly payment structure, which promotes the uptake of

such models and decreases the threshold to try out a new product (Tukker, 2004; Barquet et al., 2013).

2.3.3 Circular Business Model Characteristics

As several CBM have been identified and mapped against the different segments of the Business Model Canvas, BM characteristics can now be identified. However, as this study aims to engage CBM from a consumer perspective, several aspects of the Business Model Canvas are deemed less important, as they do not interact with consumers. Therefore, only characteristic which are perceived by or affect consumers will be discussed. In this section, these characteristics will be listed and explained related to the three described BMs (figure 7).

The first characteristic changing in these Circular Business Models, as addressed in the *value proposition*, is *Ownership* (Tukker 2004; Bocken et al., 2014; Lewandofski, 2016; Nussholz, 2017). A distinction can be made between ownership during

Business Model Canvas Segment	Value Proposition		Revenue Stream
Characteristic	*Ownership*	*Responsibility*	*Payment Structure*
Take-Back Management	Reobtained by company through the use of collection points and returning-fees	Customer is responsible for functionality of the product	One-time transaction in which ownership of the product is sold
Product Lease	At company during entire life-cycle	Company is responsible for functionality of the product	Structured monthly over-time payment
Pay-per-Use	At company during entire life-cycle	Consumer is completely unburdened and can always make use of service	Customer pays a small amount each time product or service is used

Figure 7: Key characteristics in the three selected Circular Business Models. *Ownership, Responsibility* and *Payment structure* are outlined to the Circular Business Models.

use and after use. As this study set its scope on CBMs which entail recycling (of cartridges) in which producers or recyclers need to obtain end-of-use ownership, *Ownership after use* will be of main importance. TBM is, like classical BMs, centred around the sale of ownership, causing consumers to obtain ownership during use. However, take-back incentives must be provided by the company (*key activities*) or its partners (*key partners*) in order to reobtain ownership at end-of-use, or it would not meet the proposed criteria of this study. Both PSS categories sell services, whereby the provider retains ownership and end-of-use ownership is guaranteed (Tukker, 2004).

The second characteristic, also derived from the *value proposition*, is *(product) responsibility.* In this study, *responsibility* will be extended with *guaranteed performance.* Originally, Tukker (2004) categorizes *responsibility* and *guaranteed performs* separately, however, this research will consider *guaranteed performs* as the superlative of *responsibility*. Herewith, the following categorization is obtained. In TBM, customers are fully responsible for the product and the consumables needed to operate it, and bear repair and maintenance cost. *Use-oriented* PSS shift responsibility to the service provider. Herewith, companies unburden customers by offering support with repair and maintenance and provide necessities. Lastly, *result-oriented* PSS fully unburden customers, as they provide a complete service in which a result is guaranteed (Barquet et al., 2013). Herewith, companies might provide preventive maintenance in order to ensure product performance.

The last characteristic identified from the CBMs is linked to the revenue stream, the *payment structure.* As businesses might change the way they do business, the way they make revenue changes accordingly (Barquet et al., 2013). Again, TBM is very similar to classical BMs in which a single transaction is common practice, were the different types of PSS have varying *payment structures*. *Use-oriented* PSS make use of a structured over-time payment while *result-oriented* PSS apply *pay-per-use* models.

2.4 Consumer Behaviour

So, listed above are plenty opportunities and methods on how to harvest the potential of a CE. The fact that they have been there for decades, but have not yet been implemented, can be considered disturbing (Ellen McArthur Foundation, 2013). So, how come current economical society is still designed and executed in a linear way? The root of this problem might lie in the consumption patterns of consumers, which might be the most essential in the shift to a CE (Planning, 2015). The current lack of CE initiatives is due to the current incompetence of CBM to cope with the irrational perception of consumers, in which worse alternatives, monetary and environmentally wise, are preferred. Hereby, causing a lack of incentives for the industry to provide circular options as consumers do not tend to appreciate them (Ibid.). For long, it has been acknowledged consumers tend to base their choice not on rational motives but tend to rely on more emotional and subjective beliefs and attitudes towards a product in the decision-making process (Fishbein & Ajzen, 2010). The roll of beliefs has been broadly investigated during the last decades and has abundantly been linked to behaviour in previous research. The influence of beliefs, habits, knowledge and the social norm, were pointed to be core influencers of these parameters (Thøgersen, 1995; Fishbein & Ajzen, 2010). A behavioural framework dealing with beliefs, attitudes and intention, is the Theory of Planned Behaviour.

2.4.1 The Theory of Planned Behaviour

The framework called "Theory of Planned Behaviour" (TPB) by Ajzen (1985), which acknowledges the important of intentions and attitudes in behaviour, has distinguished itself in the lasts three decades in terms of uptake and usage with over 4000 annual citation, from other behavioural frameworks (Ajzen, 2012; Sniehotta et al., 2014). The TPB was derived from the Theory of Reasoned Action (TRA) developed by Fishbein and Ajzen (1975) and is most commonly used in health-related behavioural research (Sniehotta et al., 2014).

In the framework proposed by Ajzen (1985), illustrated in figure 8, behaviour is directly initiated by intention. Previous research which investigated the influence of intention of behaviour found a correlative and a causal relation between the both (Sheeran, 2002; Webb & Sheeran, 2006). The casual effect of intention on behaviour was shown by intervention studies which resulted in an actual change of behaviour. In its turn, intention is supposed to be influenced by three different factors: *Attitude towards the behaviour* (ATB); *subjective norm* (SN); and *perceived behavioural control* (PBC) (Fishbein & Ajzen, 2010; Ajzen, 2011). All these factors are determined by beliefs, each of different kind, which provide essential information about the possibility of performing, or not performing, a specific behaviour (Ibid.). Herewith, beliefs enable the composition of estimates of favourable or unfavourable attitudes and provide insights in normative beliefs and social pressure surrounding the behaviour, as well as the sense of control over the behaviour (Ajzen, 1985).

The first variable that influences *Intention,* ATB, is assumed to be regulated by behavioural beliefs (Ajzen, 1985). These beliefs are a product of all positive and negative associations with the behaviour in question, weighted by the evaluation of outcomes (Ibid.). Next to these behavioural believes, believes of others shape intention as well. Example wise, if people express negative opinions about buying an electric vehicle, a person might be less willing to purchase such car, especially if those people are important to him. Such normative believes of other people or society, weighted with
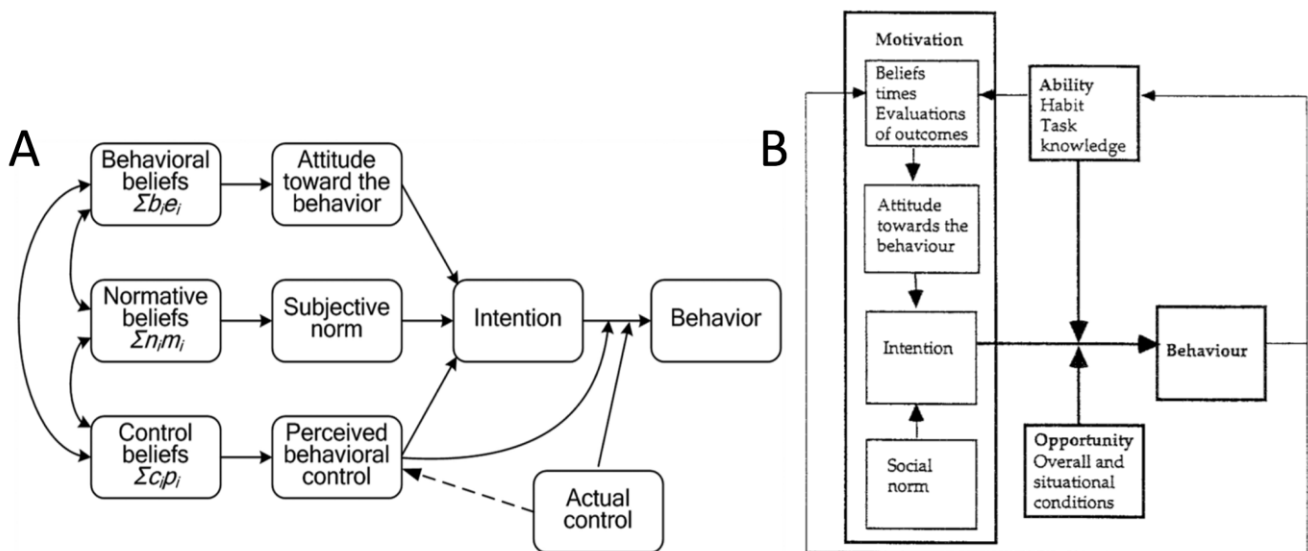

Figure 8: A is a visual representation of the Theory of Planned Behaviour by Ajzen (2012). B shows the Motivation, Ability, Opportunity model by Thøgersen (1995) which is an extension of the TRA. Both frameworks follow the same line of reasoning as that intentions are a central factor in the prediction of behaviour

a person's desire to comply with those, composes the *Social Norm*. The last measurement of *Intention*, PBC, is measured in beliefs about the perception of resources, situational factors and obstacles that could hamper the performing of a behaviour, called control believes (Van Lange et al., 2011). PBC is also mediated by the actual control (AC) a person has over the situation, as internal and external factors, might prohibit someone from converting an *Intention* into behaviour (Ajzen, 1985; Ajzen, 2011; Ajzen, 2012). In general, a more positive ATB and SN, in combination with a smaller PBC, will result in a stronger *Intention* of the person to perform a specific behaviour. Only when a sufficient degree of AC over the situation is acquired, people are expected to perform behaviour when the opportunity arises (Ajzen, 2011; Sniehotta et al., 2014).

The TPB has abundantly been used in the last decades, but has also been criticized (Sniehotta et al., 2014). A core assumption of the TPB is that people act to avoid punishments and to seek rewards. Herewith, decision making should be based on rational evaluation of behavioural consequences (Bamberg & Möser, 2007). However, Planning (2015) claims consumers to be far from rational in their decision-making process. Furthermore, in a critical review of the TPB by Sniehotta et al. (2014), several weaknesses of the theory where highlighted. They state the TPB does not describe how cognitive change, or learning, might alter a behaviour, which might seriously endanger the validity of the model. Furthermore, the TPB struggles with the inclusion of *Habits* and *past behaviour* in the model, which might have enriched the TPB (Ajzen, 2011). Ajzen (2011) states past behaviour is excluded from the TPB as it has no causal effect on intention. However, in the meta-analysis of Gardner et al. (2011), *habit*

strength was assumed to have significant effect in the prediction of behaviour. This could be strengthened by the claim of Klöckner (2013) stating the TPB lacks predictive value over repeated behaviour, especially related to environmental related decision making.

The statement of *Habit* being an influencer of behaviour, which could potentially enrich behavioural models focussing on environmental impact, has been made by other researchers too (Bagozzi, 1982; Stern, 2000; Hagger et al., 2002; Bamberg & Möser, 2007). Furthermore, Thøgersen (1995) stresses habits enable the performance of cognitive task without demanding cognitive capacity and highlights the need for habits in the shift to pro-environmental behaviour and behavioural change in general. Behavioural change does not occur after a single performance of new behaviour but should be continuously repeated in order to sustain. In the same research, Thøgersen (1995) presents the *Motivation, Ability, Opportunity* model (MAO), as an extension of the theory of reasoned action, the predecessor of TPB (figure 8). The MAO rearranges ATB and SN to *Motivation*, PBC to *Ability* and AC into *Opportunity*. Moreover, the MOA does, in contrast to the TPB, makes use of *learning* and *Habit* in the prediction of behaviour (Thøgersen, 1995; Jackson, 2005). *Habit* forms a part in a person's ability, as know behaviour have a higher success-rate, to perform a behaviour and can be strengthen or altered through the performance of that behaviour, learning.

According to Thøgersen (1995), there is a substantial lack in the understanding of consumer behaviour in combination with environmental impact, and the MOA is an attempt to surpass this gap. The TPB includes environmental considerations through SN, but this is criticized by

Thøgersen. Studies investigation environmental awareness, resulted in wide varying results among the research population, which makes SN an unstable and unreliable predictor for environmental norms (Thøgersen, 1995). In other research conflicting with the TPB, such environmental considerations are linked to *Personal Normative Beliefs* and the moral obligation to act pro-environmentally (Schwartz, 1977; Hunecke, 2001). *Personal Normative Beliefs* is, in early developmental stage, excluded from the TRA and TPB as being an alternative measure for *intention*, which might deteriorate the model (Ajzen & Fishbein, 1973). However, Hines et al. (1987) made an attempt to unify these two models and developed a TPB framework focused on environmental research. In a more resent meta-analysis, Bamberg & Möser (2007) reviewed the studies conducted making use of this unified model. Those studies incorporated environmental related parameters through the inclusion of the *moral norm* (Bamberg & Möser, 2007; Rivis et al., 2009). *Moral norm* represents a person's personal moral considerations and is mediated by *Feelings of guilt; problem awareness; internal attribution* and the SN (Bamberg & Möser, 2007). Although all these factors contributed to the prediction of *moral norm*, the role of *problem awareness* was highlighted as having direct and significant influence on *Intention* (Ibid.). Other research has shown, environmental factors can be aligned with behavioural beliefs, as this parameter overlaps most with a person's personal view, in the conflicting behavioural models (Budd & Spencer, 1985; Hunecke, 2001; Stern, 2000; De Leeuw et al., 2015). As ATB is based on imagined positive and negative outcomes, environmental considerations could be an additional belief in this subdomain of TPB.

So, it can be concluded that the TPB lacks the tools to asses environmental related behaviour through the absence of the factors *habits* and *environmental awareness.* The next section (2.4.2) will aim to optimize the TPB, for environmental related decision making, by the learnings identified from the MOA model and previous research, and herewith create an extended version of the Theory Planned Behaviour.

2.4.2 Extension of the Theory of Planned Behaviour

Due to the previously described shortcomings of the TPB (section 2.4.1) in the assessment of behaviour related to environmental impact, an extended version of the TPB will be used in this research (figure 9).

As proposed by Thøgersen (1995), learning from past experience will be included in the model through *Habit*. A habit is defined as a *behaviour repeated over time* and has shown to improve the predictability of behaviour (Triandis, 1977; Kok & Siero, 1985; Pieters, 1991; Verplanken & Holland, 2002). In the MAO, habits regulated the *Ability* to perform a behaviour, together with task knowledge. In the TPB, PBC would be the most comparable factor. The feedback arrows from *Behaviour* to *Habit*, in figure 9, illustrates that beliefs can change because of experience. As learning can make a task simpler, habits can be formed, and *Intentions* can be adjusted (Thøgersen, 1995). As previously motioned, *Habit* is measured by *past behaviour* but also by the *wish to maintain habit.* Harich (2010) argues the *wish to maintain old habits*, called *resistance to change* in scientific terminology, might be the crux in the shift to a sustainable society. Therefore, the willingness to change old behaviour could affect intention and the uptake of Circular Business Models. In this study, *Habits* will be measured by past behaviour

meaning if the current habit would suit the habits linked to the envisioned habits linked to the CBM, called *Habit Direction* (d_h), and to what extend someone is willing to change its old habit and adapt to the envisioned alternative, named *Habit Strength* (s_h).

As previously described, environmental aspects need to be included in the TPB in order to properly address environmental motives in decision making. These environmental considerations will be addressed in the *Environmental Attitude* (EA). EA represents a person's motivation to act environmental friendly and will be estimated

making use of the two most dominant mentioned factors by Bamberg and Möser (2007), namely: *Problem awareness* and *feelings of guilt.* Herewith *Environmental Attitude* is described by *consumers awareness over current environmental issues* and their *feelings of guilt over the human caused nature of these issues*. Herewith, it will not be measured to what extend consumers are informed over environmental issues, but to what extend consumers belief to be aware of the environmental problems (Bagozzi & Dabholkar, 1994). Like previously mentioned, EA can be inserted in the TPB model at various places. Studies like De Leeuw et al. (2015) showed a linkage to behavioural
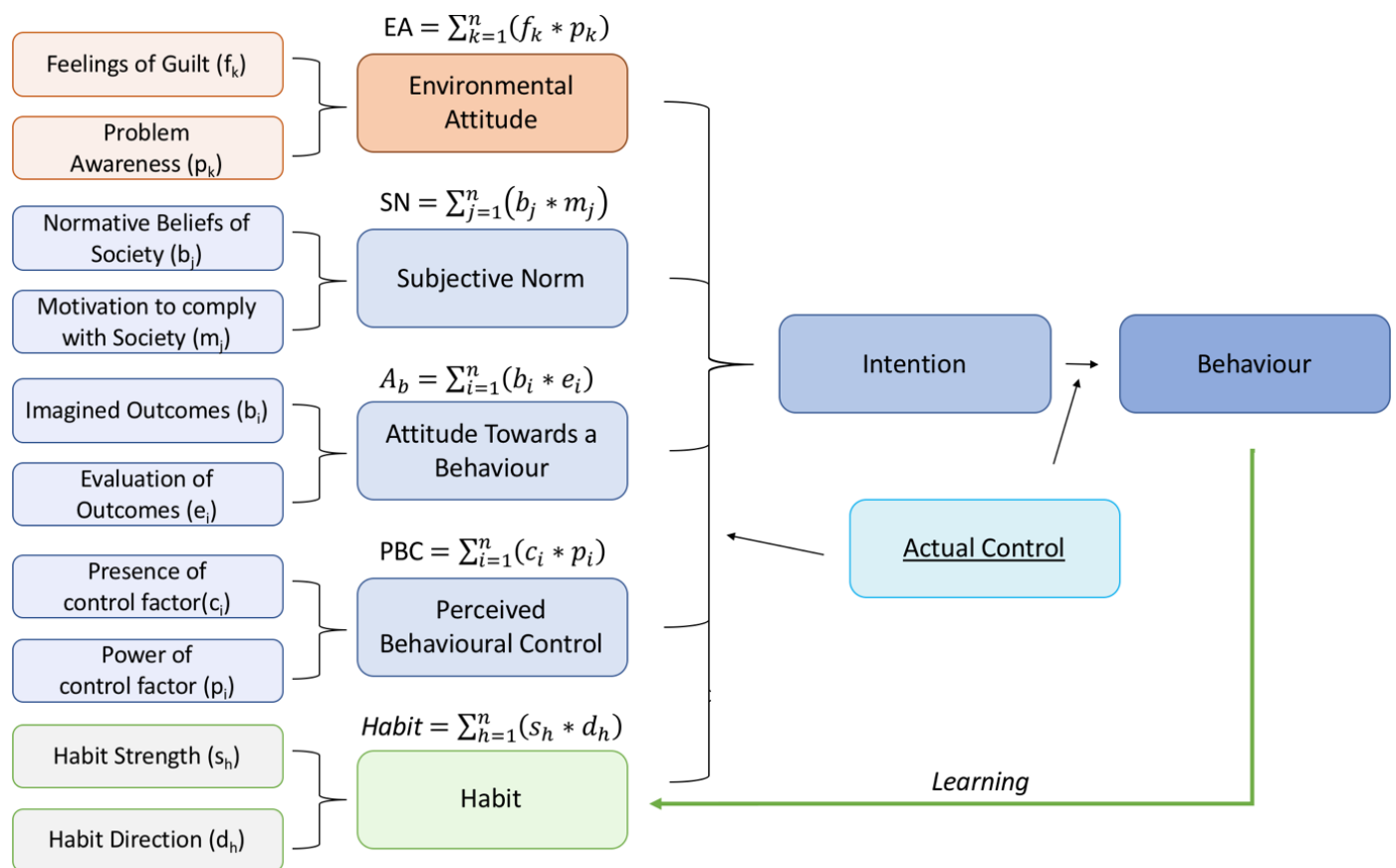

$$EA = \sum_{k=1}^{n}(f_k * p_k)$$

Feelings of Guilt (f_k)

Problem Awareness (p_k)

Environmental Attitude

$$SN = \sum_{j=1}^{n}(b_j * m_j)$$

Normative Beliefs of Society (b_j)

Motivation to comply with Society (m_j)

Subjective Norm

$$A_b = \sum_{i=1}^{n}(b_i * e_i)$$

Imagined Outcomes (b_i)

Evaluation of Outcomes (e_i)

Attitude Towards a Behaviour

$$PBC = \sum_{i=1}^{n}(c_i * p_i)$$

Presence of control factor(c_i)

Power of control factor (p_i)

Perceived Behavioural Control

$$Habit = \sum_{h=1}^{n}(s_h * d_h)$$

Habit Strength (s_h)

Habit Direction (d_h)

Habit

Intention

Behaviour

Actual Control

Learning

Figure 9: Extended version of the Theory of Planned Behaviour. Learning and habits, together with *Environmental Attitude*, have been included to make the TPB more suited to research behaviour related to environmental impact. Factors illustrated in different shades of blue, represent the original TPB framework. The feedback of behaviour on *Habit* through Learning, inspired by Thøgersen (1995) and measured by *past behaviour* and *wish to maintain Habit*, is shown in green. *Environmental Attitude*, in orange, is included as an additional estimate of *intention*. Formulas to calculate the *Subjective Norm, Perceived Behavioural Control, Attitude Towards Behaviour* and *Environmental Attitude* are listed above the corresponding factor.

beliefs, as they overlap most with a person's personal consideration, and Bamberg and Möser (2007) support the addition of EA to the TPB through the use of *moral norms* and various related pathways. However, both positioning can be questioned. The linkage of the *moral norm* to EA can be considered doubtful as the main influencer of *moral norm*, SN, is a poor predictor of EA since a lot of variance in society, concerning *Environmental Attitude*, is present (Thøgersen, 1995). If EA is linked to Behavioural beliefs, it might be out weighted by other beliefs present in society. In a CE, topics like *Ownership* and price could be of leading importance to the, assumed irrational and egocentric, consumer (Bamberg & Möser, 2007; Fishbein & Ajzen, 2010; Planning, 2015). Additionally, it may be unwise to link a new factor like EA, to already existing predictors of *Intention*, as they might hamper the predictive value of the linked factor. Ajzen (2006; 2011b) states additional factors can be included in the TPB, as long as they are measurable and do not build on already set beliefs but should be included as independent estimates of *Intention*. Therefore, EA will be considered as an additional factor influencing *Intention*, when investigating consumer behaviour related to a CE. Herewith, the impact of environmental considerations can be properly addressed, without hampering the predictive value of the model and being out weighted by other beliefs.

According to the original configuration of the TPB by Ajzen (1985), *Intention* to perform a behaviour is expected to be high when the SN and ATB are high, and the PBC is deemed low. In this study, *Intention* to participate in CBM is expected to be higher when the EA is high as well, since active engagement with the environment would provoke actions to conserve it, which can be translated to participation in the CBMs. Furthermore, the influence of *Habit* on *Intention* is expected to rely on the *Habits strength* and *direction*. As a strong *Habit*, in which its owner is not willing to change it, *Intention* to participate or not participate in this CBM is expected to be influenced greatly by such strong habits. However, when *Habits* are not profoundly rooted and can be altered easily, they are expected to have minimal effect.

3 Methods

This research will attempt to clarify the beliefs and intentions of consumers towards new CBM, by making use of the TPB. Currently, as CBM are still in development, current models are mostly unknown to the consumer. With the TPB, norms and beliefs towards these new CBM will be mapped and identified. More specifically, it will be measured how consumers think and position themselves to new CBM characteristics, expressed in attitude, norms and the feeling of control. Additionally, by measuring these beliefs, insight is gained into the underlying cognitive foundation of behaviour which will lead to Intentions to participate in the CE.

3.1 Operationalization of CBM Characteristics and extended TPB framework

In ordinary TPB-research, the TPB is used to measure the intention towards a single behaviour (Fishbein & Ajzen, 2010). This research aims to investigate the intention towards three different interventions linked to three different BM. Herewith, the scale of the study would considerably be larger than regular TPB-research. To downsize the mentioned extensive scale, *Intentions* will not be measured towards the CBM Characteristics but will directly address the different CBMs (figure 10).

In this research, the SN will be generalized over the different CBM, as previous research noted a SN concerning *Environmental Attitude* is fluctuating and unpredictable (Russel et al, 2017). However, the pilot indicated a SN dealing with *Environmental Attitude* and product *ownership* was strongly present. Nevertheless, the pilot was unsuccessful to identify SN's regarding *responsibility* and

payment structure. This could be explained by the newness of such concepts. As these concepts are new to people, they are new to society, whereby a SN has not yet been established. Therefore, by the use of the SN identified for *ownership* and *Environmental Attitude,* a general SN addressing the complete CBM will be established and used over the different measurements in the extended-TPB model.

Figure 10 is an attempt to combine both previously illustrated frameworks for the Pay-per-Print model. In this figure, the CBM characteristics were combined with the variables from the extended TPB framework. Operationalisations for the remaining CBMs can be viewed in Appendix C.

3.2 Pilot

According to the TPB standards, a pilot study, with open-ended questions, is needed to identify accessible behavioural, normative, and control beliefs, of the future respondents (Ajzen, 1991; Ajzen, 2011b, De Leeuw et al, 2015). Beliefs identified in the pilot study, will be used to create the questions used in the main questionnaire. Respondents (n=24), representative for the research population, were asked to list likely outcomes, normative beliefs, and control factors that came readily to mind, thinking of the behaviour of interest. These results were ranked according to frequency of occurrence, to determine the responses most readily accessible beliefs present in the target group. The identified beliefs from the pilot, were used as direct measures of EA, SN, ATB, PBC and *Intention* in the questionnaire. It would be incorrect to assess predetermined, arbitrarily or intuitively beliefs as they might not echo in the population (Ajzen, 1991)

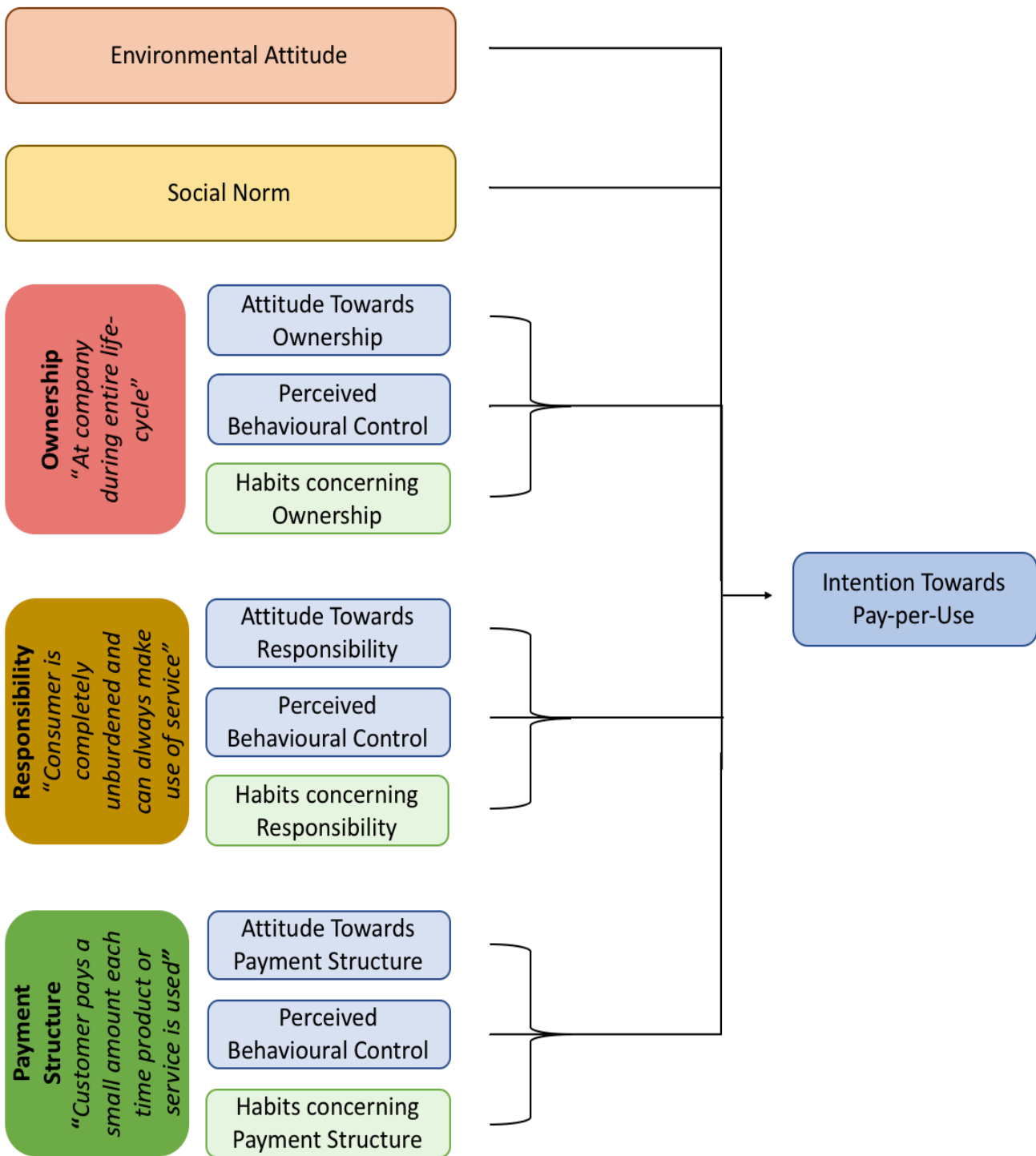**Figure 10:** Operationalisation of figure 7 and figure 9. ATB, PBC and *Habit* will be mapped to all CBM Characteristics. Afterwards, together with EA and SN, *Intention* towards a CBM can be estimated by the use of the obtained factors. The Pay-per-print Circular Business Model was used in this example. Figures showing correlations and focusing on all Circular Business Models can be seen in Appendix C.

3.3 Measurements

After the identification of the CBM characteristics, a selection was made to only investigate the characteristics applicable to consumers. *Intention* will not be mapped for each separate measurement but will focus on *Intention towards the CBMs*. This will not affect the quality of the obtained results as it still follows the intended structure of a TPB-study (Ajzen, 1991; Ajzen, 2011b). The questionnaire will be based on questionnaires validated by previous research and guidelines but reshaped to meet the current research objectives (Ajzen, 20016; Ajzen, 2011b). A 7-point bipolar scale will be used to formulate the questions, as previous research has shown a scale of this size is most optimal in TPB-related research (Ibid.).

3. 4 Questionnaire

This section will list a selection of the used questions from the questionnaire and shows how measurements will be obtained and are constructed (for full questionnaire see Appendix B). As previously mentioned, these questions will focus on CBM specified to printing solutions.

ATB is assumed to rely on the sum of the likelihood of imagined outcomes, multiplied by the score of its importance (Fishbein & Ajzen, 2011). The numeric formula, also shown in figure 9, can be displayed as $A_b = \Sigma b_i e_i$, in which A_b is the ATB, b_i is the strength of belief that performing the behaviour will result in outcome i, and e_i is the evaluation of outcome i. EA might affect, according to this model, the rating of importance of pro-environmental outcomes. To test the ATB, questions will entail the imagined outcomes…

I think it's good cartridges are collected after use:
Disagree:_1__2__3__4__5__6__7_:Agree

…and the evaluation of the behaviour.

It will be … to hand in my cartridges after use:
Easy:_1__2__3__4__5__6__7_:Hard

SN can be constructed by multiplying normative believes (b) of other people (j), with a person's desire to comply with those believes of person j (SN = $\Sigma b_j m_j$). Again, questions should entail the normative beliefs of person j…

I think other people would promote the recycling of cartridges:
Disagree:_1__2__3__4__5__6__7_:Agree

…and the motivation to comply with person j.

If others would hand in their cartridges, I would be tempted to do the same:
Not at all:_1__2__3__4__5__6__7_:Very much

Likewise, PBC is calculated by the sum of all belief of a control factor (i) being present, multiplied by the power (p) of i to inhibit or facilitate the behaviour (PBC = $\Sigma c_i p_i$). Questions would entail the belief of being able to perform a behaviour through the presence of control factors…

I think it will take … effort to hand in my cartridges:
Allot of:_1__2__3__4__5__6__7_:Almost non

…and the and the power of control factors in situation i.

The amount of effort it will take to hand in my cartridges will … influence my decision to actually hand them in:
Barely:_1__2__3__4__5__6__7_:Greatly

Furthermore, to be able to make a behavioural prediction, *Intention…*

I intend to hand in my cartridges in the future:
Disagree:_1__2__3__4__5__6__7_:Agree

...and *Habit* (Habit = $\Sigma s_h d_h$) will be addressed as well. *Habits* might be displayed by *Habit Strength* (s_h), together with the *direction* of the old habit (d_h).

I have … handed in my cartridges after use
Never:_1__2__3__4__5__6__7_:Often

I … intend to change my habits:
Do not:_1__2__3__4__5__6__7_:Do

Lastly, EA will be estimated by multiplying *problem awareness* of ecological problem k...

I'm … of the environmental crisis:
Unaware:_1__2__3__4__5__6__7_:Aware

...with the *feelings of guilt* over ecological problem k (EA = $\Sigma f_k p_k$).

I feel responsible for the consequences of my behaviour on the environment
Not at all:_1__2__3__4__5__6__7_:Very much

3.5 Sample size and research population

This research will be carried out in collaboration with Canon Europe and will focus on the Dutch B2C printer imaging market. Herewith, this study will make use of Canon's extensive consumer base of registered customers, which creates a research population of almost 1 million registered contacts linked to printer solutions in the Netherlands alone (**figure 11**). Average response rate for this customer base is estimated around 1.5 percent. With such a research population and an adopted error margin of 5 percent, at least 400 responses are required (Bryman, 2015). This research surpasses this threshold with a total of 537 responses (n= 537).

When looking at the investigated research population, it can be seen the majority of registered consumers is male. Further, the majority of registered consumers is between 55 and 74 years old. Other socio-economical descriptors of the research population are not listed as Canon is unable to measure and not validated by law to
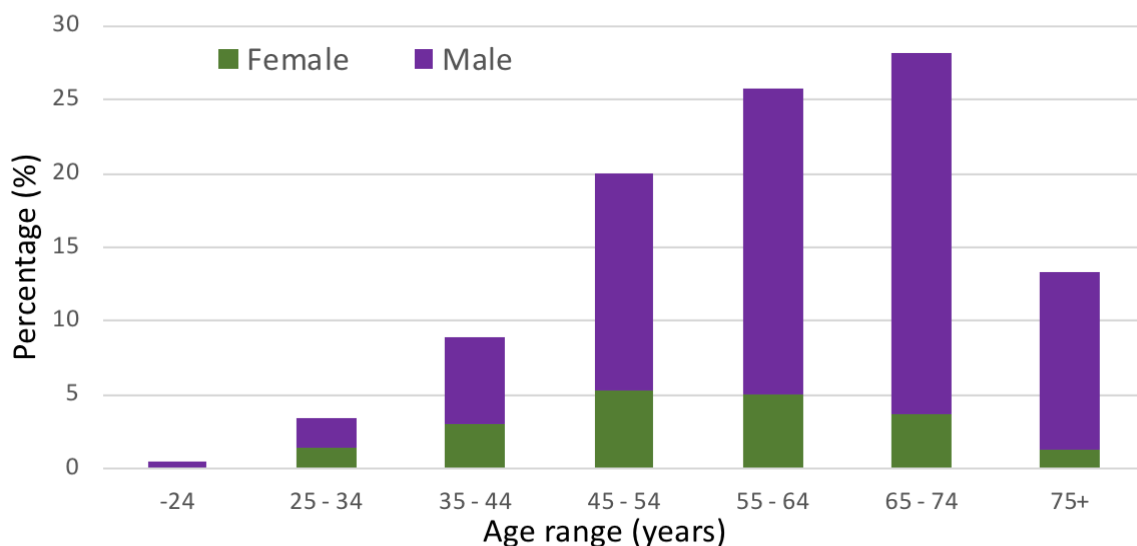

Figure 11: visual presentation of the age and gender characteristics of the used research population. Males (purple) were more strongly present in the researched population compared to females (green). Age is shown in batches of 10 years presented on the x-axis. The y-axis shows the size (in percentage) of an age batch in the research population.

collect such information. Therefore, remaining descriptors are unknown.

3.6 Analysis

Firstly, the data from the questionnaire was subdivided in three different groups corresponding to the three different BMs. For each group means, standard deviations and correlations to *Intention* will be listed. These correlations will be created by the use of multiple regressions. With the Beta-coefficients obtained from the multiple regression, the relative contribution to the *Intention* (to comply with a BM) of ATB, SN PBC, EA and *Habit* can be estimated. Herewith, models with the aim of predicting *Intention* will be constructed. Hereby, it can be evaluated which BM is more favourited by the consumer and which factor (ATB, SN PBC, EA and *Habit*), within which Business Model Characteristics, explains most of the observed variance in *Intentions.* At last, the variables incorporated in the predictive models will be further examined to clarify their relation to the consumers' willingness to participate in CBMs.

When executing the multiple regression, attention should be spent on the chance of multicollinearity, as EA and *Habit* are newly introduced factors in the TPB-model and might positively or negatively affect the predictive power of the model. Statistical analysis was performed in SPSS. MicrosoftForms was used to create and conduct the questionnaire.

4 Results

Section 4 will first list plain descriptive results obtained from the questionnaire and the extended TPB Framework in 4.1. Afterwards, these results will be interpreted and analysed in section 4.2.

4.1 Descriptive Statistics

In this section the results obtained from questionnaire and extended TPB Framework will be listed according to Circular Business Model.

4.1.1 Results Take-Back Management

Respondents showed a high behavioural Intention towards the TBM (M = 6.3, SD = 1.4). Furthermore, the willingness of consumers to outsource product ownership (OWN-ATB) is very high (M = 44.9, SD = 8.8) while the perception of possibly present limitations (OWN-PBC) and Habits over Ownership (OWN-Habit) are low and below average (M = 8.2, SD = 10.3; M = 23.4, SD = 10.4). Moreover, all factors related to Responsibility, except for the

level of familiarity with outsourcing Responsibility (RES-Habit), score above average. Consumers opinion about a one-time transaction (PS-ATB) is quite low (M = 15.5, SD = 12.7), Environmental Attitude is quite high (M = 37.1, SD = 12.6), and moral norm concerning Circular Business Models (SN) can be called average (M = 26.1, SD = 16.7). Furthermore, all variables, except for SN and being used to be the owner over the product (OWN-Habit), correlate (highly) significantly with Intention, also shown in table 1.

When all significant factors ($p < 0.05$) are included in a model, they result in the best possible fit. When the consumers opinion over Responsibility (RES-ATB) and Ownership OWN-ATB) (R-Square Change = 0.070, Standardized Coefficient Beta (SCBeta) = 0.084, $p < 0.0005$, Tolerance = 0.75; R-Square Change = 0.033, SCBeta = 0.086, $p < 0.0005$, Tolerance = 0.731), Environmental Attitude (R-Square Change = 0.017, SCBeta = 0.11, $p = 0.001$, Tolerance = 0.829), the possibility of limitations being present while handing in the old products

Table 1: Table shows descriptic statistics of the Take-back model. Listed are Mean, SD and correlations between all variables. Variables are shown in abbreviations. OWN=Ownership, RES=Responsibility and PS=Payment Structure. Example wise, OWN-ATB represents the Attitude towards the Ownership characteristics of TBM (shown in Figure 7). Theoretical range 1 - 7 = [a],

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Intention	6,3[a]	1,4	-	,260**	-,187**	-,025	,264**	,073*	,075*	-,075*	,073*	,086*	,224**	,009
2. OWN-ATB	44,9[b]	8,8		-	-,361**	,047	,344**	,053	-,012	-,146**	,053	,151**	,305**	,104**
3. OWN-PBC	8,2[b]	10,3			-	-,087*	-,205**	,094*	0,92*	,207**	,094*	-,128**	-,120**	,009
4. OWN-Habit	23,4[b]	10,4				-	-,041	,005	-,537**	,007	,005	,528**	,139**	-,052
5. RES-ATB	39,1[b]	13,0					-	,015	,040	-,120**	,015	,160**	,208**	,016
6. RES-PBC	38,6[b]	12,9						-	,024	,074*	1,00**	,013	,039	,057
7. RES-Habit	19,6[b]	14,0							-	-,043	,024	-,894**	-,154**	,074*
8. PS-ATB	15,5[b]	12,7								-	,074*	-,008	,004	,028
9. PS-PBC	38,6[b]	12,9									-	,013	,039	,057
10. PS-Habit	33,5[b]	14,6										-	,280**	-,061
11. EA	37,1[b]	12,6											-	,062
12. SN	26,1[b]	16,7												-

(OWN-PBC) (R-Square Change = 0.011, SCBeta = -0.11, p = 0.009, Tolerance = 0.761), and Habits of the consumer concerning being responsible for the product (RES-Habit) and the Payment Structure linked to this product (PS-Habit) (R-Square Change = 0.009, SCBeta = 0.56, p = 0.023, Tolerance = 0.16; R-Square Change = 0.038, SCBeta = 0.52, p < 0.0005, Tolerance = 0.15) are incorporated in a model, they together explain 16.7 percent of the observed variance (Adjusted R-Square = 0.167, SD = 1.32). The low tolerance of the Habit-parameter is the result of the fact the Habit-parameters partly explain a matching amount of variance. When these factors are separately incorporated in a model, together with the previously listed factors, the tolerance, of the Habit-parameters individually, increases to 0.97.

4.1.2 Results Lease

Means and Standard Deviations of the Ownership-parameters, EA and SN hasn't changed in comparison to the results shown in table 1, as these are constant over all CBM. A remarkable drop in Intention, or the willingness of consumers to participate in the *Lease* model, is shown (M = 2.2, SD = 1.9) (Table 2). The consumers opinion concerning outsourcing Responsibility (RES-ATB) (M = 20.3, SD = 15.2) and possible struggles when outsourcing Responsibility (RES-PBC) (M = 28.4, SD = 9.7) do not show extreme values. However, the Habit of consumers not being Responsible for product (RES-Habit) is strong, resulting in a quite low score (M = 15.3, SD = 15.3). Additionally, consumers opinion over paying a month (PS-ATB) and their familiarity with a monthly payment structure (PS-Habit) do show extreme low values (M = 12.5, SD = 13.4; M = 6.7, SD = 8.0).

The best model fit explains 27.3 percent of the observed variances (Adjusted R-square = 0.273, p <

Table 2: Table shows descriptic statistics of the Lease model. Listed are Mean, SD and correlations between all variables. Variables are shown in abbreviations. OWN=Ownership, RES=Responsibility and PS=Payment Structure. Example wise, OWN-ATB represents the Attitude towards the Ownership characteristics of Lease (shown in **Figure** 7). Theoretical range 1 - 7 = [a], Theoretical range $1 - 49$ = [b], p < .05 = *, p < .01 =**, n=537

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Intention	2,2[a]	1,9	-	-,016	,080*	,094*	,377**	,020	,137**	,381**	-,055	,261**	,058	-,006
2. OWN-ATB	44,9[b]	8,8		-	-,361**	,047	,028	,202**	,073*	-,118**	,114**	,019	,305**	,104**
3. OWN-PBC	8,2[b]	10,3			-	-,087*	,096*	-,080*	-0,79*	,173**	-,18	-,020	-,120**	,009
4. OWN-Habit	23,4[b]	10,4				-	,064	,023	261**	,022	-,025	,246**	,139**	-,052
5. RES-ATB	20,3[b]	15,2					-	,047	,068	,328**	-,063	,040	,035	,108**
6. RES-PBC	28,4[b]	9,7						-	,001	-,116**	,579**	,059	,215**	-,080*
7. RES-Habit	15,3[b]	15,3							-	,002	-,063	,220**	,102**	,041
8. PS-ATB	6,7[b]	8,0								-	-,106**	,016	-,007	,079*
9. PS-PBC	26,8[b]	8,1									-	-,012	,273**	,016
10. PS-Habit	12,5[b]	13,4										-	,090*	-,080
11. EA	37,1[b]	12,1											-	,062
12. SN	26,0[b]	16,7												-

0.001) and consists of only highly significant (p < 0.01) factors, namely consumers opinion concerning the new Payment Structure (PS-ATB)(R-Square Change = 0.145, SCBeta = 0.287, p < 0.001, Tolerance = 0.893) and Responsibility distribution (RES-ATB)(R-Square Change = 0.071, SCBeta = 0.273, p < 0.001, Tolerance = 0.892), combined with consumers familiarity with a monthly payment structure (PS-Habit) (R-Square Change = 0.060, SCBeta = 0.246, p < 0.001, Tolerance = 0.998).

4.1.3 Results Pay-per-Print

Again, consumers show little willingness to participate in this CBM as can be seen from the low score on *Intention* (M = 2.1, SD = 1.8) (table 3). Like in the Lease model, consumers *opinion over outsourcing Responsibility* (RES-ATB) (M = 25.0, SD = 12.1) and *possible struggles when outsourcing Responsibility* (RES-PBC) (M = 28.4, SD = 9.7) show average values, where *Habits concerning Responsibility* (RES-Habit) is low (M = 6.6, SD = 6.2). Likewise, *consumers opinion* (PS-ATB) and *their familiarity with paying per* use (PS-Habit) are also

low (M = 7.3, SD = 9.0; M = 9.6, SD = 10.0). However, *consumers do not expect to encounter struggles when paying per print* (PS-PBC), as no extreme values were found (M = 26.9, SD = 8.0).

In the search for a model fit which covers a maximum amount of variance, a model of all highly significant factors (p < 0.01), does deem to has the best fit (Adjusted R-square = 0.395, p = 0.015). When the *consumers attitude over paying per print* (PS-ATB) (R-Square Change = 0.364, SCBeta = 0.564, p < 0.001, Tolerance = 0.922), *consumers opinion about the outsourcing of product Responsibility to the producer* (RES-ATB) (R-Square Change = 0.017, SCBeta = 0.121, p < 0.001, Tolerance = 0.970), *consumers Habits concerning being owners of the product* (OWN-HABIT) (R-Square Change = 0.011, SCBeta = 0.088, p = 0.012, Tolerance = 0.944), and *consumers Habits concerning the how is paid for the product* (PS-Habit) (R-Square Change = 0.007, SCBeta = 0.087, p = 0.015, Tolerance = 0.886) are included, the model represents 39.5 percent of the observed variance.

Table 3: Table shows descriptic statistics of the Pay-per-Print model. Listed are Mean, SD and correlations between all variables. Variables are shown in abbreviations. OWN=Ownership, RES=Responsibility and PS=Payment Structure. Example wise, OWN-ATB represents the Attitude towards the Ownership characteristics of Pay-per-Print (shown in **Figure 7**). Theoretical range 1 - 7 = [a], Theoretical range 1 – 49 = [b], p < .05 = *, p < .01 =**, n=537

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Intention	2,1[a]	1,8	-	-,050	,079*	,109**	,220**	-,064	,104**	,603**	-,091*	,257**	,021	,011
2. OWN-ATB	44,9[b]	8,7		-	-,361**	,047	,122**	,202**	,007	-,151**	,121**	-,055	,305**	,104**
3. OWN-PBC	8,2[b]	10,3			-	-,087*	,049	-,080*	-0,048	,230**	-,026	,033	-,120**	,009
4. OWN-Habit	23,4[b]	10,4				-	,049	,023	,262**	-,008	-,032	,226**	,139**	-,052
5. RES-ATB	25,0[b]	12,1					-	,121**	,129**	,152**	,023	,112**	,152**	,043
6. RES-PBC	28,4[b]	9,7						-	-,050	-,113**	,571**	-,004	,215**	-,080*
7. RES-Habit	6,6[b]	6,2							-	,095*	-,067	,213**	,070	,010
8. PS-ATB	7,3[b]	9,0								-	-,125**	,241**	-,085*	,027
9. PS-PBC	26,9[b]	8,0									-	-,058	,280**	0,13
10. PS-Habit	9,6[b]	10,0										-	,065	-,097*
11. EA	37,1[b]	12,1											-	,062
12. SN	26,0[b]	16,7												-

4.2 Analysis

Quite extreme values for *Intention* were observed across the different CBMs. Remarkable is the high *Intention,* or *willingness to participate in the Take-back Circular Business Model*, observed in the *Take-Back Management* model, especially in comparison to the *Intention* measured for the *Lease* model and the *Pay-per-Print* model. These different outcomes could be explained with the relations of *Intention* to the different variables constructing this *willingness to participate in a CBM*. As discussed in section 2.4.2, the *Intention* to perform a behaviour is expected to be high when the *moral norms* (SN), *consumer opinion over the envisioned behaviour* (ATB) and *environmental engagement of the consumer* (EA) are high and the *chance for possible struggles being present* (PBC) is low (AJZEN). The relation of *Habits* to *Intention* depends on *strength*, or how deeply rooted the habit is incorporated in the consumers behaviour, and if the habit is in favour of the new behaviour or has a contradicting nature, called *direction*. *Habits* were formulated in such a manner that they would stimulate the adjustment to the envisioned behaviour. Therefore, *Habit* is expected to positively influence *Intention*

In the next section, by the use of the above listed expected relations of the parameters, the obtained results will be analysed and the link between parameters and Intention will be clarified.

4.2.1 Take-Back Management variables

As can be seen in section 4.1, six factors seem to significantly determine *Intention*. A critical note must be placed next to this statement as the TBM-model only accounts for 16.7 percent of the observed variance. Based on Cohens (1988) guidelines, this would be a weak model. However, within this boundary, it can be seen that *Habits*

concerning *the current Responsibility distribution* and *payment form* influence *Intention* five times as strong as the other parameters in the model (SCBeta = 0.56; SCBeta = 0.52). This could be explained by the way *Responsibility* and *Payment Structure* are designed within the *Take-Back Management* model, as they preserve the design of the current Business Models in place and therefore corresponds with the habits in place. The big influence of *Habits*, which are shaped and focussed on past and current behaviour, can be linked to the comparable design of the Take-Back Management model (Verplanken & Holland, 2002). Habits are a very strong determinant in Intention as consumers can keep their current behavioural patterns and as they are perfectly aligned with the envisioned CBM (Thøgersen, 1995; Ouellette & Wood, 1998). Strangely, as shown in Table 1, *Habits concerning the current Responsibility distribution* score quite low (M = 19.6), which implies that these *Habits* are not as deeply rooted in consumer behaviour or commonly shared among consumers. The previous predicted positive effect of this parameter on *Intention*, as a higher score on a *Habit* parameter is expected to raise *Intention*, could be hampered.

The Attitude of the consumer, concerning *Ownership* and *Responsibility*, seem to influence *Intention* the least in this model. However, *the opinion of the consumer towards handing over product ownership after use* (OWN-ATB) scores very high in mean score, meaning consumers like to hand in their used products. Therefore, this factor might still have profound impact on the observed *Intention*. Since *Ownership* is the only fundamentally changing characteristic in this model, as the other characteristics of the *Take-Back Management* model meet the design of the current model in place, its high score is accentuated. This high score could be explained by

or linked to the high mean score on *Environmental Attitude.* As the Ownership parameter, in the TBM model, addresses questions like "Do you think it is good cartridges are to be collected after use?", consumers could easily link such motives to recycling of products, and therefore associate such with environmental topics. Herewith, it could be suggested the *environmental concern of the consumer* does stimulate the *consumers attitude towards relinquishing product ownership* (OWN-ATB*)*. The link between these parameters is also visible in the data as they significantly correlate. The high mean score for these parameters could be due to the increasing popularity of recycling, or more specifically plastic recycling (Thøgersen, 1994; Okada, 2002).

Furthermore, *possible struggles related to handing over product Ownership* (OWN-PBC) does, as expected, negatively influence *Intention*, but due to its low mean score and influence this parameter is not expected to have resulted in the drop in *Intention*. Therefore, the Ownership parameters, which seem to be interlinked to *Environmental Attitude*, all deem to stimulate *Intention* directly, or seem to overrule the negative influencers, herewith explaining the high observed willingness to take part in the *Take-Back Management* model (M = 6.3).

Altogether, consumers deem to base their choice to participate or to not participate in the *Take-Back Management* model on their *opinion* and *foreseen struggles linked to handing in of products after use*, *attitude over being responsible for products themselves*, *Environmental Attitude*, and most strongly by their *habits focussed on paying for the product once* and *their familiarity with being responsible for the product themselves* (Intention = 0.084*(RES-ATB) + 0.086*(OWN-ATB) + 0.11*(EA) – 0.11*(OWN-PBC) + 0.56*(RES-Habit) + 0.52*(PS-Habit)).

4.2.2 Lease variables

In the model describing the *Intention* towards the Lease Circular Business Model, only three variables deem to have a significant influence, but create a strong model (Cohen, 1988). In this model, in contrast to the variables predicting *Intention* in the *Take-Back Management* model, the relative contribution to *Intention* is more equally divided (see 4.1.2).

Remarkable is the strong influence of the *Payment Structure* parameters in this model. As listed in Table 2, scores concerning *consumer opinion over paying a month* (PS-ATB) and *consumers familiarity with paying a month* (PS-Habit) are very low, while at the same time the *struggles associated with paying a* month (PS-PBC) is quite high, thereby all hampering *Intention*. The negative influence of *Habits concerning paying a month* (PS-Habit) could be expected as habits are formed to the current market design, like described above, and do not match a monthly payment structure. This measured low score, however, is mostly due to the *direction* of the habit, not its *strength*. Herewith, it could be argued these habits from the consumer can be changed, in order to be more aligned with a monthly payment, once the consumers opinion is in favour of a monthly payment structure. On the other hand, inspecting the low score observed from *consumers opinion about paying a month* (PS-ATB), it could be questioned if consumers are willing to shift to an alternative *Payment Structure* at all. According to Ouellette and Wood (1998), innovative intentions can be successfully transformed to new habits, once they result in a pleasant behaviour repeated over time. Unfortunately, consumers note to perceive the

new monthly payment far from pleasant and is therefore unlikely to facilitate a behavioural shift. So, it could be stated the low measured *consumer opinion* (PS-ATB) and *habit direction* (PS-Habit) have a strong negative influence on *Intention*.

The third and final parameter influencing *Intention* in this model is the *consumers opinion over outsourcing product Responsibility* (RES-ATB). As listed above, this factor is expected to, and does positively influence *Intention*. In the Lease model, responsibility shifts from the consumer towards the producer (figure 7). Reflecting on Table 2, this parameter appears to be the highest significant factor, which has a positive influence on *Intention*, in the entire model. This result indicates the wish of the consumers for unburdening of inconveniences, meaning producers remain responsible for the product during the complete life cycle (Lewandofski, 2015). This result might increase the success-rate of Product-Service-Systems, or other Business Models which shift responsibility towards the producer, in the electronics market. This wish has already been identified in other industries and B2B business models like logistics, energy and consumables (Windahl & Lakemond, 2010; Mlecnik et al., 2012; Kyrousi et al., 2015). However, the request for unburdening appears not to overcome the negative influence of the *Payment Structure* parameters, since *Intention* still scores remarkably low (Mean = 2.2).

Overall, *Intention* towards the Lease CBM is determined by *the consumers opinion over the monthly payment structure* and *the outsourcing of product responsibility*, together with *consumers familiarity to monthly payment structures* (Intention = 0.287*(PS-ATB) + 0.273*(RES-ATB) + 0.246*(PS-Habit)).

4.2.3 Pay-per-Print variables

Alike the factors in the TBM model, the parameters describing the *Pay-per-Print* do sharply differ in level of influence among each other. *Consumer attitude towards paying per use* (PS-ATB), which influence is over 5 times as strong compared to the other variables, is the most dominant parameter in the *Pay-per-Print* model. As shown in Table 3 and the Lease model, consumers are sceptic towards new forms of payment. The *consumers opinion concerning the new payment* forms is once more the most negative factor in the model. By the means of its low mean score (Mean = 7.3) and its strong influence in the model (SCBeta = 0.564), it can be concluded the low *Intention* towards the *Pay-per-Print* (Mean = 2.1) is mostly due to this parameter.

As expected from the Lease model, *consumers attitude towards outsourcing Responsibility* (RES-ATB) is the factor making a positive, but moderately strong, contribution to the model. This finding again highlights the wish for less inconveniencies and responsibilities within the electronical consumable sector. The contribution of *consumers opinion over Responsibility* to *Intention*, however, is not as profound as in the Lease model.

Again, reflecting tot the Lease model, scores for *Habits concerning the Payment Structure* are low, as consumers are not used to such *Payment Structures*. Therefore, the chance of inflicting behavioural change is again quite slim, as the envisioned behaviour is not repeated over time, due to the low score on *Habits concerning the Payment Structure*, and is not deemed pleasant, observed from the low score on *consumer attitude towards paying per use* (Ouellette and Wood, 1998). Habits over *Ownership*, or *how well-considered and frequently products are handed in*

after use, is the last factor in this model. Although its contribution is limited, it is a positive contributor to *Intention*. The presence of this parameter indicates the link between the take-back of old product is, from a consumer perspective, is more strongly present in Pay-per-Use BM then in Lease models.

Comprehensively, *Intention* towards the *Pay-per-Print* Circular Business Model is most strongly influenced or determined by the *consumers opinion concerning paying per print* but is also affected the *consumers opinion concerning the outsourcing of responsibility, consumers familiarity with paying for a service every time it is used* and *habits concerning the handing in of products after use*. (Intention = 0.564*(PS-ATB) + 0.121*(RES-ATB) + 0.088*(OWN-Habit) + 0.087*(PS-HABIT)).

5 Conclusion

This paper aimed to investigate the role of the consumer within the Circular Economy by using an extended version of the Theory of Planned Behaviour to test consumer *Intention* towards Circular Business Model characteristics. Herewith, this research addressed the question "*To what extent do Product Ownership, Product Responsibility and Payment Structure affect consumer Intention to participate in Circular Business Models which incorporate product take-back?*".

When comparing the *Intention* towards, or the *wish to take part in*, the different CBMs, it can be observed *Take-Back Management* is considerably more appreciated by consumers than the other CBMs (table 4). As Intention is the precursor and predictor of behaviour, it can be concluded *Take-Back Management* would, also when compared to the other CBMs, be most positively welcomed by consumers. Herewith, it can be stated *Take-Back Management* is the most suited CBM, able to facilitate product take-back initiatives, within the current scope, for the current electronics market.

The results clearly show the profound and reoccurring impact of the Business Model Characteristic *Payment Structure* on *Intention*, which indicates the *way consumers pay* within a business model is of major importance to consumers when dealing with CBMs. Over all models *Payment Structure* is invariably linked to *Attitude Towards a Behaviour* and *Habit*, which are in turn the most influential and reoccurring factors from the extended Theory of Planned Behaviour factors linking to *Intention*. Herewith it can be concluded, additional focus should be spent on the need to ensure the customers opinion is positively favoured, when addressing the *Payment Structure* of a CBM. Moreover, schemes should be emplaced to reshape habits of consumers towards habits which are more in favour with the envisioned business models *Payment Structure*.

The second most influential characteristic on *Intention* is found to be *Responsibility*. While this characteristic is of influence in all models, the corresponding weights, or slopes in the established equations, are not as impactful as the *Payment Structure* parameters. Meaning, the in- or outsourcing of product responsibility by consumers is deemed important, as these factors are uniformly present, but do not affect *Intention* to the same extend as *Payment Structure*.

Table 4: visual summary of the measured *Intention* towards, *or willingness to participate in*, the Circular Business Models and the factors influencing this *Intention* with corresponding slopes. Factors were listed according to influence on *Intention,* by descending value.

Circular Business Model	Intention	Factor	Slope	Factor	Slope	Factor	Slope	Factor	Slope	Factor	Slope
Take-Back Management	6.3	*Habits* concerning *Responsibility*	.56	*Habits* concerning *Payment form*	.52	*Environmental Awareness*	.11	*Consumer opinion about remaining owner of the product*	.086	*Consumer opinion about remaining Responsible for the product*	.084
Product Lease	2.2	*Consumer opinion concerning paying a moth*	.287	*Consumer opinion concerning outsourcing of Responsibility*	.273	*Habits* concerning *Payment form*	.246	-	-	-	-
Pay-per-Print	2.1	*Consumer opinion concerning paying per print*	.564	*Consumer opinion concerning outsourcing of Responsibility*	.121	*Habits* concerning *Ownership*	.088	*Habits* concerning *Payment form*	.087	-	-

The last characteristic, *Ownership*, is neither strongly present or influential in the consumers decision making process. The question concerning who the owner of the product will be is only, to a small extent, deemed of importance in the *Take-Back Management* model. As *Ownership* is weakly represented over the different models and has no impactful parameters listed in the determination of *Intention*, it can be concluded *Ownership* is the least impactful characteristic in Circular Business Models dealing with take-back schemes in the current electronics market.

6 Discussion

This research aimed to address two different knowledge gaps. The first gap was of a scientific nature in which the Theory of Planned Behaviour by Ajzen (2012) was optimized for environmental related decision making by the introduction of *Environmental Attitude* and past behaviour in the form of Habits. The second gap was relevant for both scholars and business and dealt with the lack of understanding of consumer attitudes towards circular consumption models (Ramani, 2010; Catulli, 2013; Planning, 2015; Ghisellini et al., 2016).

Within this chapter, it will first be evaluated to what extent the enrichment of the Theory of Planned Behaviour was successful in section 6.1. Sequentially, in section 6.2 limitations encountered during this study will be discussed. And to close this research, the relevance of the obtained results for business and the academic society will be highlighted.

6.1 Evaluation of the enrichment of the TPB

This study made use of an extended version of the Theory of Planned Behaviour. By introducing *Habits* and *Environmental Attitude* to the original framework of Ajzen (2012), this study aimed to apply the TPB on environmental related behaviour. In order to examine the credibility of the new proposed version of the TPB, the new introduced factors and the variance explained by the framework, will be discussed and compared to other studies making use of the Theory of Planned Behaviour.

6.1.1 Habit

The first newly introduced parameter to Ajzen's (2010) framework is *Habit*, which is constructed by the *direction* of a *Habit* and its *strength* (section 2.4.2). As can be seen in the results obtained in this study, the influence of *Habit*s is abundantly present in all examined models. In the *Take-Back Management* model, both *Habit*-parameters are the strongest influencers. In the *Lease* and *Pay-per-Print* model, the *Habit*-parameters are less strong. Additionally, the tolerance of the *Habit*-parameters is very high, meaning the variance observed by these factors cannot be owned to other parameters in the model. However, as noted in section 4.2.1, the *Habit*-parameters in the *Take-Back Management* model do decrease in tolerance when incorporated simultaneously, meaning the variance accounted for by these parameters partly overlaps.

Still, it can be stated *Habits* increased the predictive value of the TPB to behaviour. Therefore, this study acknowledges and supports the claim made by numerous scholars to include past behaviour, possibly in the form of habits, to the Theory of Planned Behaviour (Thøgersen, 1995; Stern, 2000; Hagger et al., 2002; Bamberg & Möser, 2007; Ajzen, 2011).

6.1.2 Environmental Attitude

The second addition to the original Theory of Planned Behaviour model was Environmental Attitude. This parameter is described by consumers awareness over current environmental issues and their feelings of guilt over the human caused nature of these issues (section 2.4.2). Compared to Habit, EA is less strongly and frequently present in the researched models. While this parameter makes a significant contribution to the prediction of Intention, with a high tolerance score, in the Take-Back Management model, it is absent in the remaining CBMs. However, this observation does not indicate a direct exclusion of EA from the

proposed framework. The observation of *Environmental Attitude* only having a significant effect on *Intention* in the *Take-Back Management* model could be due to the way environmental relevance is perceived by the consumer.

According to Minton and Rose (1997), *consumers' attitude towards the preservation of the environment* is strongly present and a contribution to *Intention*. This study is able to support the first claim based on the high measured score for EA (Table 1). However, scholars like Thøgersen (1994), McCarty and Shrum (1994), Minton and Rose (1997), and Laroche et al. (2001), all address *Environmental Attitude* from a recycling perspective. So, these scholars claimed to have found a high measurement of *consumers attitude to preserve the environment,* while in fact they measured *consumer attitude towards recycling.* When adopting a consumer perspective, previous research described recycling as the method of separating and collecting used or waste products (Bom et al., 2017). Reflecting on the statement of Minton and Rose (1997), and likewise statements of other scholars, in combination with the found consumer definition of recycling, it can be stated *consumer attitude towards the collection and separation of waste products,* not the *preservation of the environment*, is high. This last statement can give an explanation to the missing influence of EA in the *Lease* and *Pay-per-Print* models. In practice, Take-Back Management will make use of collection points known to the consumer from other recycling initiatives. As stated, the practise of handing in used products is perceived as a pro-environmental behaviour resulting in environmental benefits. As can be seen in table 4, consumers do not attribute environmental gains to the *Lease* and *Pay-per-Print* models, as they do not apply recycling schemes which are familiar to the consumer. Therefore,

consumers do not perceive the environmental benefits of these CBMs, and do not weight *Environmental Attitude* as a relevant factor when determining *Intention* towards the *Lease* and *Pay-per-Print* models. Therefore, EA should not be excluded from the framework as this parameter does, when perceived relevant, significantly influence *Intention*.

6.1.3 Observed variance

Since the introduction of the Theory of Planned Behaviour over two decades ago, numerous studies made use of this framework in the prediction of *Intention* and behaviour (Ajzen, 2011). Like all frameworks researching behaviours, the Theory of Planned Behaviour can only successfully clarify a varying amount of observed variance. In meta-analytic reviews of the TPB, over a broad range of behavioral domains, scholars found varying average ranges of declared variance. Ajzen (2011) claims the TPB produces multiple correlations ranging from 0.59 to 0.66, and McEachan et al. (2011) found in meta-analytic review a range of from 0.40 to 0.57. Armitage and Conner (2001) indicated, over 185 independent studies, the TPB only accounted for 39 percent (0.39) of the variance in *Intention*.

With the use of the extended version of the Theory of Planned Behaviour, this study drafted three multiple regression models, based on real data, which accounted for 16.7, 27.3, and 39.5 percent of the observed variance. According to Cohen's (1988) standard, the first model is deemed weak, where the remaining models fit the category strong. Referring to Armitage and Conner (2001), only the strongest model found in this study surpluses the scores listed in their meta-analysis. So, in comparison with other TPB-research, the

models found in this study would be categorized average to weak.

The same research by Armitage and Conner (2001), provides a possible explanation for these observed percentages. Low variance score in the multiple regression models would mostly be due to a lack of *Social Norms* in the model. This study encountered similar results as scores measured for *Social Norm* were moderate and noninfluential over all models. This could be due to the newness of the researched behaviour. As this study investigated innovative Circular Business Model characteristics, society was yet unfamiliar with such behaviours. Therefore, social norms directed to CBMs, are not yet strongly present in society.

Another explanation for the low observed Social Norm, could be found in the newly introduced factors (Ajzen 2006; 2011b). Ajzen (2006; 2011b) states that the addition of new factors to the TPB could hamper the predictive value of the original factors. However, when looking at the result, it can be seen SN correlates only with a few other parameters. Herewith it can be concluded *Social Norm* does not overlap with other factors in their contribution to *Intention*. Therefore, Ajzen's (2006; 2011b) warning is not applicable to this research.

6.2 Limitations & Recommendations

The current study includes some limitations which need to be addressed in further research. The Theory of Planned Behaviour is expected to result in higher quality responses when respondents do not receive any benefits, or are not in any way obliged to participate, when completing the questionnaire (Ajzen, 2011b). Therefore, when creating the questionnaire, the amount of questions was reduced to a minimum level as a smaller questionnaire was likely to take less effort

to complete, and herewith to yield more responses. An implication arising from this method is the degrading of the predictive power of the *Social Norm,* as the predictive power of SN is expected to drop sharply when this parameter is not properly adressed *(*Armitage & Conner, 2001). Moreover, when conducting the pilot study, *Social Norm* was not strongly present within the researched consumer beliefs and was therefore not strongly presents in the questionnaire. As this study measured only very limited influence of SN, which might be due to flaws in the research design, future studies should more properly and profoundly address *Social Norm* into their research to further exclude *Social Norm* as an influencer of consumer behaviour within a Circular Economy, or to reintroduce this parameter in the behavioural models.

When looking at the characteristics of the research population (figure 11), it can be observed the average age of researched people is quite high. Moreover, the percentage of males within the research population is considerably larger than the percentage of females. However, previous research has shown that no clear personal factors, like gender and age, correlate significant with a person's environmental engagement (Van Liere & Dunlap, 1980; Borden, 1985; De Leeuw et al., 2015). Moreover, Ajzen (1985) states such parameters would not have a direct effect on behaviour or *Intention* in the Theory of Planned Behaviour. In order to confirm these claims, likewise case study should be repeated for a research population in which age and gender are more normally divided. Building on the claims of Ajzen (1985), Borden (1985) and De Leeuw et al. (2015), the quality of the obtained results is not expected to be affected by this observation.

The results of this research indicate *Take-Back Management* could be a successful strategy for companies to reclaim products after use. However, the implementation period of such take-back schemes can be quite extensive. Ajzen (1985) states *Intentions* can change over time by new information affecting the decision-making process and continuous changing of norms in society. Therefore, companies should be cautious when making long term decisions based on current results, as they might not echo in future societies.

6.3 Societal and Scientific Relevance

From a business perspective, the results of this study show the *Take-Back Management* model could be a successful strategy to reclaim electronical products after use. This study advices Canon, and other companies in the electronics market, to implement models like *Take-Back Management.* Herewith, business actors could respond to the legal obligation, stated in the WEEE Directive 2012/19/EU, by providing take-back options for electronical waste. In this manner, larger quantities of waste can be collected and herewith, the recycling industry can be stimulated, as recycling centers will benefit from economies of scale resulting in a decrease in recycling costs (Duran et al., 2006; Wang et al., 2014). Additionally, as the recycling industry will gain momentum by its increasing volume, larger amounts of recycled materials will enter the market, which will decrease the need for virgin materials. However, as mentioned in the previous section, these recommendations are based on the current market and consumer preferences. If companies would decide to act upon these recommendations, actions should be taken in the near future. This is due to the argument stated by Ajzen (1985), which

highlights the changing nature of *Intention* over time (section 6.2).

This study created value for the academic community in two different ways. Firstly, this study made the first attempt to map the consumer's perspective towards Circular Business Models and identify the consumer's beliefs associated with the practicalities accompanying a Circular Economy. Secondly, this study introduced the Theory Planned Behaviour to environmental related decision-making focussed on CBMs. Herewith, this study gave call to the need for research on consumer attitudes and intentions towards CBMs, made by numerous scholars (like Lewandowski (2015), Planning (2015), Gullstrand Ebbring (2015), Ghisellini et al. (2016) and Kirchherr et al. (2017)). As this study clearly identified which characteristics are prioritized by the consumer, future research should address these characteristics specifically with more in-depth analysis. Herewith, tailor made solutions to the current identified barriers could be constructed, resulting in a further optimization of CBMs to consumers preferences. These future studies could use the, by this study proposed, extended Theory of Planned Behaviour framework to address CBMs in total, or its characteristics separately and more in depth. As this study created a foundation for further research on consumer behaviour within a Circular Economy to build upon, the proposed framework could be used to address the Business Model Characteristics individually or examine likewise CBMs in other industries. Altogether, resulting in a new research field with the potential to contribute to the successful implementation of Circular Business Models in numerous industries.

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Appendix

Appendix A - Abbreviations

AC   *Actual control*. Measurement for *intention* in the Theory of Planned behaviour by Ajzen (1985). Represents all internal and external factors which determine if a person is in control over a specific situation.

ATB   *Attitude Towards a Behaviour*. Measurement for *intention* in the Theory of Planned behaviour by Ajzen (1985). ATB is determined by multiplying associations with the behaviour in question, with the evaluation of outcomes.

EA   *Environmental Attitude*. Additional factor included as measurement for *intention* in the TPB, herewith, suiting the model to the assessment of environmental related behaviour.

BM   *Business Model*. A business model describes the rational of how an organization creates, delivers and captures value.

BMC   *Business Model Canvas*, developed by Osterwald & Pigneur (2010). Used to asses and map BMs

CBM   *Circular Business Model*. A BM which incorporates the aspects of a CE

CE   *Circular Economy*. "An economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations" (Kirchherr et al., 2017, page 4)

Lease   Abbreviation for the *Product Lease Circular Business Model*, which offers the service of being able to print (figure 7)

MAO   *Motivation, Ability,* Opportunity model (Thøgersen, 1995). An extension of the TRA which makes use of learning and habit in the prediction of behaviour and aims to address environmental decision making

PBC   *Perceived Behaviour Control*. Measurement for *intention* in the Theory of Planned behaviour by Ajzen (1985). PBC is determined by the sense of control being present and the power of this control factor over a situation.

PpP   *Pay-per-Print* is the *Use-oriented* CBM which is most applicable to the case study. In Such a model, the consumer would pay a small fee every time the printer is used while being unburdened of responsibilities and hazels regarding printing necessities and repair (figure 7)

PSS   *Product-Service-Systems* (Tukker, 2004). CBM listed by Bocken et al. (2014) which aims to sell services instead of product ownership

SN   *Subjective Norm*. Measurement for intention in the Theory of Planned behaviour by Ajzen (1985). Normative believes of other people or society, weighted with a person's desire to comply with those, composes the SN

TBM   *Take-back Management.* CBM listed by Bocken et al. (2014) which focusses on retrieving product for recycling at end-of-life (figure 7)

TPB   *Theory of Planned Behaviour* (Ajzen, 1985). Behavioural framework mostly used in health-related research. States *intention* is direct predecessor of behaviour which can be estimated by SN, ATB and PBC.

TRA   *Theory of* Reasoned Action (Fishbein and Ajzen, 1975). Predecessor of the TPB

WEEE   *Waste Electronic and Electric Equipment*. Products, such as computers, telecommunications, printing and lighting equipment which are categorized as obsolete or unwanted by its user

Appendix B – Questionnaire

Table B1: Table listing all asked questions in the questionnaire, categorized by CBM-characteristic, CBM and factor within the analytical framework, in Dutch

Characteristic	Factor	CBM	Parameter	Question
Ownership	ATB	All	*Imagined outcomes (b_i)*	Ik vind het goed dat cartridges, na gebruik, worden ingezameld: Oneens:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Eens
		All	*Evaluation of outcomes (e_i)*	Ik zou de moeite nemen om mijn cartridges in te leveren bij de lokale supermarkt, cartridge verkooppunt of via de post: Waarschijnlijk niet:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Waarschijnlijk wel
	PBC	All	*Sense of control factor being present (c_i)*	Ik denk dat het inleveren van mijn cartridges ... moeite zal kosten: Weinig:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Veel
		All	*Power of control factor (p_i)*	De hoeveelheid moeite die het zal kosten om de cartridges in te leveren, beïnvloed mijn keuze om de cartridges wel dan niet in te leveren...: Nauwelijks:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Sterk
	Habit	All	*Habit Direction (d_h)*	Ik heb ... mijn cartridges ingeleverd bij de lokale supermarkt, cartridge verkooppunt of via de post: Nog nooit:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Al vaker

Responsibility	ATB	TBM	*Imagined outcomes* (b_i)	Ik vind het … om de inkt voor mijn printer zelf (online of in de winkel) te moeten aanschaffen: Vervelend:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Prima
		TBM	*Evaluation of outcomes* (e_i)	Het (online of in de winkel) aanschaffen van cartridges voor mijn printer kost mij … moeite: Geen:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Veel
		Lease	*Imagined outcomes* (b_i)	Het zou … zijn als de producent van mijn printer mij inkt zou toe sturen: Onhandig:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Handig
		Lease & PpP	*Evaluation of outcomes* (e_i)	Het laten opsturen van inkt, voor mijn printer, zou mij … moeite kosten: Geen:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Veel
		PpP	*Imagined outcomes* (b_i)	Ik zou het … vinden als mij de inkt wordt opgestuurd, nog voor de oude op is, zodat ik hier geen zorg meer voor hoef te dragen en nooit zonder inkt kom te zitten Onhandig:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Handig
		PpP	*Imagined outcomes* (b_i)	Het is voor mij …belangrijk dat ik ten alle tijden kan printen: Niet:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Erg
		PpP	*Evaluation of outcomes* (e_i)	Ik zou het … vinden als mijn printer zelf bijhoudt wanneer reparatie nodig of aanstaande is: Niet oke:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Prima
	PBC	Lease & PpP	*Sense of control factor being present* (c_i)	Ik denk dat de afspraken, betreffende het opsturen van inkt voor mijn printer, duidelijk zullen zijn: Oneens:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Eens
		Lease & PpP	*Power of control factor* (p_i)	Ik vind de duidelijkheid van de afspraken, betreffende het opsturen van inkt voor mijn printer, …belangrijk: Niet:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Erg
		Lease & PpP	*Sense of control factor being present* (c_i)	Ik verwacht dat er contracten nodig zullen zijn wanneer ik gebruik zal maken van een Lease model: Oneens:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Eens
		Lease & PpP	*Power of control factor* (p_i)	Ik zou het … vinden om aan een contact gebonden te zijn: Prima:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Vervelend
	Habit	TBM	*Habit Direction* (d_h)	Ik heb … zelf cartridges gekocht: Nog nooit:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Al erg vaak
		Lease	*Habit Direction* (d_h)	Ik heb … gebruik gemaakt van diensten waarbij mij inkt werd opgestuurd: Nog nooit:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Al vaker.
		PpP	*Habit Direction* (d_h)	Ik heb … gebruik gemaakt van diensten waarbij mij automatisch inkt werd opgestuurd: Nog nooit:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Al vaker.

Payment Structure	ATB	All	*Imagined outcomes* (b_i)	Ik vind het … om keer op keer cartridges aan te moeten schaffen: Vervelend:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Geen probleem
		TBM	*Evaluation of outcomes* (e_i)	Ik vind het betalen van een totaalbedrag bij het aanschaffen van de cartridges … : Niet optimaal:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Geen probleem
		Lease	*Evaluation of outcomes* (e_i)	Ik zou het …vinden om een maandelijks bedrag voor de cartridges te betalen: Onnodig:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Handig
		PpP	*Evaluation of outcomes* $(e_i$	Ik zou het … vinden om een klein bedrag per print te betalen: Onhandig:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Prima
	PBC	TBM	*Sense of control factor being present* (c_i)	Ik vind cartridges … in aanschaf: Goedkoop:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Duur
		TBM	*Power of control factor* (p_i)	Wanneer ik cartridges koop, let ik … op prijs: Niet:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Erg
		Lease	*Sense of control factor being present* (c_i)	Ik verwacht dat het kostenoverzicht, betreffende het maandelijks betalen voor cartridges, onduidelijk en niet transparant zal zijn: Oneens:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Eens
		PpP	*Sense of control factor being present* (c_i)	Ik verwacht dat het kostenoverzicht, betreffende het betalen per print, onduidelijk en niet transparant zal zijn: Oneens:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Eens
		Lease & PpP	*Power of control factor* (p_i)	Ik vind de duidelijkheid en transparantie van het kostenoverzicht … belangrijk: Niet:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Erg
	Habit	TBM	*Habit Direction* (d_h)	Ik heb … zelf cartridges gekocht Nog nooit:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Al erg vaak
		Lease	*Habit Direction* (d_h)	Ik heb … gebruik gemaakt van producten of diensten waarvoor ik maandelijks betaalde Nog nooit:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Al erg vaak
		PpP	*Habit Direction* (d_h)	Ik heb … gebruik gemaakt van producten of diensten waarvoor ik, alleen als ik ze gebruikte, een klein bedrag per keer betaalde: Nog nooit:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Al erg vaak

Environmental Attitude	EA		Problem awareness (p_k)	Ik ben … op de hoogte van de milieuproblematiek: Niet:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Goed
			Problem awareness (p_k)	Ik denk dat óók mijn gedrag invloed heeft op het milieu: Oneens:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Eens
			Feelings of guilt (f_k)	Ik voel me … verantwoordelijk voor de gevolgen van mijn gedrag op het milieu: Niet:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Erg

All	SN	All	Normative belief of society (b_j)	Ik denk dat iedereen het goed vindt dat cartridges, na gebruik, worden ingezameld: Oneens:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Eens
		All	Motivation to comply with society (m_j)	Als iedereen de cartridges zou inleveren, na gebruik, zou ik dat ook meer doen: Waarschijnlijk niet:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Waarschijnlijk wel
	Habit	All	Habit Strength (s_h)	Ik ben niet van plan mijn gewoontes aan te passen: Oneens:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Eens

Intention towards CBM		Lease	Intention	Ik zou graag gebruik maken van een systeem waarin ik maandelijks betaal voor de printer, alle nodige inkt gratis toegestuurd krijg en de cartridges na gebruik weer opstuur of inlever Oneens:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Eens
		TBM	Intention	Ik zou graag bij het systeem blijven waarin ik zelf mijn printer en cartridges koop, maar ik ben bereid om de cartridges in te leveren na gebruik Oneens:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Eens
		PpP	Intention	Ik zou graag gebruik maken van een systeem waarin ik een klein bedrag betaal per print, alle nodige inkt gratis toegestuurd krijg en de cartridges na gebruik weer opstuur of inlever Oneens:__1__:__2__:__3__:__4__:__5__:__6__:__7__: Eens

As the scope of this research is set on the Dutch printer user, response rates were predicted to rise when questions were formulated in Dutch. The current order of the questions does not reflect the used order in the questionnaire, in which questions were ordered according to topic, instead of scientific subdomain.

As can be seen in table B1, some characteristics and factors were generalised over all CBM. As described in section 3.1, the pilot was unsuccessful to identify SN's regarding *responsibility* and *payment structure*. Therefore, a SN was used over all CBMs in general. Another factor, *Habit Strength*, was also generalised over the different models. The underlying reason for this approach was the shortening of the questionnaire to elevate response rate, as the generalisation did not seem to affect the imagined results. To the same line of reasoning, PBC for TBM in *Responsibility* and *Payment Structure,* as the pilot study indicated identic measurements for both factors. Moreover, the characteristic *Ownership* was not addressed separately for each CBM as well. This study aims to investigate the *Intention* of customers to BM which facilitate product recycling. This requires a company to obtain end-of-life ownership. The different CBM do differ in ownership structure during-during use, but not in end-of-life. Therefore, CBM-characteristic could be generalised throughout the study, without hampering the predictive value of the model.

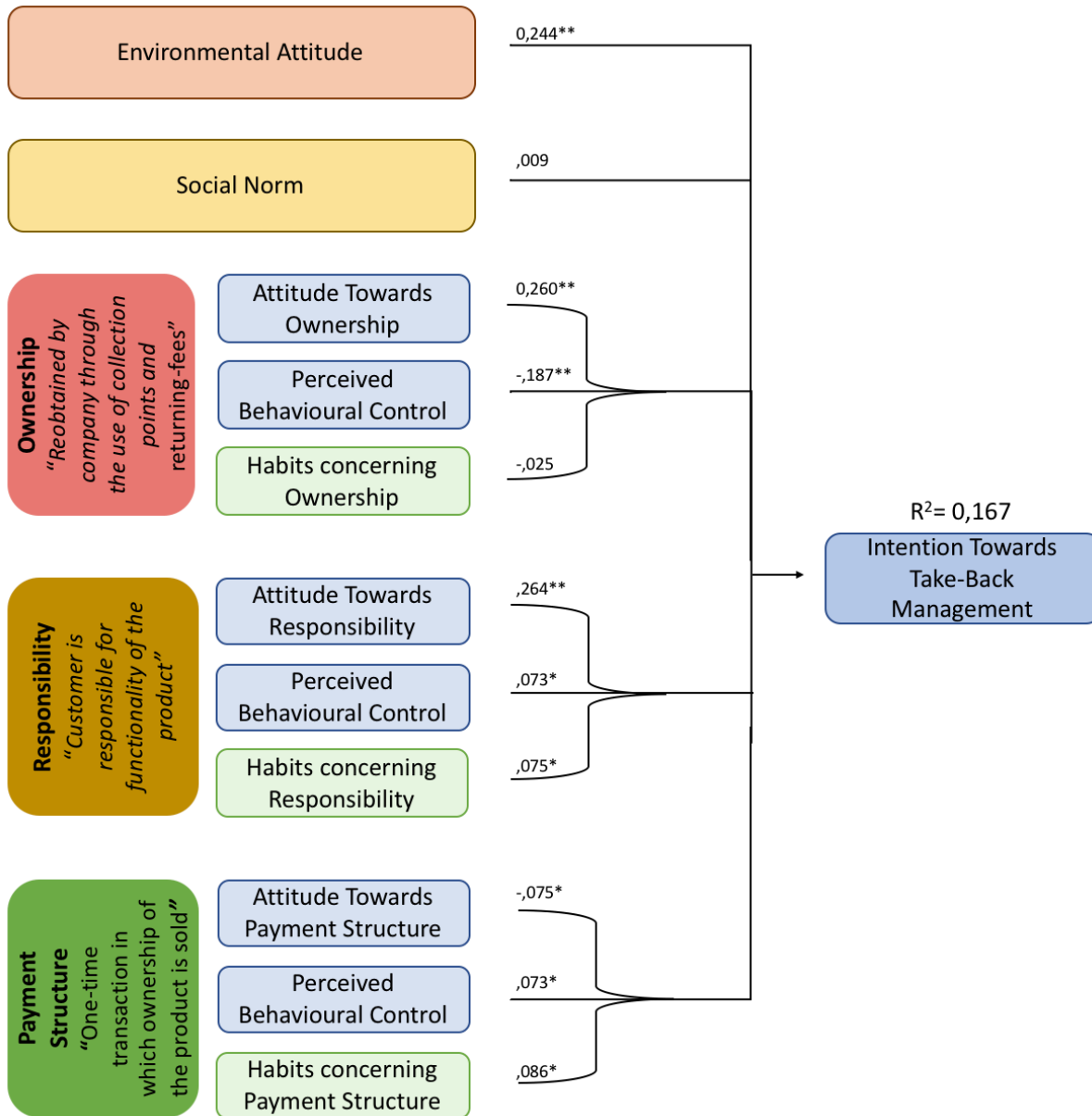# Appendix C – Operationalization of Frameworks with correlations

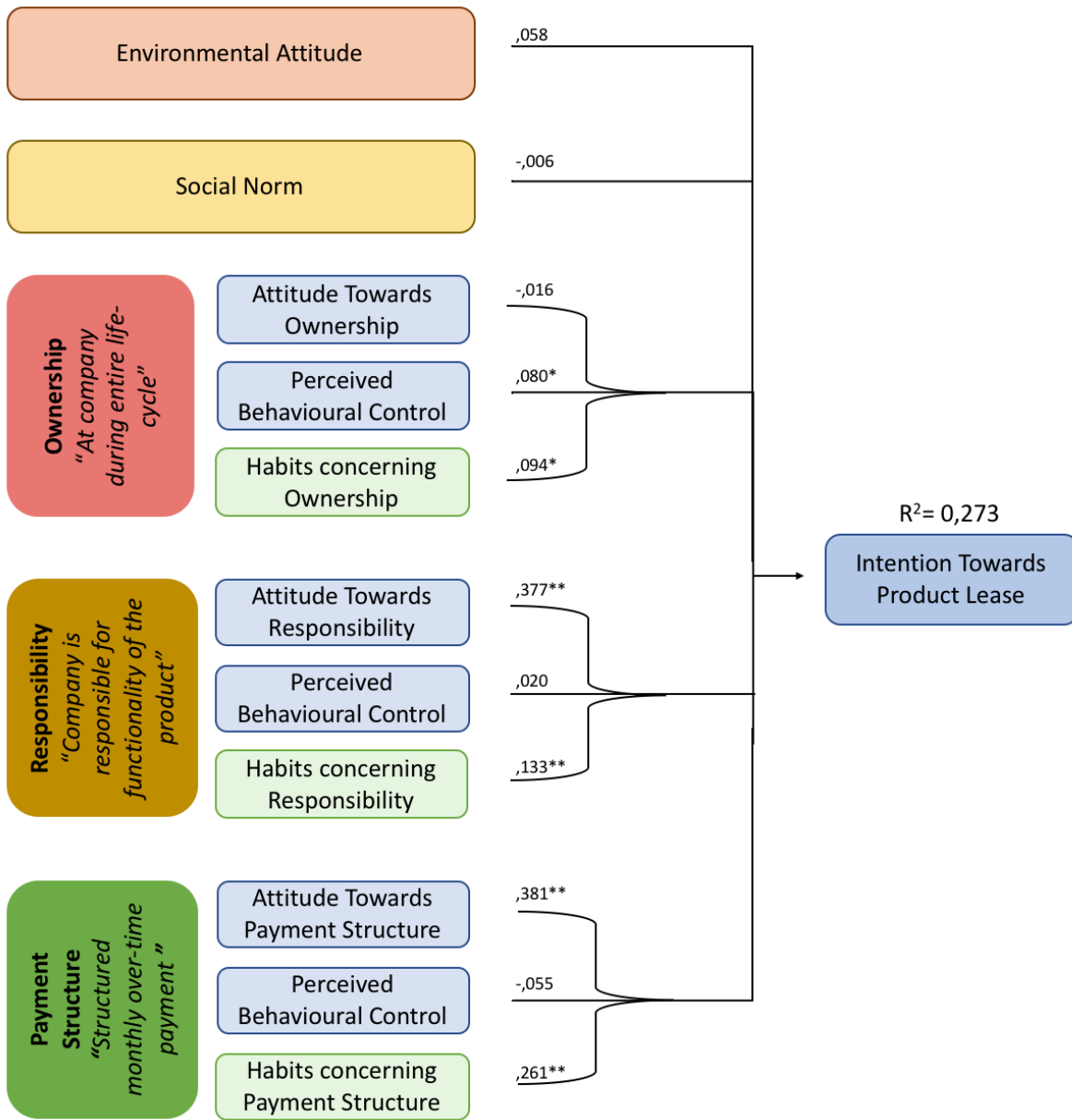**Figure C1:** Operationalisation of figure 7 and figure 9 focussing on the *Take-Back Managements* model.

Figure C2: Operationalisation of figure 7 and figure 9 focussing on the *Lease* model.
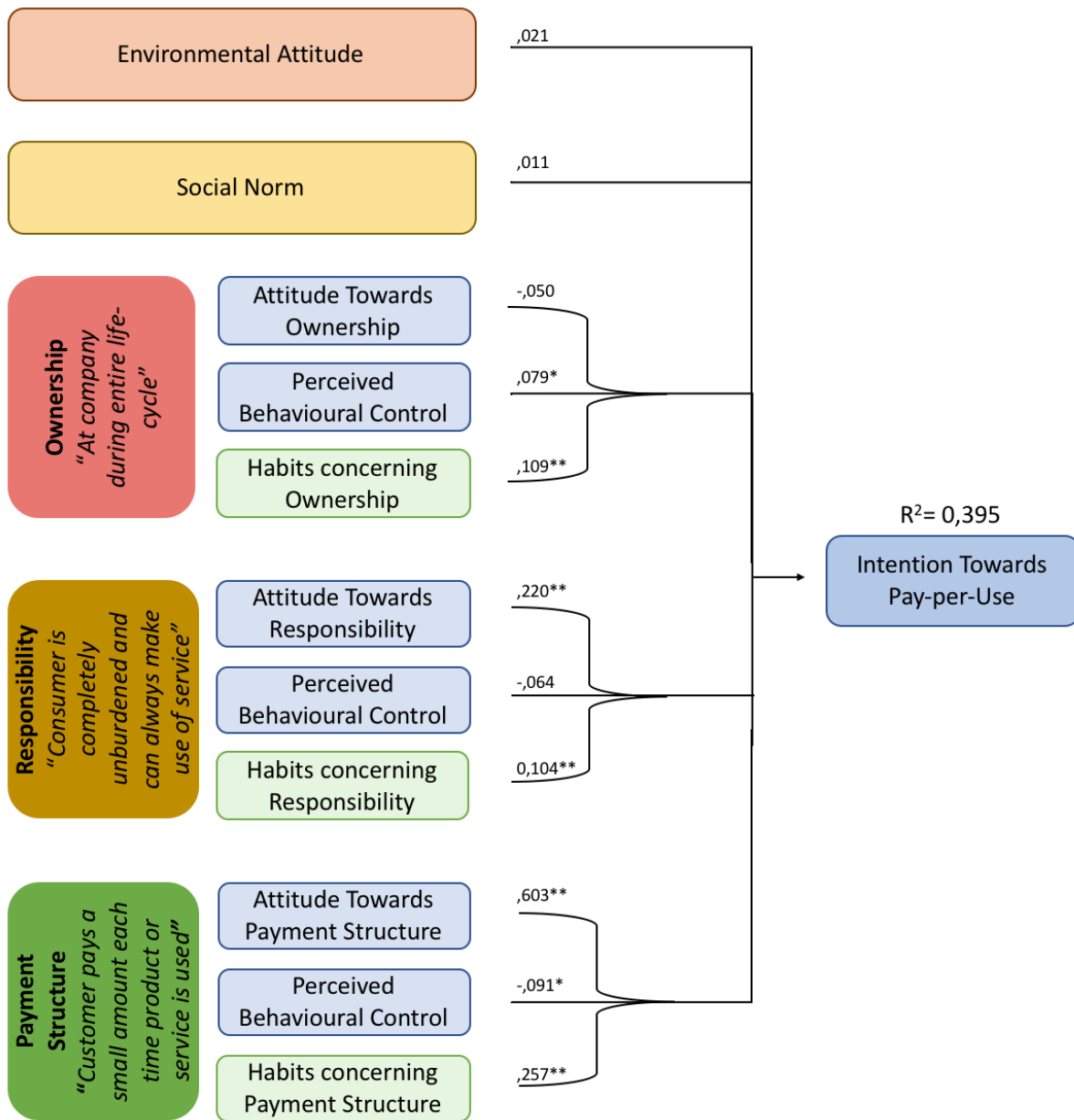
Figure C3: Operationalisation of figure 7 and figure 9 focussing on the *Pay per Print* model.