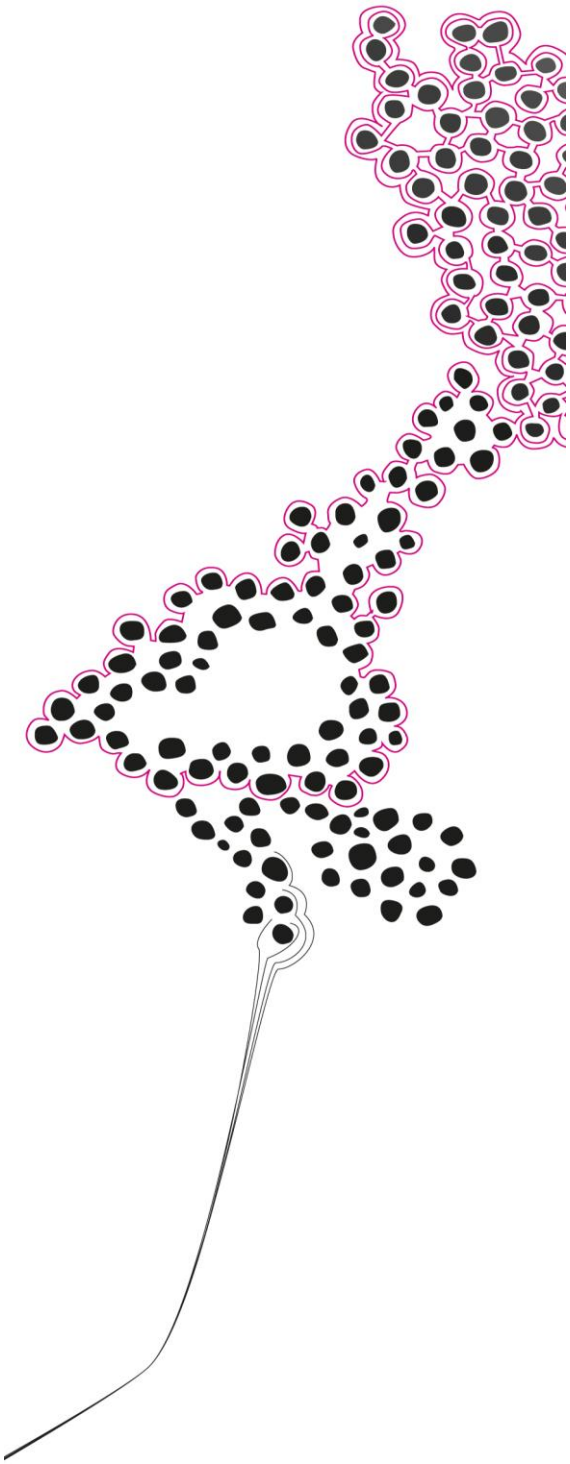

Factors influencing students' intention to recycle

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Abstract

With levels of consumption rising and resources diminishing turning waste into a resource –recycling- becomes indispensable. Even more in light of current EU proposals to introduce mandatory recycling rates. In order to increase recycling rates individuals play an important role. This paper focuses on factors that influence students' behavioural intention to recycle at the University of Twente. This question is approached by using the theory of planned behaviour with the extension of the variables perceived moral obligation, past behaviour, knowledge and inconvenience. An online questionnaire was distributed via e-mail and social networking website among University of Twente students and filled in by 116 students. The resulting multiple regression analysis revealed that the overall model predicts students' intention to recycle. Perceived moral obligation, past behaviour and inconvenience significantly predict intention to recycle while attitude, subjective norm, perceived behavioural control do not significantly predict student's intention to recycle. Future research is recommended to focus on reaching a bigger sample size by distributing an additional paper questionnaire and to measure actual recycling behaviour by means of an observational study.

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1 INTRODUCTION

1.1 BACKGROUND

"If all the world's citizens lived as Europeans, we would need more than two and a half planets to provide the necessary resources, absorb our wastes, and leave some capacity for wild species." (WWF, Global Footprint Network, & ESA, 2007). Unfortunately, we do not have two planets to satisfy our resource needs. Quite the contrary is happening with natural resources shrinking rapidly (WWF & GFN, 2012). Still, the human population of the European Union (EU) life in a throw-away society. In a throw-away society there is an abundance of cheap products which are easily available and not designed to last for a life time. Moreover, the introduction of the same product with slightly increased functions invites consumers to dispose the old one even though it is still fully functioning (Cox, Griffith, Giorgi, & King, 2013). Hence, our economy is based on a linear model where we extract resources and easily dispose of them after usage.

Today each member of the EU consumes as much as 43kg of resources a day with even higher numbers of consumption in the United States (European Economic and Social Committee, 2013). This amounts to 600kg of municipal solid waste (MSW) per year by each individual in the Netherlands, while it is 700kg in the US (OECD, 2013b). Although MSW accounts for as little as 10% of waste produced, its negative consequences to the environment are far reaching. The material plastic can be an example. From 1950 until 2009 the production rates of plastic have skyrocketed with an average of 9% yearly reflecting its ongoing popularity (PlasticsEurope, 2010). Plastic is non-biodegradable and an increasing amount of it is ending up in our oceans in form of

tiny pieces, referred to as microplastic (UNEP, 2011). This is not only dangerous to marine wildlife but also to human beings who highly value fish in their diets. Thus, microplastics that have been wrongfully discarded by humans will eventually end up on their plate. Next to its negative consequences to the environment as well as human beings, littered plastics also damage the economy. A report by the United Nations Environment Programme (UNEP puts a monetary value on the negative consequences suffered by the marine ecosystem and amounts it to 13bn dollars per year (UNEP, 2014). The bulk of plastics ending up in the oceans derive from littering. Litter refers to "items that are discarded by an individual, but it can include any item that is in an unacceptable location, regardless of the origin" (Schultz, P. W., Bator, R. J., Large, L. B., Bruni, C. M., & Tabanico, J. J., 2013, p. 2). The latter means that an individual might not have littered on purpose, instead the item might have been littered by accident, e.g. a piece of paper falling out of someone's pocket. The question remains what to do about overconsumption and its consequences? According to the EU's waste hierarchy the best solution would be to consume less, thereby creating less waste and consequently negative impacts on the environment would vanish (European Commission, 2008). The second step in the waste hierarchy is to "re-use" the product and the third option is "recycling" the product (European Commission, 2008). The fourth step of the waste hierachy is "recovery", which refers to the retrieval of e.g. energy from the incineration of the product (European Commission, 2008). The last step in waste management is "disposal" where waste is inserted into landfills (European Commission, 2008).

Given the recent trends of consumption it will probably be a long process to change mind sets from constant consumption to reducing it. In the meantime recycling is

an acceptable option that can minimize the economic loss generated through landfill and incineration as well as lowering the burden carried by the environment and our health (European Commission, 2011).

To promote and increase recycling the EU has implemented various tools such as the “European Commission's Roadmap on a resource efficient Europe” (European Commission, 2011), “European Landfill directive” (European Commission, 1999) or “EU's Waste Framework Directive” (European Commission, 2008) incorporated in a set of goals achieved by 2020. The latter gives a target for member states to recycle 50% of their solid municipal waste by 2020 (European Environment Agency, 2013). Recently, the EU has stepped up their efforts by introducing a proposal which aims to strengthen the case for a circular economy. In a circular economy products remain a valid resource throughout their whole life cycle. For example, after a product has reached its end of life, it will no longer be thrown away, rather its raw materials will be re-used for the next generation of the product. This way there is no such thing as *“waste”* anymore (Ellen McArthur Foundation, 2011). In addition, the EU member states are asked to recycle 70% of their municipal waste by 2030 and sending recyclable products to landfill will not be legal anymore (European Commission, 2014). This is an ambitious goal, for some countries less and for others more. For instance, in the Netherlands 50% of MSW was recycled in 2012 whereas the EU average was 42% (Eurostat, 2012). Compared to the past, recycling rates have risen, but looking to the future goal much work has to be done.

1.2 THE SITUATION AT THE UNIVERSITY OF TWENTE

As one of the three technical universities located in the eastern part of the Netherlands the University of Twente (UT) is the only campus-based higher education institution in the

Netherlands. This makes for an interesting case to examine, because students spend more time on the premises of the UT in comparison to universities without a campus. Therefore, the UT can have a greater influence on their students recycling behaviour. For the year 2013-2014, 9707 students are enrolled at the UT and approximately 2000 students live on the facilities (Universiteit Twente, 2014a). Each student living on campus is doing so under the management of the housing organization called "Acasa". At present, general waste is picked up from campus three times a week and paper picked up once a week from each house on campus. Glass containers are situated close to the housing units while plastic waste can be discarded on campus near the supermarket. Moreover, twice a week students have the opportunity to drop of bulky waste next to the general waste containers. Students are informed about these opportunities prior to signing the contract and reminded in the Acasa news e-mail (Acasa, 2014). Next to recycling opportunities for students living on campus, the UT recently launched a pilot project for recycling in the building *Vrijhof* (Universiteit Twente, 2014b). The plan is to provide recycling stations where "paper, plastic and residual waste" can be collected (UT Nieuws, 2014). These stations are placed at central points in the hallway, for example next to vending machines and near the buildings exit. If enough students and staff members use the provided facilities, recycling points will be implemented throughout the whole campus (UT Nieuws, 2014). No information is provided on why the Vrijhof was chosen for the pilot project.

Even though Acasa is offering students various recycling opportunities, it seems as students are not making use of them in full scope. Frequently, from personal observation, bulky waste is dumped in the river next to the student houses or old couches

are burned on campus. There seems to be a general disregard for the importance of recycling and negative consequences of behaviour for the environment. This is alarming because with the number of students increasing each year, the students of the UT should be regarded as an influential group when it comes to engaging in pro-environmental behaviour through recycling. Students are highly educated individuals who will be more likely to work in positions where they can actively influence a large group of other individuals. To illustrate, a student who has learned the value of waste as a resource and the importance of recycling, will be likely to continue doing so later in life and will impact other individuals in their recycling behaviour (Christakis & Fowler, 2009). To support the cause, and for the EU proposal to meet its objective, the UT, as an higher education institution can serve as a role model in good environmental behaviour by implementing a throughout recycling system on their campuses (Dahle & Neumayer, 2001). In order for a recycling scheme to be successful on campus it is important to know which factors influence students' intention to recycle. Once these factors are identified, a recycling scheme could be tailored to students of the UT.

1.3 THEORETICAL BACKGROUND

Human behaviour is essential to all parts of life which results in a high diversity of theories and models trying to explain it. An early approach is the Theory of Reasoned Action, which proposes that human behaviour is steered by an individual's "intention" to perform a certain behaviour and intention is therefore formed by "attitude toward the behaviour" as well as "subjective norm" (Fishbein & Ajzen, 1975). This approach assumes that individuals can always influence the performance of the actual behaviour thereby neglecting scenarios in which individuals have no power over the situation.

Ajzen (1991) later revised the theory of reasoned action by incorporating another variable into the model that accounts for an individual's ability to have control over the behaviour. This variable is since referred to as "perceived behavioural control" and the extended model is termed theory of planned behaviour (Ajzen, 1991). The theory of planned behaviour is a basic behavioural theory applicable to various behaviours and should be further extended with other variables that are specific to the behaviour studied (Ajzen, 1991).

A multitude of variables are studied with relation to recycling behaviour. However, including all these might result in a model that is too extensive to measure recycling behaviour. For that reason, four additional variables were chosen in this thesis in order to extend the theory of planned behaviour. Firstly, studies found that an individual is more likely to recycle if she/he thinks recycling is a morally correct behaviour (Beck & Ajzen, 1991; Conner & Armitage, 1998; Chu & Chiu, 2003). Hence, perceived moral obligation is included in the model. Secondly, individuals' past experience with recycling is claimed to predict future recycling behaviour in a couple of studies (Bentler & Speckart, 1979; Lee, Young & Marans, 1995; Tonglet, Phillips & Read, 2004). Thirdly, situational factors such as the inconvenience of recycling is playing a role in the individuals' intention to recycle (Derksen & Gartrell, 1993; McCarty & Shrum, 1994; Domina & Koch, 2002; Kelly, Mason, Leiss & Ganesh, 2006). Fourthly, the knowledge about the technical aspects of recycling, e.g. which materials belong in which bin, have been found to increase individuals' motivation to recycle (De Young, 1989; Hornik, Cherian, Madansky & Narayana, 1995; Schultz, Oskamp & Mainieri, 1995; Oskamp, Burkhardt ,

Schultz , Hurin & Zelezny, 1998). Therefore, this study aims is to investigate the following main research question:

To what extent is UT students' behavioural intention to recycle influenced by their attitude to recycling, subjective norm, perceived behavioural control, perceived moral obligation, past behaviour, knowledge and inconvenience?

1.4 SOCIETAL AND ACADEMIC RELEVANCE

The importance of recycling for the environment, societies and the people who live in them are discussed above. In addition, knowledge about students' recycling behaviour can be an important tool for policy makers or those responsible for implementing recycling schemes on campus. The gained knowledge can be used to implement specific measures to increase student participation in recycling schemes. Furthermore, studying recycling behaviour of UT students is also interesting from an academic point of view. Various studies have been undertaken to study recycling behaviour of MSW but most of these studies were directed at household's recycling behaviour (see Thøgersen, 1994, do Valle, Reis, Menezes & Rebelo, 2004) and a few studies investigated students' recycling behaviour on campus. For instance, Kelly et al. (2006) conducted a study at Massey University in New Zealand by means of a paper- based questionnaire. Their study's aim was to investigate students' and staffs' attitude about recycling on campus, as well as ways in which participation in the current recycling scheme can be increased (Kelly et al., 2006). Overall, participants in the study were satisfied with the recycling scheme in place. Still, participants wished for more information on where to place the waste as well as making recycling more convenient by providing more recycling facilities (Kelly et al., 2006).

In addition, much of the work undertaken has only focused on "the individual influences of a few variables without attempting to incorporate those variables into a larger theoretical framework" (Lindsay & Strathman, 1997, p. 1800). Moreover, studies conducted about recycling behaviour a long time ago and in different places lack the power to explain UT students' recycling behaviour. For instance, Schultz, Oskamp & Mainieri (1995) argue that when recycling was initially introduced it was still relatively time consuming and high effort was required to recycle. For that reason, individuals concerned with the environment were more likely to recycle. Whereas nowadays recycling is more convenient and "environmental concern" might not explain anymore why individuals recycle (Schultz, Oskamp & Mainieri, 1995, p.107). Consequently, this paper aims to close the gap and find out which factors influence UT students' intention to recycle.

2 LITERATURE REVIEW

As mentioned earlier, negative consequences of consumption and the resolving waste are manifold. The individuals as well as the economy is taking harm through waste carried to landfills or incinerators instead of closing the loop and treating "waste" as a valuable resource. While the ideal option, consume less, is hard to combine with the current economic model first steps are taken toward a circular economy. Essential for a circular economy is to reuse products by recycling them. The EU is giving a framework for member states to become active and transform our economy towards a circular model but in the end it is the people who need to change their behaviour and make recycling part of their daily life. That is why the study at hand seeks to answer which factors influence students' recycling behaviour at the UT with the aim to make recommendations to policy

makers at the UT. In order to bring change one needs to analyse what to change i.e. what is the problem and in this case, what factors determine if students recycle or not? As Fishbein states "the more one knows about the factors that underlie the performance (or nonperformance) of any given behaviour, the more likely it is that one can design a successful intervention to change or reinforce that behavior." (Fishbein, 2008, p.834). Consequently, questions relating to why humans behave in a certain way require knowledge about human behaviour. That is why the most prominent behavioural theory, the TPB, is used as a base and extended by four additional variables.

The following section starts with a definition of the concepts, recycling behaviour and waste. Next, the theories used in the study at hand are described, followed by a conceptualization of the concepts in the section Analytical framework. At last, the hypotheses are formulated and a visualization of the conceptual model is given.

For reasons of clarity the following part will begin with a discussion of the definition of recycling behaviour.

2.1 DEFINING RECYCLING BEHAVIOUR AND WASTE

First of all, what is considered to be waste, what is recycling and what is recycling behaviour? Even though the term waste can be contested, its definition is straightforward in terms of which materials are considered as waste in this study. This study focusses on solid municipal waste which is defined as follows. *"Municipal waste is waste collected and treated by or for municipalities. It covers waste from households, including bulky waste, similar waste from commerce and trade, office buildings, institutions and small businesses, yard and garden waste, street sweepings, the contents of litter containers, and market cleansing waste."* (OECD, 2013a). Even though the municipality of Enschede

does not have the responsibility to collect and treat the UT's waste, the definition above can still be applied to the situation to the UT. As an illustration, the UT's campus is equipped with housing units, supermarkets, hairdressers and overall similar facilities that are found in a municipality and the UT is making their own waste management arrangements with a waste collector (Universiteit Twente, 2014c).

While various studies discuss behaviour, recycling and ultimately recycling behaviour the term "recycling behaviour" is receiving less attention.

In order to define recycling behaviour we look at Stern's article about "significant environmental behaviour" (2000). Stern defines significant environmental behaviour primarily as acts that change or alter resources from the environment or that impact the "dynamics of the ecosystem" in general (2000). In a second definition Stern incorporates the individual's desire to protect the environment with his behaviour, which reads as follows "behaviour that is undertaken to change (normally to benefit) the environment" (Stern, 2000) . Another set of authors, Kollmuss & Agyeman, define "pro-environmental behaviour" as "behaviour that consciously seeks to minimize the negative impact of one's actions on the natural and built-world (e.g. minimize resource and energy consumption, use of non-toxic substances, reduce waste production)" (Kollmuss & Agyeman, 2002, p.240). These definitions are helpful for understanding recycling behaviour, because recycling is considered to be good for the environment. According to Waite "Recycling is a very broad term referring to the conversion of waste (as discarded material with no worth) into a useful material" (as cited in Read, 1999, p.222). Fishbein & Ajzen (2011) take a more generalized approach to defining any kind of behaviour. Namely, "behaviour is composed of four elements: the *action* performed, the *target* at which the action is

directed, the *context* in which it is performed, and the *time* at which it is performed" (Ajzen & Fishbein, 2011, p. 29). Hence, recycling behaviour is defined as separating waste (action) at UT in the following three months. The period of three month is chosen, because it leaves enough room to account for variability. For instance, if the time period is one week it could happen that a week prior to filling in the questionnaire the student was prevented from recycling due to unforeseen circumstances. Whereas when the time period is longer, the impact of unforeseen events decreases. On the negative side, if the time period is too long students might fail to remember how often they have recycled their waste.

Having defined recycling behaviour the following part (2.2. Theories) will discuss the theoretical framework of this study by looking deeper into the theories mentioned in the section Theoretical background.

2.2 THEORIES

2.2.1 Theory of planned behaviour

Among the most well-known models to explain human behaviour is the theory of planned behaviour which is the successor of the theory of reasoned action. The underlying assumption of both models is that human beings are driven by their motivation to perform a certain task i.e. to behave in a certain way. Motivation describes the effort individuals put into performing the tasks and these motivational factors are captured in what Ajzen (1991) calls *intentions* (Ajzen, 1991). The relationship between intention and behaviour is said to be positive i.e. the stronger the individual's intention to perform the behaviour, the more likely she/he will be to do so. Another characteristic both models share is that prior to behaviour are *attitudes toward the behaviour* and s*ubjective norm* which then

build the intention to perform the behaviour (Ajzen, 1991; Head & Noar, 2013). Attitude is the individual's positive or negative judgment about a behaviour and formed through *behavioural beliefs* (Fishbein & Ajzen, 1975: Ajzen, 1991). The central assumption is that individuals are shaped by many impressions they make during their lives. Due to these impressions and experiences they form a set of beliefs which they use to assess their attitude toward something. Some of these beliefs are more ingrained in the individual, while others can differ per behaviour under consideration. During a life-time individuals form a multitude of beliefs, but only salient beliefs are supposed to contribute toward the formation of attitude toward a behaviour (Fishbein & Ajzen, 1975, p.218). Fishbein & Ajzen (1975) refer to prior research which has shown that individuals use between five to nine salient beliefs to form an attitude about an object (Fishbein & Ajzen, 1975, p. 218). To illustrate, individuals form attitudes about a behaviour by connecting it to something they know or have experienced already. The new behaviour, and its outcome, will be judged upon the beliefs of the old behaviour. Hence, if an individual believes the behaviour is tiresome and not worth the effort the attitude about that behaviour will be more likely to be negative and vice versa (Ajzen, 1991). This process of attitude formation is reflected in the expectancy-value model. According to the model, attitude is assessed by using the sum of all "beliefs about the object's attributes or about the act's consequences (b), and the evaluations of the attributes or consequences (e). "(Ajzen & Fishbein, 1975, p. 223). Consequently, it can be stated that an individual will be more likely to form the intention of engaging in a behaviour if she/he holds a more positive attitude about the behaviour under question (Armitage & Conner, 2001).

Another element in the theory of planned behaviour is *subjective norm.* Subjective norm relates to how favourable other people think about the behaviour and whether their opinion influences the individual to behave in a certain way (Ajzen, 1991). Similar to attitude, subjective norm consists of a set of normative beliefs an individual has about what her/his friends and family consider the right thing to do (Ajzen, 1991). In other words, the assumption is that people will be more inclined to engage in a certain behaviour, e.g. recycling, if their contact persons believe it is the appropriate thing to do. However, other scholars are undecided about the role of subjective norm in predicting behaviour, because of its minor contribution toward explaining behaviour in various studies (Armitage & Conner, 2001). Therefore, some studies deliberately excluded subjective norm (e.g. Sparks, Shepherd, Wieringa, & Zimmermanns, 1995). Armitage and Conner (2001) claim that subjective norm has not shown a strong link to behaviour because prior studies have used the wrong measurement to capture the concept. Namely, studies refuting the usefulness of subjective norm in the theory of planned behaviour mainly "use single item measures, as opposed to more reliable multi-item scales" (Armitage & Conner, 2001, p. 478). Armitage & Conner's (2001) results of their meta-analyses match with previous studies which found subjective norm to contribute the least to explaining behaviour. This is not to say that subjective norm should be excluded altogether. Rather, it needs to be conceptualized and measured differently which will be discussed in detail below.

Still, attitude and subjective norm predict behavioural intentions which are directly linked to the performance of the behaviour (Ajzen, 1991; Head & Noar, 2013). Although the theory of reasoned action contributed toward predicting behaviour in

various studies, Ajzen (1991) believed it was lacking the power to explain behaviour not under volitional control (Sheppard, Jon & Warshaw, 1998; Ajzen, 1991). For instance, an individual and her/his friends are very positive about recycling and everyone recycles at home, but the waste collector puts all recycled materials into one bin. In this scenario it is not in the power of the individual to recycle. That is why it is important to incorporate an individual's perception of how she/he can control the situation into the model to predict behaviour. This also applies to an individual's belief whether she/he is capable of recycling. For example, two students living on campus of the UT both possess the same skills needed to recycle. Given that they have the same skills the student who believes she/he can recycle will be more likely to do so than the student who thinks she/he is not able to recycle. Therefore, Ajzen (1991) included a new variable, perceived behavioural control, which aims to incorporate behaviours into the model that are not easily achieved because of constraints (Ajzen, 1991, p. 183). In other words, perceived behavioural control describes "people's perception of the ease or difficulty of performing the behaviour of interest" (Ajzen, 1991). The beliefs that lead to the formation of perceived behavioural control are called "control beliefs" (Ajzen, 1991). Thus, Ajzen (1991) claims that intentions alone will directly predict behaviour in situations in which an individual feels to have complete power over the behaviour, i.e. strong perceived behavioural control. In situations where the individual feels uncertain about her/his control over the situation perceived behavioural control has a direct link to the behaviour under question (Ajzen, 1991). However, Armitage & Conner (2001) remark that there is a gap between an individual's assessment of perceived behavioural control and real control over the situation. Previous research has shown that often times perceived

behavioural control will not capture actual control over the behaviour fully, rather it gives a less precise picture. Hence, assumptions from perceived behavioural control to actual behavioural control should be regarded with care (Armitage & Conner, 2001).

It has been up for debate whether the theory of planned behaviour captures all aspects that could be important to predict and explain behaviour. The theory of reasoned action has been extended already and Ajzen (1991) remarks that the theory of planned behaviour can be extended by further variables if they proof to significantly contribute toward explaining behaviour. The following part will discuss the extension of the theory of planned behaviour by past behaviour, perceived moral obligation, knowledge and inconvenience.

2.2.2 Past behaviour

Past behaviour is said to have an effect on the way we behave in the future. However, there is no general agreement on the role of past behaviour in the theory of planned behaviour. Originally, Ajzen & Beck (1991) state that past behaviour is indirectly accounted for by the variables of the theory of planned behaviour under the conditions that all factors pertaining to the behaviour are known and held constant (Beck & Ajzen, 1991). In case past behaviour shows an effect on future behaviour it is due to a missing component in the model and to measurement variance (Ajzen, 1991). Bentler & Speckart refute Aijzen & Beck's (1991) notion that past behaviour has only an indirect effect on intention through attitudes and subjective norm (Bentler & Speckart, 1979, p. 454). Rather, they claim that past behaviour has a direct effect on intention. Though, past behaviour is not the cause for future behaviour, but engaging in a behaviour more frequently will increase the likelihood to perform the same behaviour in the future

(Conner & Armitage, 1998). In accordance with that line of thought are Lee, Young & Marans (1995) investigated general recycling behaviour in the office and paper recycling behaviour. In their study people who used to recycle paper at home were more likely to recycle paper at the office. However, recycling paper at home does not influence the recycling behaviour of other materials at the office. Thus, they argue that past behaviour can only make predicative claims about future recycling behaviour if it is with regard to the same behaviour and material (Lee et al., 1995). In a more recent study among households in the United Kingdom, Tonglet et al. (2004) came to a similar conclusion. Namely, "previous recycling experience" positively influences recycling behaviour and is adding explanatory value to the theory of planned behaviour and should be included in the model when testing recycling behaviour. A study about consumerism also found that past behaviour was independently predicting future behaviour (Smith, Manstead, Terry, Louis, Kotterman, Wolfs, 2007). In addition, they found that the effect of past behaviour is not related to the measurement method chosen as claimed by Ajzen (Ajzen, 1991; Smith et al., 2007). All in all, research has shown that past behaviour can have an independent effect on intention and future behaviour. With regard to recycling, it can be assumed that a person who has frequently recycled will continue to do so if all conditions have remained the same. Therefore, past behaviour is included to test whether past recycling behaviour influences future behaviour.

2.2.3 Perceived moral obligation

The theory of planned behaviour postulates that individuals are influenced by norms laid upon them by society which is reflected in the construct subjective norm. While subjective norm captures the individual's behaviour in reaction to what other people

think, scholars argue that the theory of planned behaviour does not capture norms the individuals put upon herself/himself. For example, some people might not engage in a certain behaviour because they believe it is the right thing to do and not because of what others think. For that reason, Beck & Ajzen (1991), among others, included feelings of personal norms when researching college student's behaviour with regard to "shoplifting, lying and getting out of assignments" (1991, p. 285). The aim of their study was to investigate to what extent the theory of planned behaviour measures behaviours classified as dishonest. Their study found perceived moral obligation indeed contributes toward forecasting if an individual would lie, while it has a smaller impact on "shoplifting and cheating" (Beck & Ajzen, 1991, 300). In other words, Beck & Ajzen (1991) argue that "perceived moral obligation seems to contribute to the formation of intentions to perform dishonest behaviours" even if the added value of including PMO is limited (1991, p. 296). Conner & Armitage (1998) agree with Beck & Ajzen (1991) that including a measure of personal norms is appropriate when measuring behaviour that can be placed on a "moral or ethical dimension" (Conner & Armitage, 1998, p. 1441). Given the argumentation above, recycling can contribute toward diminishing waste in landfills, oceans or other negative environmental consequences. Hence, one could argue that to recycle or not can be a moral decision (Chu & Chiu, 2003). With regard to recycling behaviour, Chu & Chiu (2003) tested perceived moral obligation and found an independent effect on behavioural intentions. Tonglet et al. (2004) hypothesize in the same fashion, a person who considers to recycle or not presumably includes personal norms in the decision making process. However, their study did not confirm this

assumption. Namely, perceived moral obligation could not explain recycling behaviour, but it contributes toward the formation of the intention to recycle (Tonglet et al., 2004).

2.2.4 Situational factors

According to the theory of planned behaviour, perceived behavioural control covers factors such as lack of recycling skill, i.e. knowledge about which waste to separate, and having easy access to recycling facilities, i.e. how convenient is recycling for the individual. However, Tonglet et al. (2004) argue that perceived behavioural control does not adequately address situational factors. Therefore, the theory of planned behaviour is extended by the factors knowledge and inconvenience about recycling.

2.2.4.1 Knowledge

A large body of research has attempted to explain why individuals recycle. Some studies arrived at the conclusion that "knowledge" about recycling, i.e. which waste to separate and in which bin to place, it is a significant factor for explaining recycling behaviour (De Young, 1989; Hornik, Cherian, Madansky & Narayana, 1995; Schultz, Oskamp & Mainieri, 1995; Oskamp, Burkhardt , Schultz , Hurin & Zelezny, 1998). First of all, De Young (1989) found knowledge and information about recycling important for people's willingness to participate in a recycling scheme. Interventions to increase recycling need to move away from the erroneous belief people know everything about how to recycle. The question of how was even more significant than informing people about why recycling is important (De Young, 1989, p. 350). The less people know about which materials to separate the more effort is needed to do so which can lead to frustration and disengagement in recycling schemes (De Young, 1989). However, information about how to recycle is only an explaining factor for people's recycling behaviour if they are

not familiar with recycling. In case people recycle regularly, information/ knowledge is not contributing toward explaining recycling behaviour (De Young, 1989). Schultz, Oskamp, Mainieri's (1995) agree with De Young (1989), the more knowledgeable a person is about recycling, the more likely she/he will be to participate in recycling schemes. Hornik et al. (1995) conducted a literature study of studies related to recycling behaviour published after 1968. They found knowledge to be the most significant factor predicting recycling behaviour (Hornik, et al., 1995). Another study by Oskamp et al. (1998) measured actual participation in kerbside recycling by looking at "frequency of participation, amount of recyclable materials, and contamination of recyclables by improper material" (Oskamp et al., 1998, p.37). They observed a positive relationship between information about recycling and the amount of materials recycled per recycling activity. While it has no effect on the frequency or contamination rate (Oskamp et al., 1998).

2.2.4.2 Inconvenience

Next to perceived moral obligation, past experience and knowledge about recycling, the inconvenience of recycling has been mentioned to influence recycling behaviour in a multitude of studies (Derksen & Gartrell, 1993; McCarty & Shrum, 1994; Domina & Koch, 2002; Kelly et al., 2006). In 1993 Derksen & Gartrell found out that individuals who held a general positive attitude about recycling were more likely to recycle if it was convenient for them to do so. Interestingly, the same finding applied to individuals that did not care much about the environment. When recycling was made "easy and convenient" those groups not concerned with the environment would achieve high recycling rates as well (Derksen & Gartrell, 1993, p.439). McCarty & Shrum (1994)

found that among college students the inconvenience of recycling plays a major role, while the importance of recycling did not influence recycling behaviour. College students' perception about the convenience of recycling would influence their view about the importance of recycling. Hence, if students regarded recycling as inconvenient they would be more likely to regard it as not important. However, their study showed that once students are more concerned about the greater good of the group they would regard recycling as less inconvenient and therefore as more important. This finding has a contrary result if a student is more self- centred. Namely, students that care more about themselves would see recycling as less convenient. Another pair of researchers supporting inconvenience as factor explaining recycling behaviour are Domina & Koch (2002). In their study they conducted a mail survey to find out if the convenience of recycling and available recycling facilities impacts household's occurrence to recycle. Their findings show that households were more likely to recycle frequently if recycling would be regarded as convenient which is facilitated by available recycling facilities. Furthermore, households indicated willingness to increase the amount of different materials recycled if it would be convenient for them (Domina & Koch, 2002). Kelly et al. (2006) arrive at a similar conclusion in their study about on campus recycling behaviour. That is, students and employees of the university would be more likely to participate in the campus recycling scheme if it would be more convenient for them, e.g. by making more recycling facilities available (Kelly et al., 2006).

In order to achieve clarity about the definition of the variables studied the following part will shortly outline the conceptualization of the dependent and independent variables before sketching the hypotheses and model.

2.3 ANALYTICAL FRAMEWORK

Behavioural intention to recycle. The dependent variable of this study is behavioural intention to recycle. Ajzen (1991) defines intention as "how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behaviour" and intentions have a direct link to actual behaviour (Ajzen, 1991, p. 181). In this study recycling is defined as "the conversion of waste (as discarded material with no worth) into a useful material" (Read, 1999, p.222). Combining Ajzen's (1991) definition of intention with the definition of recycling, behavioural intention to recycle is defined as the effort an individual plans to put into the conversion of waste (as discarded material with no worth) into a useful material" (Ajzen, 1991; Read, 1999, p.222). Furthermore, Ajzen (1991) states that a certain behaviour also needs to be defined with regards to time and a specific place. Hence, the chosen time period is the upcoming three month and the space of interest is the property of the UT. Therefore, the behavioural intention to recycle is the effort an individual plans to put into the conversion of waste at the UT in the next three months.

Attitude. According to Ajzen (1991), Attitude "refers to the degree to which a person has a favourable or unfavourable evaluation or appraisal of the behaviour in question" (Ajzen, 1991, p. 188). Hence, in this study attitude toward recycling refers to the individual's positive or negative evaluation of recycling.

Subjective norm. Subjective norm refers to the individual's belief that she/he should behave according to norms accepted in society. This variable takes into account what other people think about the behaviour under question. For instance, if recycling at

the UT is common a student might feel obliged to recycle as well. Or, if everyone in a group of friends recycles or sees recycling as valuable might impact that individual.

Perceived behavioural control. Perceived behavioural control refers to the individual's belief of how easy or difficult it is to engage in the behaviour (Ajzen, 1991). In the study at hand perceived behavioural control relates to opportunities and constraints to recycle. For example, whether students' belief there are proper recycling facilities. Opportunities can be recycling bins on campus or a specific time the separated waste is being picked up. While constraints could be that either there are no bins to recycle or these are not recognized at the UT.

Perceived moral obligation. While subjective norm refers to the impact that third people have on the individual, perceived moral obligation relates to the individual's personal norms of what is the right thing to do. Hence, in the study at hand perceived moral obligation describes the students' personal moral belief toward recycling.

Past behaviour. Past behaviour has been found to contribute toward explaining future behaviour. Past behaviour could mean any period, but within this study past behaviour is defined as recycling that took place during the last three months. At the same time, the frequency of recycling behaviour plays a role when defining past behaviour.

Knowledge. In the study at hand knowledge refers to the students' awareness of how to recycle. This includes knowledge about which materials can be recycled together, e.g. do aluminium and plastic go together? As well as knowledge about in which bin to place certain materials. In addition, knowledge about the state of the material, e.g. does

the material need to be clean in order for it to be recycled properly? Knowledge about the location of recycling facilities is assessed using perceived behavioural control.

Inconvenience. Inconvenience refers to the student's belief of how much hassle it is for them to recycle. For instance, when recycling takes up a lot of time students might feel that it is inconvenient to recycle. Moreover, recycling might be perceived as inconvenient if it is complicated or extra effort is needed to recycle, compared to tossing waste in one bin.

After having discussed the theory of planned behaviour and the variables to be added to the model, in the next section the hypotheses are modelled.

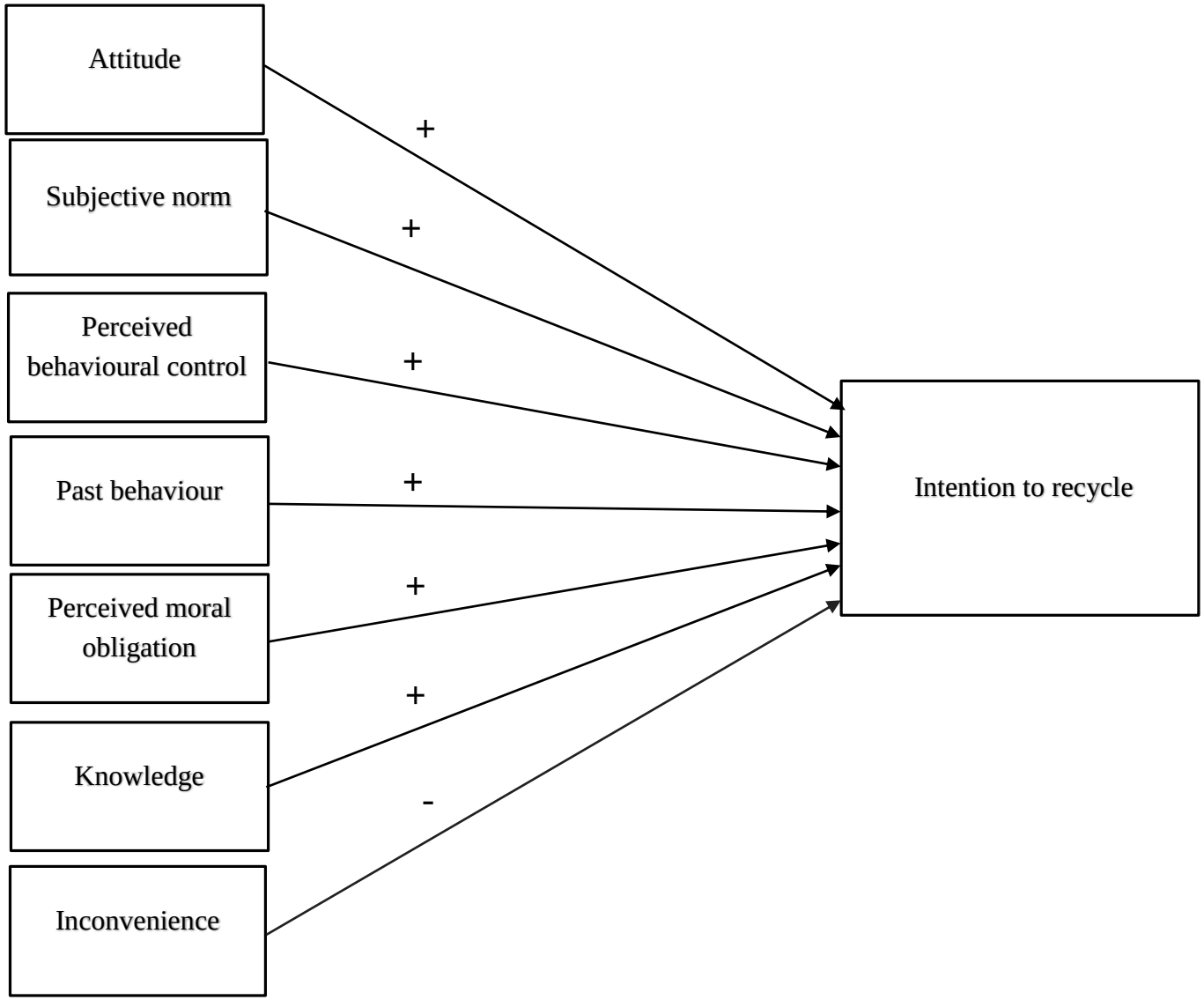
2.4 HYPOTHESES AND MODEL

The following section models the hypotheses derived from the literature discussed. The hypotheses read accordingly:

> $\boldsymbol{Hypothesis_1}$**:** Students who hold positive attitudes toward recycling are more likely to have the intention to recycle.
>
> $\boldsymbol{Hypothesis_2}$**:** Students who feel high subjective norm to recycle are more likely to have the intention to recycle.
>
> $\boldsymbol{Hypothesis_3}$**:** Students who perceive high behavioural control to recycle are more likely to have the intention to recycle.
>
> $\boldsymbol{Hypothesis_4}$**:** Students who have recycled in the past are more likely to have the intention to recycle.
>
> $\boldsymbol{Hypothesis_5}$*:* Students who believe recycling is morally right are more likely to form intention to recycle.
>
> $\boldsymbol{Hpothesis_6}$**:** Students who have knowledge about recycling are more likely to have the intention to recycle.
>
> $\boldsymbol{Hypothesis_7}$**:** Students who perceive recycling as inconvenient are less likely to have the intention to recycle.

In figure 1, a conceptual model derives from the hypotheses:

Figure 1 *Conceptual model*.
This figure illustrates the direction of the relationship between the independent variables and the dependent variable. A positive relationship is displayed using a plus sign (+) while a negative relationship is displayed using a minus sign (-).



3 RESEARCH METHODOLOGY

The main purpose of this study is to investigate which reasons can explain why students at the UT recycle their waste, or why not. As seen in the literature there are several approaches to the topic of waste recycling and the theory of planned behaviour has been proven useful. Furthermore, perceived moral obligation, past behaviour as well as the situational factors knowledge and inconvenience have been proven to significantly explain recycling behaviour.

3.1 RESEARCH DESIGN

The aim of this research is to find out the variables that explain UT students' recycling behaviour on campus. Various independent variables have been discussed in the literature to influence recycling behaviour. In order to not overburden the model with all variables discussed, seven independent variables were chosen to be included in the conceptual model. This study is interested in the intention to recycle compared to actual behaviour that is why behavioural intention to recycle is the dependent variable. Intention to recycle is said to directly predict actual behaviour if the behaviour is under volitional control (Ajzen, 1991). With the variables derived from literature seven hypotheses to be tested were formulated. All the independent variables are assumed to be directly related to behavioural intention. To test the hypotheses a causal design is chosen and the hypotheses are tested by means of an online questionnaire.

3.2 CASE SELECTION AND SAMPLING

The unit of analysis are individuals and the sample are students at the UT. The UT comprises the campus as well as external teaching facilities. External facilities include the building of the International Institute for Geo-Information Science and Earth Observation which is situated outside the campus but still under the management of the UT. Students are defined as enrolled at the UT in the academic year 2014-2015, either full-time or part-time. Currently there is only data

available for the number of students enrolled in the academic year 2013-2014. Namely, a total of 9161 students were enrolled during that year. 5605 of that total number were enrolled in a bachelor program, 314 in a pre-master program and, 3242 in a master program (Universiteit Twente, 2014a). It is important to note that students have the opportunity to enrol in more than one program. For example, it is possible to be enrolled as bachelor student and simultaneously as pre-master student. While it is not possible to be enrolled as bachelor and master student. Hence, among the total number of students there might be a few students that are listed twice. However, this is not taken into account in the calculation of the total number of students. In previous years the number of students enrolled increased continuously. Based on this it can be assumed that enrolments for the current academic year 2014-2015 are slightly higher than the numbers available. Moreover, the UT has five faculties- Engineering Technology (CTW), Electrical Engineering, Mathematics and Computer Science (EEMCS), Behavioural Sciences, Management and Social Sciences (BMS), Science and Technology (TNW) and the ITC (Universiteit Twente, 2014d).

The chosen sampling technique is convenience sampling. This non-probability sampling technique aims to include all subjects in the study that are available at a given time (Babbie, 2001). This technique is often used for studies among university students, because it is relatively easy to get a sufficient response rate without investing much resources (Babbie, 2001). However, the ease comes with a price, because it is hard to generalize from convenience samples to a wider population. Babbie goes so far in claiming that “it seldom produces data of general value” (Babbie, 2001, p.192). Nevertheless, convenience sampling is the chosen technique, because detailed information about the population under study is not available for this research and given the resources available this is the best option. Students are approached using an internet survey. Internet surveys are a good tool to reach college students, because they are more likely to spend a

considerable amount of time online and can be assumed to decree over the needed technological knowledge to be comfortable with a web-based questionnaire. In addition, internet-based surveys are easy to answer and the respondent can choose a good time to fill them in (Sax, Gilmartin & Bryant, 2003). Shih & Fan (2008) found evidence for higher response rates in internet surveys among students compared to paper based surveys. On the down side, Smith (2007) remarks that participants might be reluctant to answer the survey for reasons of privacy and internet security or because technical difficulties make responding not possible.

There are various ways to engage participation of students in the survey. First, the online questionnaire is shared on the social networking site Facebook, in so-called "groups" that are affiliated with the UT. For example, "University of Marketplace" or "University of Twente International". The link was also made available online through UT Nieuws (the university newspaper) as well as through a student organisation GeneratIn'. GeneratIn' was chosen, because it aims to reach students from all faculties and engages with issues about sustainability on campus (GeneratiIn', 2015). However, using Facebook bears the risk of only reaching students that are active on that platform. For this reason, the questionnaire is also shared via e-mail. E-mails were distributed to certain courses using the online learning platform blackboard.

3.3 QUESTIONNAIRE

The questionnaire is designed and distributed via the Lime Survey service. Participants are able to access the survey via an online link. On the first page participants encountered a welcome text which explains the intention of the survey. However, the introduction to the topic is not detailed in order to avoid bias regarding the topic. Distributing surveys online can run the risk of targeting the wrong group of participants. For that reason the first sentence on the welcome page specifically mentions that the survey is only intended to be filled in by students of the UT. In addition, a definition of the term recycling and waste is given to help guide the participant and

prevent misunderstandings of the terms. Lastly, it is pointed out that there are no right or wrong answers and that filling in the survey is anonymous and that participants can stop the survey at any time during the process. Prior research has shown that participants are more likely to finish the survey if there is a process indication (Couper, Traugott & Lamias, 2001). Each page of the survey contains a bar showing the progress until the end in percentages. Moreover, the questionnaire consists of 44 questions. The 44 questions are spread out in nine parts, called A-I. Each part is dedicated to one variable under study with the addition of one part with room for further comments from participants and one part about demographics of the participants. The structure of the questionnaire is as follows, A: Attitude, B: Subjective norm, C: Perceived behavioural control, D: Perceived moral obligation, E: Knowledge, F: Inconvenience, G: Recycling behaviour, H: Additional comments, and I: Demographics. In order to guarantee consistency, the sequence of the variables in the questionnaire is based on the sequence of the discussion of the variable in the written report. With the exception of behavioural intention to recycle, which is prompted near the end of the questionnaire. In the light of the current privacy debate respondents might be reluctant to share their personal information at the start of the survey. That is why the questionnaire deliberately ends with the section about participant's demographic information. A better part of the questions are taken from previous studies. All the variables under scrutiny have been studied elsewhere beforehand but not combined into one model. Adopting previous questions has the benefit that the questions have been validated, if the questionnaire was carried out correctly. Table 1 gives an overview of the sources used for each hypothesis and how many items the questionnaire included. Afterwards the content of the questionnaire is discussed in detail.

Table 1 *Overview of variables and sources*

Construct	Items	Source
H_1 Attitude	8	Kelly et al. (2006) & Knussen & Yule (2008)
H_2 Subjective norm	6	Tonglet et al. (2004), Knussen & Yule (2006) & Knussen & Yule, 2006
H_3 Perceived behavioural control	5	Tonglet et al. (2004) & Knussen & Yule (2008)
H_4 Perceived moral obligation	7	Lee et al. (1995)& Tonglet et al. (2004)
H_5 Past recycling behaviour	2	Tonglet et al. (2004)
H_6 Knowledge	5	Lee et al. (1995),Tonglet et al. (2004) & Kelly et al. (2006),
H_7 Inconvenience	6	Mc Carty & Shrum (1994), Lee et al. (1995) & Kelly et al. (2006)
Behavioural intention to recycle	6	Tonglet et al. (2004)

Part A Attitude. Attitude is measured using eight general questions about recycling. The questions referring to attitude are not specific to the situation at the UT, because the intention is to find out about students' general attitude about recycling. The first four questions have the same sentence structure and similar wording. Namely, "recycling is good, recycling is useful, recycling is rewarding, recycling is responsible" (Tonglet et al., 2004). The fifth question uses negative wording. That is, "I am not interested in the idea of recycling" (Knussen & Yule, 2008). Question six is taken from Knussen and Yule (2008), "My feelings toward recycling are favourable". The last two questions, "I don't think recycling has many positive effects on the environment" and "I make great personal effort to recycle as much as possible", are from a study by Kelly et al. (2006).

Part B Subjective norm. Subjective norm consists of five questions. The first three questions have a similar structure and wording. The first question reads, "Most people who are

important to me think that I should recycle my waste" and the second, "Most people who are important to me would approve of me recycling my waste" (Tonglet et al., 2004). The third and fourth question are taken from Knussen et al. but similar to the first two (2006). Namely, "Most people who are important to me want me to engage in recycling" and "Most of my family think that recycling is a good thing to do" (Knussen & Yule, 2006). The last question asks directly about the influence of other people's recycling behaviour on the participant, "If more people recycle, I would recycle more" Knussen & Yule, 2006

Part C Perceived behavioural control. Perceived behavioural control is tested using five questions. Most of the questions have been taken from literature but adapted to the UT. First of all, "There are plenty of opportunities for me to engage in recycling at the University of Twente" and "It will be easy for me to engage in recycling on campus during the next month" (Knussen & Yule, 2008). The third question is a general question about recycling, "Recycling is easy" (Tonglet et al., 2004). Lastly, the fourth and fifth question read as follows: "The University of Twente provides satisfactory resources for recycling" and "I know where to take my waste for recycling at the University of Twente" (Tonglet et al., 2004).

Part D Perceived moral obligation. Perceived moral obligation is measured using seven questions. Question one to five have been used by Tonglet et al. (2004). Namely, "I feel I should not waste anything if it can be used again", "It would be wrong of me not to recycle my waste", "I would feel guilty if I did not recycle my waste", "Not recycling goes against my principles" and "Everybody should share the responsibility to recycle waste" (Tonglet et al., 2004). The last two questions are, "Recycling should be an essential part of our way of life" and "Recycling seems like the right thing to do" (Lee et al., 1995).

Part E Knowledge. Knowledge is measured with five questions. These are, "I would recycle more waste if I had more information on recycling" (Kelly et al., 2006), "More

information about how to recycle should be available at the University of Twente" (Lee et al., 1995), "I know how to recycle my waste" (Tonglet et al., 2004), "If I knew what was happening to the recyclables after I dispose of them, I would recycle more often" (Kelly et al., 2006), and "There is little information if recycling at the University of Twente" (Lee et al., 1995).

Part F Inconvenience. Inconvenience is measured using six questions. Question one to five are from recent studies while question six is added by the researcher after the pre-test. They read as follows: "I don't have time to recycle" (Kelly et al., 2006), "Recycling is inconvenient" (Kelly et al., 2006), "Recycling is too complicated" (Tonglet et al., 2004), "Recycling is too much trouble" (Mc Carty & Shrum, 1994), "It is inconvenient for me to recycle at the University of Twente" (Lee et al., 1995).

Part G Recycling behaviour. The part "Recycling behaviour" measures past recycling behaviour and behavioural intention to recycle. All questions have been taken from Tonglet et al. (2004) and adapted to the UT. The first question section, behavioural intention to recycle, consists of eight questions. Each question asks the respondents about his or her likelihood, intention, future recycling behaviour and plan to recycle on campus or at home in the forthcoming four weeks. The last set of questions is about past recycling behaviour. Namely, "In the past three month how frequently did your recycle your waste at the University of Twente" and "In the past three month how frequently did you recycle your waste at home".

Part H Additional information. Additional information gives the participants a chance to share their experience with recycling in higher education institution with the questions, "Would you like to share some good experiences of recycling at high education institutions?"

Part I Demographics. Demographics asks six questions about the participant's age, gender, study programme, student's status and whether they live on or off campus.

Most of the items listed above, except for additional information and demographics, were answered using a seven point Likert scale. In a Likert scale participants are confronted with a statement/question which they are asked to evaluate on a scale. Likert scales range from three to eleven answer options. Friedman & Amoo (1991) found in a literature study that "using anywhere from 5- to 11-point scales" is recommended. According to Alwin & Krosnick (1991) increasing the number of response options increases the reliability of the answer. For instance, scales with three response options are sufficient for individuals that have either a very strong opinion in favour or against something, while individuals that are indifferent about a topic might tend to answer in the middle. Hence, increasing the response options decreases the "random guessing" (Alwing & Krosnick, 1991, p. 149). However, there is a point in which increasing the number of response options does not result in more reliability, because "people probably differentiate between weak, moderate, and strong feelings" (Alwing & Krosnick, 1991, p. 149). Hence, in the questionnaire at hand a 7 point Likert scale is used throughout the questionnaire. Most of the answers are listed beginning with strongly agree, moderately agree, slightly agree, neutral, slightly disagree, moderately disagree, to strongly disagree (from the positive to the negative). Except for the questions about recycling intention and past recycling behaviour. Namely, for recycling intention respondents could choose answer ranging from extremely likely, very likely, somewhat likely, neutral, and somewhat unlikely to extremely unlikely. Whereas answers for past recycling behaviour range from always, very frequently, frequently, neutral, rarely, very rarely to never. Studies found that the location of the answer will have an effect on the outcome of the survey. Namely, participants are more likely to choose the item listed first more often. Hence, "a bias towards the left side of the scale" is present and should be kept in mind when analysing the data (Friedman, H. H., Herskovitz, P. J., & Pollack, 1994).

Prior to the distribution of the questionnaire a pre-test was sent to six people. The pre-test was distributed as word version, because the online server Lime Survey could not be accessed at that point in time. All the six participants were advised to fill in the questionnaire and write down any confusions when filling in, or other advice that would come to mind. Participants were also asked to count the time needed to fill in the questionnaire. It took an average of seven minutes to fill in the questionnaire. After the pre-test no items were deleted from the questionnaire.

3.4 RESPONDENTS

A total of 221 people accessed the questionnaire via the link. Of these 221, 119 people finished the questionnaire. Resulting into 102 people that did not finish the questionnaire. However, 61 people were excluded from the questionnaire and from the analysis because no answer was given at all. This could be due to people only opening the questionnaire in their browser without looking at the content. In the end a total of 160 people accessed the questionnaire with 119 valid answers and 41 incomplete answers. Five respondents indicated under additional information that they have finished their studies and are employed. Since the target group of this study are students currently enrolled at the UT these five respondents were excluded from the analysis. Hence, the remaining sample size is 114.

3.5 RELIABILITY

To test the internal consistency of the questionnaire Cronbach's alpha was calculated using SPSS for each of the constructs in the study. The guiding principle in interpreting Cronbach's alpha is that "the closer it is to 1.0 the greater the internal consistency of the items in the scale" (Gliem & Gliem, 2003). As seen in Table 1, the majority of constructs show satisfying results for Cronbach's alpha and are close to 1. The construct knowledge shows a low Cronbach's alpha (= 0,556) and should be interpreted with caution. Past recycling behaviour (α = 0,228) resulted in a very low alpha and needs to be analysed with caution as well.

Table 2 *Cronbach's alpha*

Reliability statistics Cronbach's alpha

Construct	Items	α
Attitude	8	0,634
Subjective norm	6	0,735
Perceived behavioural control	5	0,897
Perceived moral obligation	7	0,903
Knowledge	5	0,556
Inconvenience	6	0,817
Behavioural intention to recycle	6	0,935
Past recycling behaviour	2	0,228

Note. α *= 5%.*

3.6 STATISTICAL ANALYSIS

The data is analysed using a linear model, multiple regression, because the aim of the study is to find out which factors influence students' intention to recycle by means of seven independent variables. In other words, we are interested to what extent attitude, subjective norm, perceived behavioural control, perceived moral obligation, past behaviour, inconvenience and knowledge can predict students' intention to recycle. The statistical equation for a simple regression and for multiple regression is as follows:

$$outcome_{\ i=}(model) + error_i$$

In regression the outcome variable is equivalent to the dependent variable and the predictor variable resembles the independent variable. While the error describes the difference between the predicted and actual scores (Field, 2013). Therefore the model of recycling intention reads as follows:

$$BIR = (b_{o+}b_1a + b_2sn + b_3pbc + b_4pmo + b_5pb + b_6k + b_7i) + \varepsilon_i + \varepsilon_i$$

Prior to the analysis the assumptions for multiple regression need to be checked. Zuur, Ieno & Elphick (2010) emphasize an eight step guideline to check assumptions. In multiple regression not all eight steps are applicable. First of all, the data needs to be checked for outliers. Each variable was visually tested for outliers using boxplots (see Appendix D, Figure 15-20). No outliers were found on which basis measurement error can be precluded. The second assumption is that the residuals are homogenously distributed, which is also called homogeneity of variance (Zuur et al., 2010). Plotting the residuals of the linear regression model against the predicted values affirms the 2nd assumption (See Appendix D, Figure 22). The 3rd assumption of regression assumes a normal distribution of the population. Testing if the whole population of UT students is normally distributed is not possible, because one would need to know the whole population which would make drawing a sample senseless. Hence, a histogram of the residuals can give an indication whether the population is normally distributed. The plotted histogram of the residuals shows a normal distribution (See Appendix D, Figure 21). The next step to check is if there is a linear relationship between the predictor variables and outcome variable. Plotting the predictor variable (X) with the outcome variable (Y) using a scatter dot graph shows that all relationships between X and Y are linear (Appendix D, Figure 8-14). The last step is to check if the predictor (independent) variables correlate with each other, since high correlations between variables can hide an otherwise measureable main effect of a variable. All correlations are below 0, 9 on which basis we can preclude multicollinearity (Appendix C, Figure 7). Another method to check for no multicollinearity is to use the VIF values using SPSS. These values should be below 10. In our data set all values are below ten and it can be concluded that data set has no multicollinearity (Field, 2013). Hence the data can be analysed using multiple regression.

The main assumption for the whole model, null hypothesis, is that there is no relation between attitude, subjective norm, perceived behavioural control, perceived moral obligation,

past behaviour, knowledge and inconvenience and behavioural intention to recycle unless proven otherwise. The alternative hypothesis is that at least one variable contributes to explaining behavioural intention to recycle. Hence, the null hypothesis and alternative hypothesis read as follows:

$$H_0: b_1a = b_2sn = b_3pbc = b_4pmo = b_5pb = b_6k = b_7i = 0$$
$$H_1: at\ least\ one \neq 0$$

The next question of interest is which of the predictors contributes to explaining intention to recycle and if there are predictors that do not contribute. The initial assumption for each predictor is that they do not influence students' intention to recycle. The alternative hypothesis is that each predictor does contribute to the model. Therefore, the null hypothesis and alternative hypothesis for each predictor read as follows:

Attitude.

$$H_{1,0}: b_1a = 0$$

$$H_1: b_1a \neq 0$$

Subjective norm.

$$H_{2,0}: b_2sn = 0$$

$$H_2: b_2sn \neq 0$$

Perceived behavioural control.

$$H_{3,0}: b_3pbc = 0$$

$$H_3: b_3pbc \neq 0$$

Perceived moral obligation.

$$H_{4,0}: b_4 pmo = 0$$

$$H_4: b_4 pmo \neq 0$$

Past behaviour.

$$H_{5,0}: b_5 pb = 0$$

$$H_5: b_5 pb \neq 0$$

Knowledge.

$$H_{6,0}: b_6 k = 0$$

$$H_6: b_6 k \neq 0$$

Inconvenience.

$$H_{7,0}: b_7 i = 0$$

$$H_7: b_7 i \neq 0$$

In section 4 Findings, the overall findings of the statistical analysis are laid down.

4 FINDINGS

A multiple regression analysis was conducted to investigate to what extent attitude, subjective norm, perceived behavioural control, perceived moral obligation, inconvenience and knowledge predict student's behavioural intention to recycle at the UT. The section begins with a descriptive overview of the respondent's gender, age, faculty and living situation.

4.1 RESPONSE RATE AND DESCRIPTIVE CHARACTERISTICS

As a reminder, a total of 114 students filled in the questionnaire during three weeks' time. More than half of the respondents are female with 57% and the remaining 43 % male (Appendix A, Figure 2). The majority of the respondents live off campus, with 73, 7% and 26, 3% on campus (Appendix A, Figure 4). The respondent's mean age is 23, 89 with a standard deviation of 3,820 (Appendix A, Figure 3). Interestingly, most of the participants belong to the faculty of BMS with

64, 04 % and the least participants are from the ITC faculty with 4, 39%. Students from the faculty TNW and CTW are equally distributed with 9, 65% each. 7, 02% of the participants belong to the faculty EECMS, and 5, 26% of the participants were listed as "other" because it was not clear to which faculty they belong (Appendix A, Figure 5).

4.2 RESPONSES PER QUESTION CATEGORY

In the following the most noticeable response statistics are highlighted. A detailed overview of all answer can be found in the appendix.

Attitude

Students' attitude was tested using eight statements on which students could indicate their level of agreement on a seven point Likert scale. Interestingly, for the statement "Recycling is good" most of the participants answered that they either strongly agree (71, 1%) or moderately agree (24, 6%), and only a few people answered options in between. The same responses are found for the item "recycling waste is useful". Namely, 67, 5% of the respondents strongly agree with the statement and 25, 4% moderately agree. 5, 3 % of the respondents answered that they moderately disagree with the statement. Regarding the statement "recycling is rewarding" most of the students indicated that they moderately agree with 37, 7%. While 13, 2% stated that they moderately disagree and the same percentage of students indicated that they slightly disagree. On the other side, 25, 2% of students strongly agree with the statement. Regarding the statement "Recycling is rewarding", the percentages of respondents are similar to A1 and A2. A large part of the students strongly agree with the statement. In addition, almost all respondents, 48, 2 % moderately disagree and 31, 6% slightly disagree, disagree with the statement "I am not interested in the idea of recycling waste", while only one student strongly disagrees with the statement. The next percentage of answer is in line with the previous responses. The majority of students disagree with the statement" I don't think recycling waste has many positive effects on

the environment". In more detail, 50% of students moderately disagree and 35, 1% slightly disagree with the statement. Interestingly, the largest part of the respondents strongly disagree and moderately disagree with 32, 5% with the statement "I make great personal effort to recycle as much as possible". 11, 4% of the respondents strongly agree with the statement. All percentages are in Table 4 in the Appendix B.

Subjective norm

Subjective norm was measured using six questions. In the first question, "Most people who are important to me think that I should recycle my waste", the majority of participants answered that they agree with the statement. That is, 23, 7% of students slightly agree with the statement and 23, 7% of students moderately agree with the statement. Similarly, 23, 7% of students take a neutral standpoint. The outcome for the second statement, "Most people who are important to me would approve of me recycling my waste" is similar. Namely, a majority of students agree with the statement and only one student indicated that she/he disagrees. 8, 8% of the students remained neutral. The distribution of the answers for the question "Most people who are important to me want me to engage in recycling" is more spread. That is, most of the students slightly agree (30, 7%) while 21, 1% do not have an opinion. Almost all students indicated that their families think recycling is a good thing to do, while a total of 6, 1% do not agree with the statement. In addition, a large part of students (32, 5%) remain neutral when it comes to the statement whether it will be expected of them to recycle each day in the forthcoming month. Moreover, more than half of the students agree with the statement that they would recycle more if more people would recycle. All answers can be found in Table 6 in the Appendix B.

Perceived behavioural control

Regarding the perceived behavioural control of recycling the following answers were given. Most students' answers are located on the negative side of the scale for the statement "There are plenty

of opportunities for me to engage in recycling at the University of Twente". Still, about a third of the students agree with the statement and 14% do not have an opinion about the opportunities to recycle. The situation with the statement whether recycling is easy on campus is similar. Most of the students disagree with the statement and 16, 7% stay neutral. On the contrary, more than half of the student agree that recycling is easy. Still, 20, 2% of the students slightly disagree with the statement. Moreover, more students disagree that the UT provides satisfactory resources for recycling. A point to be noted is that more than half of the students do not know where to take their waste at the UT. All answers can be found in Table 7 in the Appendix B.

Perceived moral obligation

Perceived moral obligation was measured using seven statements. The most interesting fact to note is that for each statement two thirds of the whole sample agreed with each statement. Only the statement "Not recycling goes against my principles" had more than 14% of respondents who remain neutral about the statement. 14% of students slightly disagree that they would feel guilty if they do not recycle. More than 85% agree to some extent that everybody should share the responsibility of recycling. Furthermore, the majority of students strongly agree that recycling seems like the right thing to do. On the contrary, one person slightly disagrees with the statement. Likewise, the majority of students agrees that recycling should be an essential way of life, while four students indicated that they disagree with the statement.

Knowledge

Students' knowledge about recycling is measured with five statements. The majority of responses for all questions is on the positive side of the scale. Hence, almost all students agree e.g. that more information would help them to recycle more. For instance, 33, 3% of students strongly agree and 28, 9% moderately agree with this statement that the UT should provide more information about recycling on campus. On the contrary, one person strongly disagrees. Students

also indicated that if they knew what was happening with the recyclables after they dispose of them they would recycle more often. Regarding the same statement 17, 5% of students remain neutral. Lastly, over 60% of students agree with the statement that there is little information about recycling on campus. All answers can be found in Table 8 in the Appendix B.

Inconvenience

The inconvenience of recycling is measured using five items. The most notable about these answers is that except for the first statement the percentage of students answering strongly agree and strongly disagree are exactly the same. For example, 6, 1% of students strongly agree and 6, 1% of students strongly disagrees that recycling at the UT is inconvenient. Moreover, the majority of students agree with the statement that they do not have time to recycle. Another observation is that most students remained neutral whether they think recycling is inconvenient, too complicated, too much trouble and convenient. All answers can be found in Table 9 in the Appendix B.

Recycling behaviour

Students were asked about their recycling behaviour on campus and at home. Noticeably, the numbers of students who always recycle at home (16, 7%) are considerably higher than students who always recycle at the UT (3, 5%). In contrast, the difference between students who recycle very frequently at home (34, 2 %) and at the UT is smaller (21, 1%). Interestingly, the percentage of students who frequently recycle at home and at the UT are the same with 27, 2 %. On the other side, 15, 8% students indicate that they never recycle their waste at the UT, while 5, 3% of the students say they never recycle at home. All answers can be found in Table 10 in the Appendix B.

Recycling intention

Students were asked about their recycling intention at home and at the UT. More than half of the students indicated that they are extremely or somewhat likely to intend to recycle at home and at university. More students are unlikely to recycle at the UT than at home in the following four weeks. The outcome for students' intention to recycle at home or at the UT is similar. Namely, the majority of students are likely to recycle their waste at home and a few students are less likely to recycle at the UT. Regarding the statement "I will try to recycle my waste at the University of Twente each day in the forthcoming month" 28, 1% of students say they are very likely to do so. The number for at home are slightly higher. On the contrary, more than 30% of students are unlikely to plan to recycle at home. Again, the majority of students indicated that they are likely to recycle at home. All answers can be found in Table 11 in the Appendix B.

Past behaviour

Students were asked how frequently they have recycled in the past three months at home and at the university. The majority of students replied that they either always (12, 3%), very frequently (35, 1%), and frequently (30, 7%) recycle at home. On the other side, more students replied that they rarely (22, 8%), very rarely (9, 6%) or never (7, 0%) recycle at university. Still, almost half of the students indicated that they did recycle on campus in the past three months. All answers can be found in Table 11 in the Appendix B.

Additional comments

Apart from the variables tested in the questionnaire there was room for additional comments or to share experiences with recycling at other universities. Several participants used this space to give feedback about the situation at the UT and the new recycling facilities in the building Vrijhof. Below a number of the comments are stated beginning with comments about the situation at the UT.

"No provided Information about Recycling at UT"

"At the UT, the only recycling option that exists is in the Waaier canteen, all other bins are just for all kinds of waste"

"I want to recommend the UT to set up more garbage cans that allow recycling. Currently there are so few and in front of the flats on the campus there is only one large container so no recycling is possible at all."

"I'd like to be able to recycle organic waste at my home on campus, as well as aluminium cans and other metallic containers."

"Well, I do not have good experience to share but I would like to mention that the recycling system implemented at the Vrijhof is not very user friendly and costs a lot of time. Each time you want to throw away something you need to walk to a recycling "station"."

In the following part the correlations among the variables is described.

4.3 CORRELATIONS

In a first step the variables of the theory of planned behaviour were entered into the model using the software SPSS. Namely, attitude, subjective norm and perceived behavioural control. Next, perceived moral obligation was entered and after that past behaviour. Lastly, knowledge and inconvenience were entered together because they form situational factors.

Overall, the results (Figure 7 in the Appendix) for the Pearson correlation show that almost all variables in the model have a significant positive relationship with recycling intention when alpha is 0.05 ($\propto = 5\%$). With the exception of knowledge which shows a low correlation and the value is not significant (r = .146, p = > .05). The highest positive correlation was found between past behaviour (r = .733, p = < .05) and recycling intention. In addition, a strong correlation was found between perceived behavioural control (r = .590, p = >.05) and recycling intention. The variables attitude (r = .337, p = <.05), subjective norm (r = .478, p = <.05) and

perceived moral obligation (r = .404, p = <.05) show a moderate positive relationship with recycling intention. Next, the results for the multiple linear regression are described.

4.4 MULTIPLE REGRESSION

Multiple regression was conducted to see whether the variables of the study predict the recycling intention of students.

In Table 3, an overview of the beta values for the sample (Beta) as well as the whole population (B) is given, next to its level of significance. Table 3 also shows the level of variance explained by the whole model.

Table 3 *Overview coefficients and R² of the model*

Predictor	ΔR^2	B	Std. Error	Beta	Sig.
(Constant)		-9,582	3,462		,007
Attitude		,041	,107	,034	,701
Subjective norm		,083	,097	,072	,398
PBC		,038	,072	,044	,602
PMO		,175	,089	,200	,052
Past Behaviour		2,213	,300	,588	,000
Inconvenience		-,197	,066	-,213	,004
Knowledge	,675	,059	,113	,040	,602

Note. B= estimate of the regression coefficients for the whole population of UT students. Beta= regression coefficient for the sample. P< 0, 05.ΔR^2*= total variance explained by the* model. *PBC= Perceived behavioural control. PMO= Perceived moral obligation.*

First of all, the analysis (Table 3) shows that the overall model significantly predicts student's intention to recycle. In more detail, the model explains 67, 5% (ΔR^2=, 675) of the variance in behavioural intention to recycle. Using the Enter method in SPSS it was found that attitude, subjective norm, perceived behavioural control, perceived moral obligation, past behaviour, knowledge and inconvenience explain a significant amount of students' behavioural intention to recycle($F(7/108) = 31{,}971, p < {,}05, R^2 = .675,\ R^2{}_{Adjusted} = .653$). Hence, the null hypothesis, there is no relationship between the predictor variables and the outcome variable

can be rejected. Or in other words, there is at least one variable in the model that predicts student's intention to recycle.

With regard to the single predictors, the analysis shows that attitude ($Beta = .041$, $t(110) = .385$, $p > .05$), subjective norm ($Beta = .083$, $t(110) = .084$, $p > .05$), perceived behavioural control ($Beta = .038$, $t(110) = .523$, $p > .05$) and knowledge ($Beta = .059$, $t(110) = .523$, $p > .05$) did not significantly predict behavioural intention to recycle. On the basis of this we can state that there is not enough evidence to reject the null hypothesis from $H_{1,0}$,$H_{2,0}$, $H_{3,0}$, $H_{6,0}$. On the contrary, the analysis shows that perceived moral obligation ($Beta = .175$, $t(110) = 1.965$, $p < .05$), past behaviour ($Beta = 2{,}213$, $t(110) = 7.368$, $p > .05$) and inconvenience ($Beta =$- .196, $t(110) = 2{,}972$, $p > .05$) did significantly predict students' behavioural intention to recycle. In more detail, when perceived moral obligation rises by one unit, behavioural intention to recycle will rise by 0.17 units. Hence, there is enough evidence to reject the null hypothesis of $H_{4,0}$.With regard to past behaviour, when past behaviour rises by one unit, behavioural intention to recycle will rise by 2, 21 units. As a result, there is enough evidence to reject the null hypothesis $H_{5,0}$ .The last predictor with statistically significant results is inconvenience. That is, if inconvenience rises by one unit the behavioural intention to recycle will go down by 0, 19 units. This shows a negative relationship between student's intention to recycle and inconvenience. Therefore, we have enough evidence to reject the null hypothesis $H_{7,0}$.

In section 5, Discussion, the findings will be interpreted and possible shortcoming of the research is discussed.

5 DISCUSSION

The results show that student's decision to form the intention to recycle is related to perceived moral obligation, past behaviour and inconvenience. In other words, students are more likely to form the intention to recycle if they personally feel recycling is the right thing to do, when they have prior experience with recycling on campus and lastly if recycling is convenient for them. At the same time, the attitude toward recycling, subjective norm, perceived behavioural control and knowledge do not significantly contribute.

Before rejecting the usefulness of the theory of planned behaviour and knowledge in influencing students' intention to recycle in the sample investigated a couple of things should be considered. First of all, the results should be interpreted with caution because of the relatively low sample size. A general rule for the sample size is that the more respondents participate in the survey the higher the explanatory power will be (Field, 2013). However, Green (1991) refutes this one for all approach to sample sizes. He argues that multiple regression needs to take into account the number of predictors and the effect size wanted to be achieved. Hence, he formulates a rule for the sample size when the fit of the overall model is tested (Green, 1991). In the study at hand 106 participants are needed to test the overall model and 111 participants are needed to test the contribution of each predictor individually. As a reminder, 114 students participated, which is close to the recommended sample size not leaving room for measurement errors. The relatively low sample size could be explained by the manner the questionnaire was distributed. The questionnaire was spread via social networks and the university e-mail. Distributing web survey bares the risk of "coverage error" i.e. not including people without internet access or in our population students without the social media website Facebook (Couper, 2001). In addition, students receive requests to participate in survey via social networks site regularly which can result in reluctance to participate in a survey, a phenomenon which Couper calls "oversurveying

effect" (2001, p.465). In order to reach students that do not regularly visit social networking sites follow up research should spread the questionnaire also via paper. Distributing a paper questionnaire has the advantage that students fill in the questionnaire at that moment in time, while an online questionnaire can be postponed to be filled in at a later point in time and then be forgotten. In addition, students who spent more time on campus either going to the library, visiting lectures or for other reasons would be included if a paper questionnaire is distributed on campus. On the negative side, distributing a paper questionnaire is more time and resource intense. Furthermore, the length of the questionnaire is also a factor that decides whether students are willing to participate (Porter, 2004). The questionnaire at hand consist of 45 questions, which might have discouraged students from participating or finishing the questionnaire.

Next to the sample size and measuring errors other reasons might explain why the results for the variables of the theory of planned behaviour and knowledge are not significant. To begin with, the survey was titled "Recycling at the UT" which might have resulted in sampling bias, or self-selection bias. Namely, students who are already interested in recycling and that have a positive opinion about recycling might have been more interested in participation, while students less interested did not take part. This could explain why attitude has no effect on student's intention to recycle. In other words, the sample of students studied is a homogenous group with the majority of respondents strongly or moderately agreeing with the statements regarding attitude. This could be caused by the sequence of the answer format from strongly agree to strongly disagree. Prior research has shown that participants are more likely to answer the option on the left side more often (Friedman, H. H., Herskovitz, P. J., & Pollack, 1994). Moreover, students might have been reluctant to state their true attitude about recycling, even though the questionnaire was anonymous, because they unconsciously feel that they should be in favour of recycling. The data at hand also shows that having a high attitude about recycling does not result

into actually forming the intention to recycle. With attention to subjective norm, previous studies have excluded subjective norm from the measurement because it did not significantly contribute to explaining intention to recycle. Upon this critique Armitage and Conner (2001) proposed to include a multi item measurement of subjective norm. In the study at hand, using a multi-item measurement did not lead to more significant results. Another explanation for the low contribution of subjective norm could be that recycling is not widely discussed among college students and therefore students do not feel obliged to recycle because of friends. On the contrary, perceived moral obligation significantly predicts students' intention to recycle. This finding indicates that even though students are not influenced by what their friends and family belief is the right thing to do they are guided by their own personal norms. In light of these findings it should be pointed out that most students move away from their parents and school friends once they go off to college. For this reason, students might be less influenced by their parents and friends than their own moral beliefs when it comes to their intention to recycle on campus. Furthermore, the theory of planned behaviour claims that people will be more likely to form the intention to recycle if perceived behavioural control is high. In the study at hand, perceived behavioural control does not influence whether students form the intention to recycle. Although this might be true, the data show that students have a different perception of perceived behavioural control on the campus. In other words, all answer options are almost represented in equal parts. Hence, perceived behavioural control might not have been adequately measured or students feel very differently about how many opportunities to recycle are plenty. For example, one student might feel one recycling station per building is enough while another student wants various bins per corridor and room. Moreover, it was hypothesized that the more knowledgeable a person is the more likely is she/he to form the recycling intention. Contrary to De Young (1989), Schultz, Oskamp, Mainieri's (1995) and Hornik et. al. (1995) we did not find a

relationship between knowledge and intention to recycling. This might be for two reasons. First of all, the articles listed have all been published years ago and nowadays recycling is more common. Still, knowledge was included in the study because it was assumed that even though recycling is common people do not know the specifics of recycling. Another explanation why no effect was found is that students are not aware of their level of knowledge. Hence, self-assessing knowledge might not bring valid results. Rather, knowledge should be measured by using an experimental setup. For example, participants could be asked to sort certain materials in the right bin and the number of rightful sorted materials could indicate the level of knowledge.

Students were given the opportunity to share their experience with recycling at other higher education institutes. A couple of students used this space to state their opinion on what is going wrong on the campus of the UT. The overall opinion reflected in these comments is that there are not enough opportunities to recycle at the UT. It would be interesting to further investigate student opinions on how to solve the problem or what kind of recycling facilities they would welcome. One hint is given that bins for recycling need to be placed in the lecture halls and not only in hall ways. Another respondent wishes to be able to separate more kinds of waste.

The remaining question is what the implications of the results are for the UT. The results show that students who have prior experience with recycling on campus are more likely to form the intention to recycle in the future. Moreover, students are guided by their own moral idea of whether recycling is morally right and are not influenced by friends. An apparently important factor is the inconvenience, or convenience, of recycling. While attitude about recycling and perceived behavioural control play a less important role. Thus the following recommendations are given to policy makers at the UT, or those responsible for the implementation or recycling schemes. Recycling should be made as convenient as possible. This includes providing plenty of recycling bins, in the hallways, lecture halls and all buildings. Recycling facilities should become

the norm and not the exception. As this research showed, if students have recycled before they will be more likely to have the intention to recycle in the future. Therefore, if plenty of opportunities are given students will become more adaptive and participative. In addition, it became apparent in the current section that students have their own ideas on what recycling facilities should look like. Therefore, it might be interesting to further investigate how UT students think about the design of further recycling facilities at the UT. This could happen by means of a committee that participates in the design of recycling schemes. In order to capture the UT's diversity it would be useful to draw a sample from students of all faculties as well as administrative- and research staff from all faculties.

6 CONCLUSION

The conclusion starts by analysing if the methodological approach to respond to the main research question turned out to be reliable. Specifically, we discuss in this section about the methods and findings used to assess the hypotheses driving this research. To elaborate on the arguments, some of the findings highlighted are here mentioned, also to describe the main limitations identified. At last, recommendations for future research are discussed in this section.

As a reminder, this study is guided by the following research question: *To what extent is UT students' behavioural intention to recycle influenced by their attitude to recycling, subjective norm, perceived behavioural control, perceived moral obligation, past behaviour, knowledge and inconvenience?* Correspondingly, seven hypotheses were formulated, which are:

> H_1: Students who hold positive attitudes toward recycling are more likely to have the intention to recycle.
>
> H_2: Students who feel high subjective norm to recycle are more likely to have the intention to recycle.
>
> H_3: Students who perceive high behavioural control to recycle are more likely to have the intention to recycle.

H_4: Students who have recycled in the past are more likely to have the intention to recycle.

H_5: Students who belief recycling is morally right are more likely to form behavioural intention to recycle.

H_6: Students who have knowledge about recycling are more likely to have the intention to recycle.

H_7: Students who perceive recycling as inconvenient are less likely to have the intention to recycle.

In order to test the hypotheses an online questionnaire was distributed via e-mail and social networking websites. Each variable was measured using five to eight statements and respondents could indicate their agreement on a seven- point Likert scale. Using an online questionnaire might have impacted the results for several reasons. First of all, students who do not frequently check their university e-mail or students not belonging to social networking website might not have been reached. Moreover, some of the concepts might have been too complex to be measured by means of a self-assessed online questionnaire. For instance, most participants agreed that they decree over enough knowledge to recycle. However, it is not clear if the questionnaire could answer whether participants understood the complexity of the term "knowledge". For example, students might be used to recycle and think that they know how to recycle, but do not decree over specific knowledge how to recycle. This could show in a situation in which they are asked whether a milk carton belongs to a bin for paper or in the general bin. In addition, Ajzen (1991) intended with his theory of planned behaviour that the behaviour under study needs to be as much specific as possible. In retrospective, the questionnaire might have resulted in more significant results if the behaviour under study would have been more specific. In other words, instead of asking about general attitude about recycling the study might have resulted in more significant findings if the attitude about different materials would have been assessed. All things considered, the following section will give recommendations for future research.

RECOMMENDATIONS FOR FUTURE RESEARCH

In the Conclusion section various research limitations were discussed. First of all, future research should try to reach a wider population by interviewing students on campus by means of a paper-based questionnaire. Given the findings for the conceptual model, it might be interesting to place future research in a different context. For example, the questionnaire could be distributed to teaching and administrative staff at the UT. Or, the questionnaire could be distributed in a different city or country in order to have a regional representation of students' attitudes towards recycling. This can be another way to test the usefulness of our conceptual model. Furthermore, the questionnaire should be more specific. Instead of focusing on recycling in general the focus should be put on specific materials. For example, it should differentiate between intention to recycle paper or plastic. In addition, the questionnaire asked about the living situation of students, e.g. whether they live on or off campus. However, this information was not used in the further analysis. Future research could investigate to what extent students' intention to recycle is different for students who live on campus and off campus. This would require a more careful conceptualization of living on campus and at home. Ultimately, it would be interesting to test actual recycling behaviour by means of an observational study. This type of study can provide insights about the participants' understandings of the variables under study. An example of an observational on the campus of the UT would be to observe the recycling behaviour of students living on campus.

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Zuur, A. F., Ieno, E. N. & Elphick, C. S. (2010). A protocol for data exploration to avoid common statistical problems. *Methods in Ecology and Evolution*, *1*, 3–14.

APPENDIX A DESCRIPTIVE STATISTICS

Figure 2 *Distribution of gender*

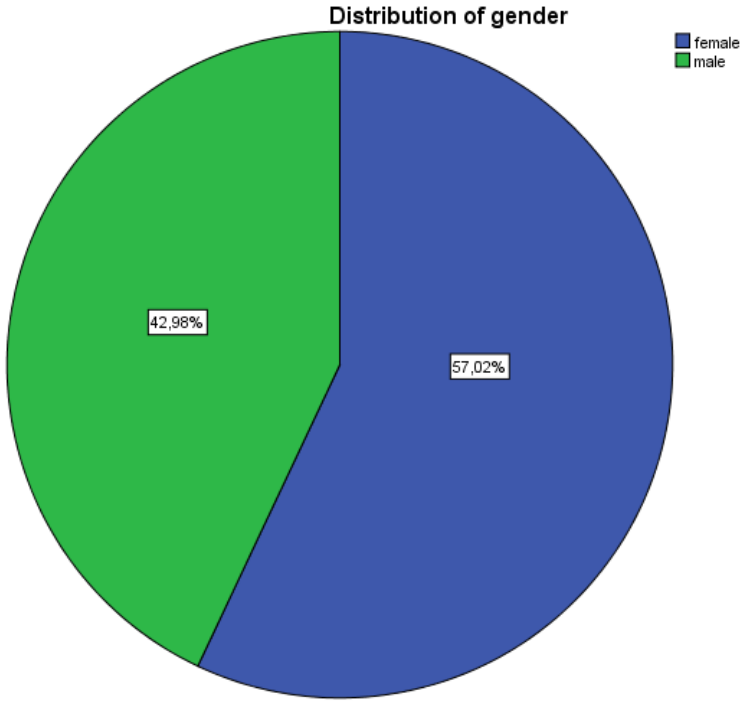


Figure 3 *Distribution of age*

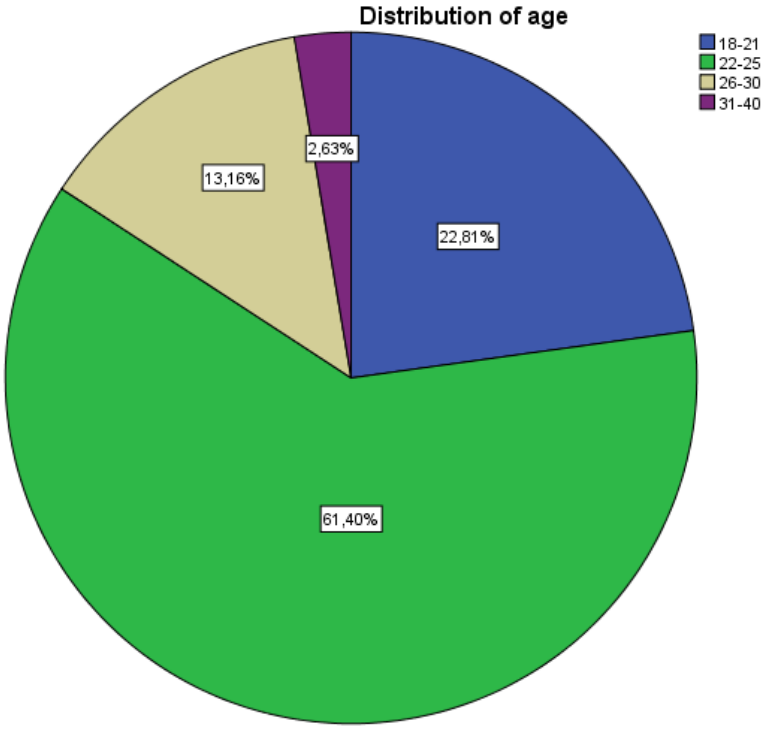


Figure 4 *Distribution of living situation*

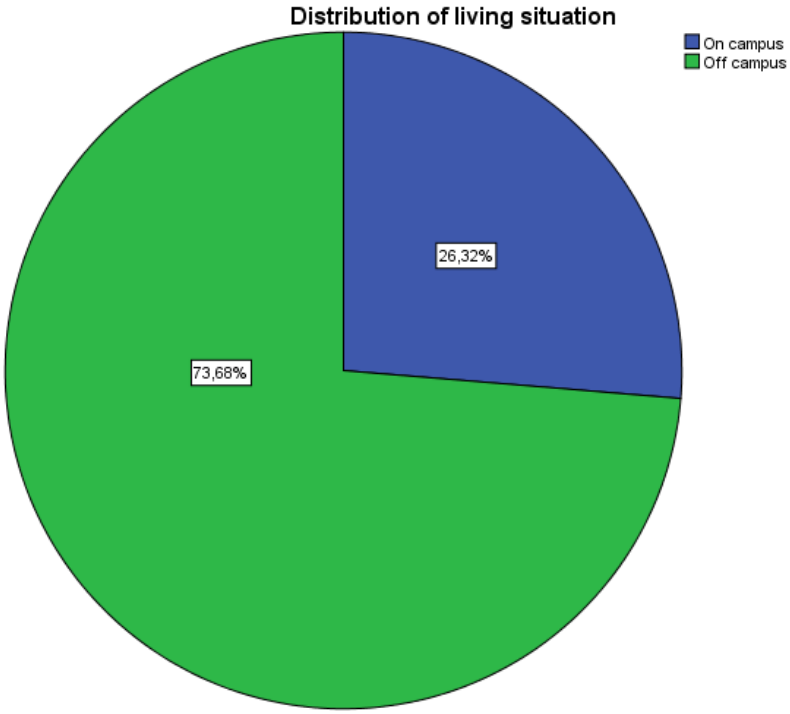


Figure 5 *Distribution of faculty affiliation*

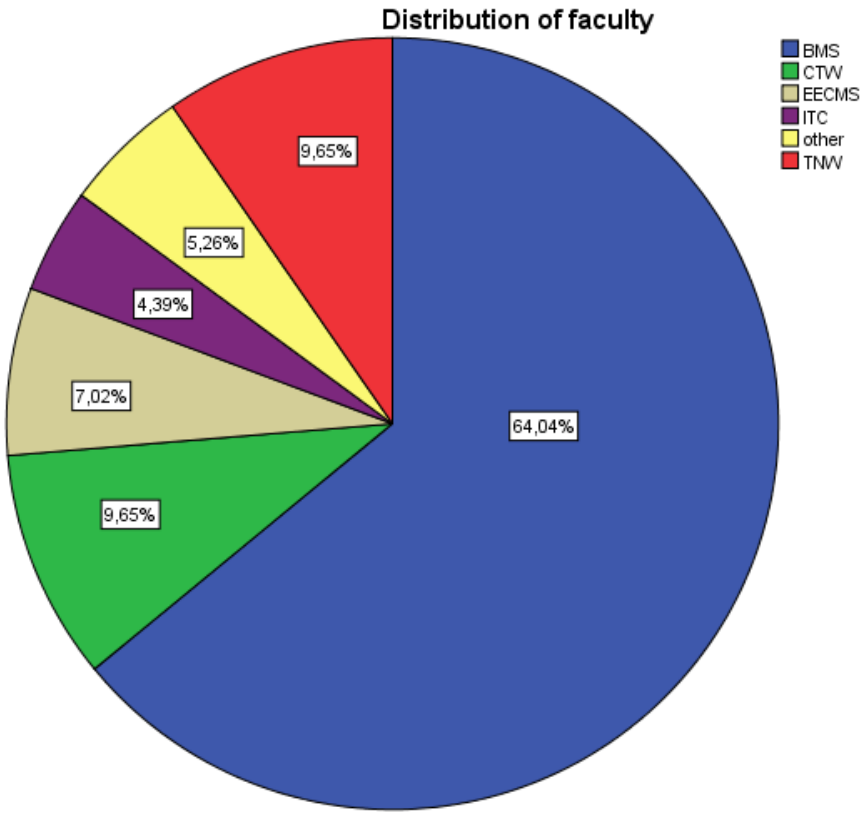
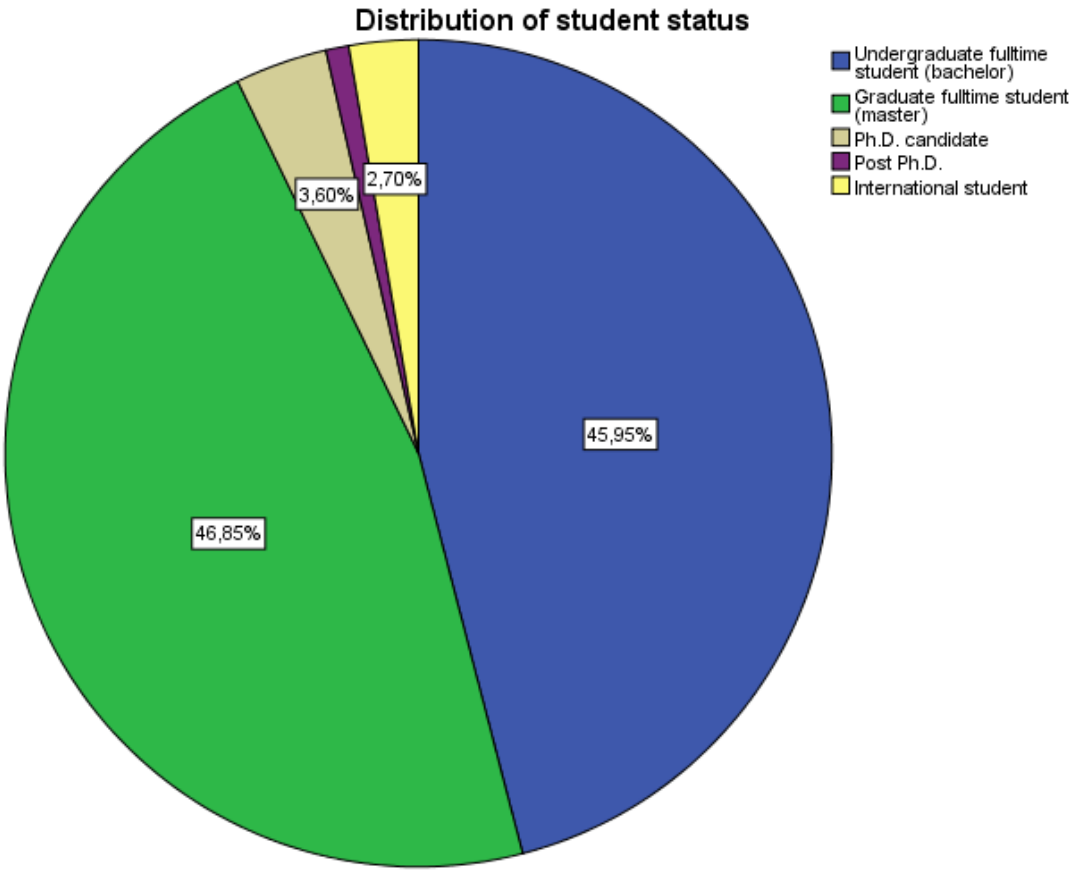


Figure 6 *Distribution of student status*



APPENDIX B DISTRIBUTION OF ANSWERS

Table 4 *Attiude*

	Strongly agree	Moderately agree	Slightly agree	Neutral	Slightly disagree	Moderately disagree	Strongly disagree
Recycling waste is good	71,1	24,6	0,9	0	0	3,5	0
Recycling waste is useful	67,5	25,4	0	0,9	0,9	5,3	0
Recycling waste is rewarding	25,4	37,7	2,6	6,1	13,2	13,2	1,8
Recycling waste is responsible	58,8	32,5	0	2,6	0,9	5,3	0
I am not interested in the idea of recycling waste	1,8	0	6,1	11,4	31,6	48,2	0,9
My feelings toward recycling are favourable	41,2	35,1	0,9	1,8	9,6	9,6	1,8
I don't think recycling waste has many positive effects on the environment	1,8	3,5	4,4	5,3	35,1	50	0
I make great personal effort to recycle as much as possible	11,4	2,6	9,6	6,1	5,3	32,5	32,5

Table 5 Subjective norm

	Strongly agree	Moderately agree	Slightly agree	Neutral	Slightly disagree	Moderately disagree	Strongly disagree
Most people who are important to me think that I should recycle my waste	7,9	23,7	27,2	23,7	8,8	7,0	1,8
Most people who are important to me would approve of me recycling my waste	22,8	41,2	26,3	8,8	0	,9	0
Most people who are important to me want me to engage in recycling	7,9	17,5	30,7	21,1	9,6	10,5	2,6
Most of my family think that recycling is a good thing to do	25,4	38,6	21,1	8,8	2,6	3,5	0
It is expected of me to recycle my waste at the University of Twente each day in the forthcoming month	8,8	14,9	10,5	32,5	7,0	13,2	13,2

If more people would recycle I would also recycle more	21,1	26,3	19,3	15,8	8,8	7,0	1,8

Table 6 *Perceived behavioural control*

	Strongly agree	Moderately agree	Slightly agree	Neutral	Slightly disagree	Moderately disagree	Strongly disagree
There are plenty of opportunities for me to engage in recycling at the University of Twente	6,1	15,8	16,7	14,0	14,0	21,9	11,4
It will be easy for me to engage in recycling on campus during the next month	8,8	13,2	14,0	16,7	21,1	16,7	9,6
Recycling is easy	13,2	22,8	21,1	14,0	20,2	7,0	1,8
The University of Twente provides satisfactory resources for recycling	6,1	11,4	18,4	16,7	19,3	16,7	11,4
I know where to take my waste for recycling at the University of Twente	10,5	10,5	14,0	9,6	14,9	20,2	15,8

Table 7 *Knowledge*

	Strongly agree	Moderately agree	Slightly agree	Neutral	Slightly disagree	Moderately disagree	Strongly disagree
I would recycle more waste if I had more information on recycling waste	23,7	24,6	27,2	11,4	5,3	6,1	1,8
More information about how to recycle waste should be available at the University of Twente	33,3	28,9	16,7	12,3	5,3	2,6	,9
I know how to recycle my waste	21,9	32,5	27,2	4,4	10,5	1,8	1,8

If I knew what was happening to the recyclables after I dispose them, I would recycle more often	23,7	30,7	16,7	17,5	4,4	3,5	3,5
There is little information of recycling at the University of Twente	25,4	26,3	21,1	19,3	6,1	,9	,9

Table 8 *Inconvenience*

	Strongly agree	Moderately agree	Slightly agree	Neutral	Slightly disagree	Moderately disagree	Strongly disagree
I don't have time to recycle	15,8	22,8	26,3	13,2	18,4	2,6	,9
Recycling at the University of Twente is inconvenient	6,1	14,0	11,4	28,1	20,2	14,0	6,1
Recycling at the University of Twente is too complicated	6,1	17,5	17,5	26,3	14,0	12,3	6,1
Recycling at the University of Twente is too much trouble	7,9	15,8	14,9	22,8	21,1	9,6	7,9
It is convenient for me to recycle at the University of Twente	7,0	12,3	14,0	27,2	16,7	15,8	7,0
Recycling takes up too much space at home	6,1	17,5	18,4	14,0	25,4	12,3	6,1

Table 9 *Recycling behavior*

	Always	Very frequently	Frequently	Neutral	Rarely	Very rarely	Never
How frequently do you recycle your waste at the University of Twente?	3,5	21,1	27,2	15,8	11,4	5,3	15,8
How frequently do you recycle your waste at the home?	16,7	34,2	27,2	7,9	4,4	4,4	5,3

Table 10 *Recycling intention*

	Extremely likely	Very likely	Somewhat likely	Neutral	Somewhat unlikely	Very unlikely	Extremely unlikely

How likely are you to recycle your waste at the University of Twente in the next four weeks	10,5	22,8	27,2	12,3	12,3	10,5	4,4
How likely are you to recycle your waste at home in the next four weeks	25,4	32,5	22,8	6,1	4,4	6,1	2,6
I intend to recycle my waste at the University of Twente every day in the forthcoming month	8,8	27,2	22,8	13,2	9,6	11,4	7,0
I intend to recycle my waste at home every day in the forthcoming month	19,3	36,0	22,8	7,0	3,5	7,0	4,4
I will try to recycle my waste at the University of Twente each day in the forthcoming month	13,2	28,1	21,1	14,9	6,1	9,6	7,0
I will try to recycle my waste at home each day in the forthcoming month	21,1	39,5	18,4	6,1	5,3	6,1	3,5
I plan to recycle my waste at the University of Twente each day in the forthcoming month	8,8	27,2	21,1	13,2	11,4	10,5	7,9
I plan to recycle my waste at home each day in the forthcoming month	21,1	36,0	17,5	12,3	2,6	7,0	3,5

Table 11 *Past behavior*

	Always	Very frequently	Frequently	Neutral	Rarely	Very rarely	Never
In the past three month how frequently did you recycle your waste at the University of Twente	2,6	22,8	24,6	10,5	22,8	9,6	7,0
In the past three month how frequently did you recycle your waste at home	12,3	35,1	30,7	4,4	7,9	5,3	4,4

APPENDIX C CORRELATIONS

Figure 7 *Table of correlations*

Correlations

		Intent	AttitudeCorr	SubjectiveNorm	PercBehavContr	PercMorOblig	PastBehavior	Knowledge	Inconvenience
Pearson Correlation	Intent	1,000	,337	,478	,590	,404	,733	,146	,519
	AttitudeCorr	,337	1,000	,606	,154	,765	,103	,513	,101
	SubjectiveNorm	,478	,606	1,000	,325	,682	,334	,495	,130
	PercBehavContr	,590	,154	,325	1,000	,139	,661	-,121	,590
	PercMorOblig	,404	,765	,682	,139	1,000	,125	,605	,132
	PastBehavior	,733	,103	,334	,661	,125	1,000	-,037	,444
	Knowledge	,146	,513	,495	-,121	,605	-,037	1,000	-,199
	Inconvenience	,519	,101	,130	,590	,132	,444	-,199	1,000
Sig. (1-tailed)	Intent	.	,000	,000	,000	,000	,000	,061	,000
	AttitudeCorr	,000	.	,000	,051	,000	,137	,000	,141
	SubjectiveNorm	,000	,000	.	,000	,000	,000	,000	,083
	PercBehavContr	,000	,051	,000	.	,070	,000	,099	,000
	PercMorOblig	,000	,000	,000	,070	.	,093	,000	,080
	PastBehavior	,000	,137	,000	,000	,093	.	,348	,000
	Knowledge	,061	,000	,000	,099	,000	,348	.	,017
	Inconvenience	,000	,141	,083	,000	,080	,000	,017	.
N	Intent	114	114	114	114	114	114	114	114
	AttitudeCorr	114	114	114	114	114	114	114	114
	SubjectiveNorm	114	114	114	114	114	114	114	114
	PercBehavContr	114	114	114	114	114	114	114	114
	PercMorOblig	114	114	114	114	114	114	114	114
	PastBehavior	114	114	114	114	114	114	114	114
	Knowledge	114	114	114	114	114	114	114	114
	Inconvenience	114	114	114	114	114	114	114	114

APPENDIX D STATISTICAL ASSUMPTIONS

Figure 8 *Residual plot intention aganist Attitude*

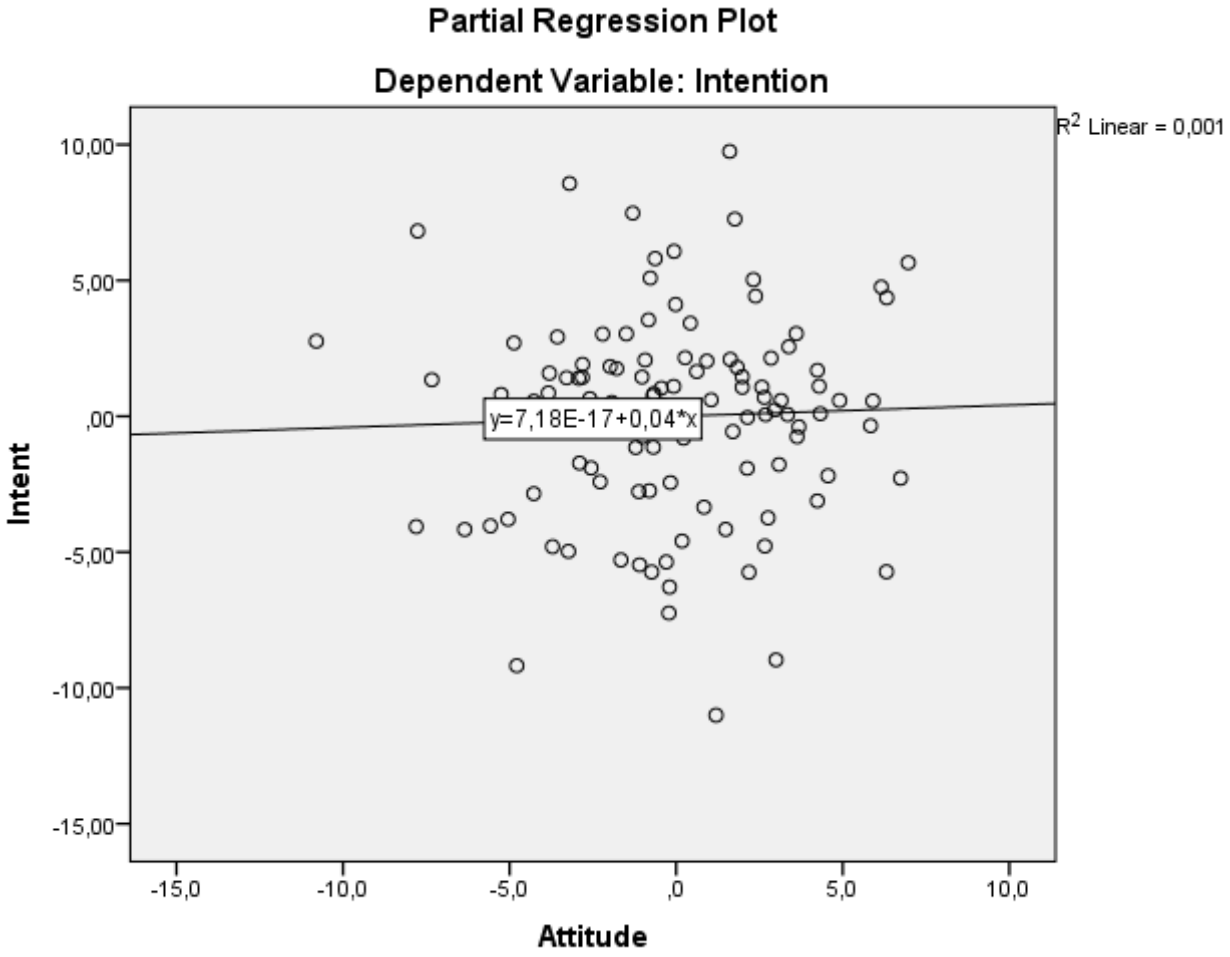


Figure 9 *Residual plot intention against subjective norm*

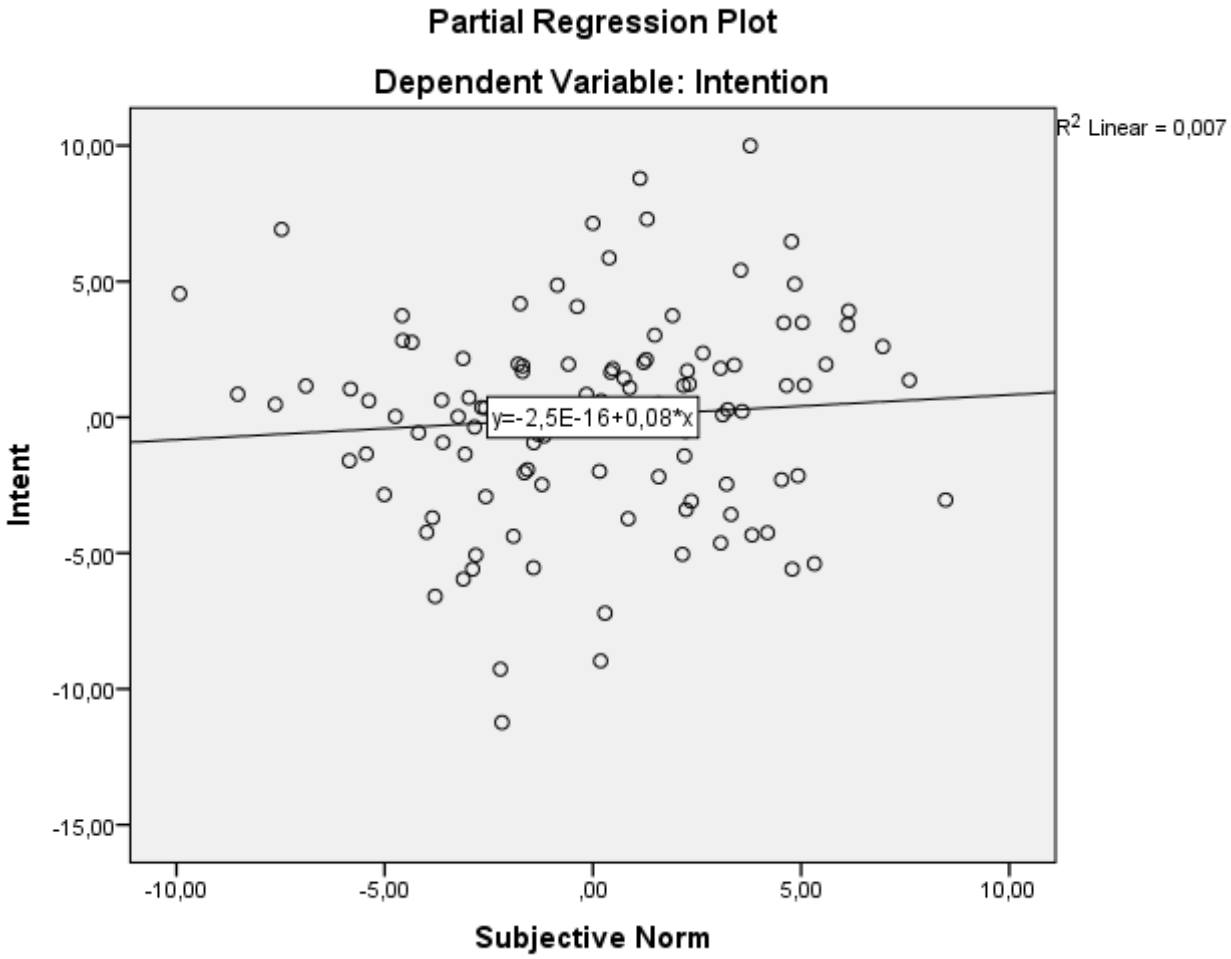


Figure 10 *Residual plot intention against perceived behavioural control*

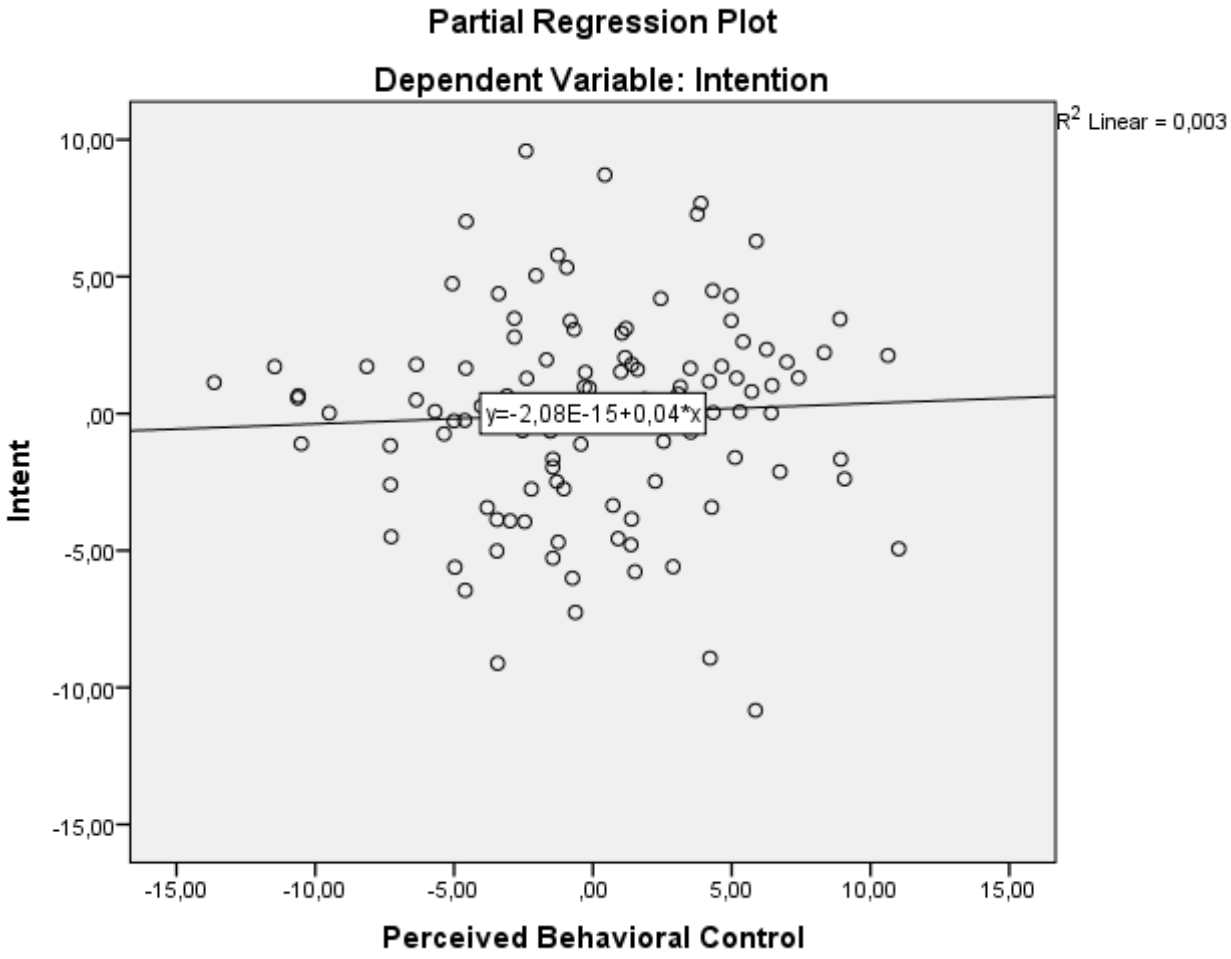


Figure 11 *Residual plot intention against perceived moral obligation*

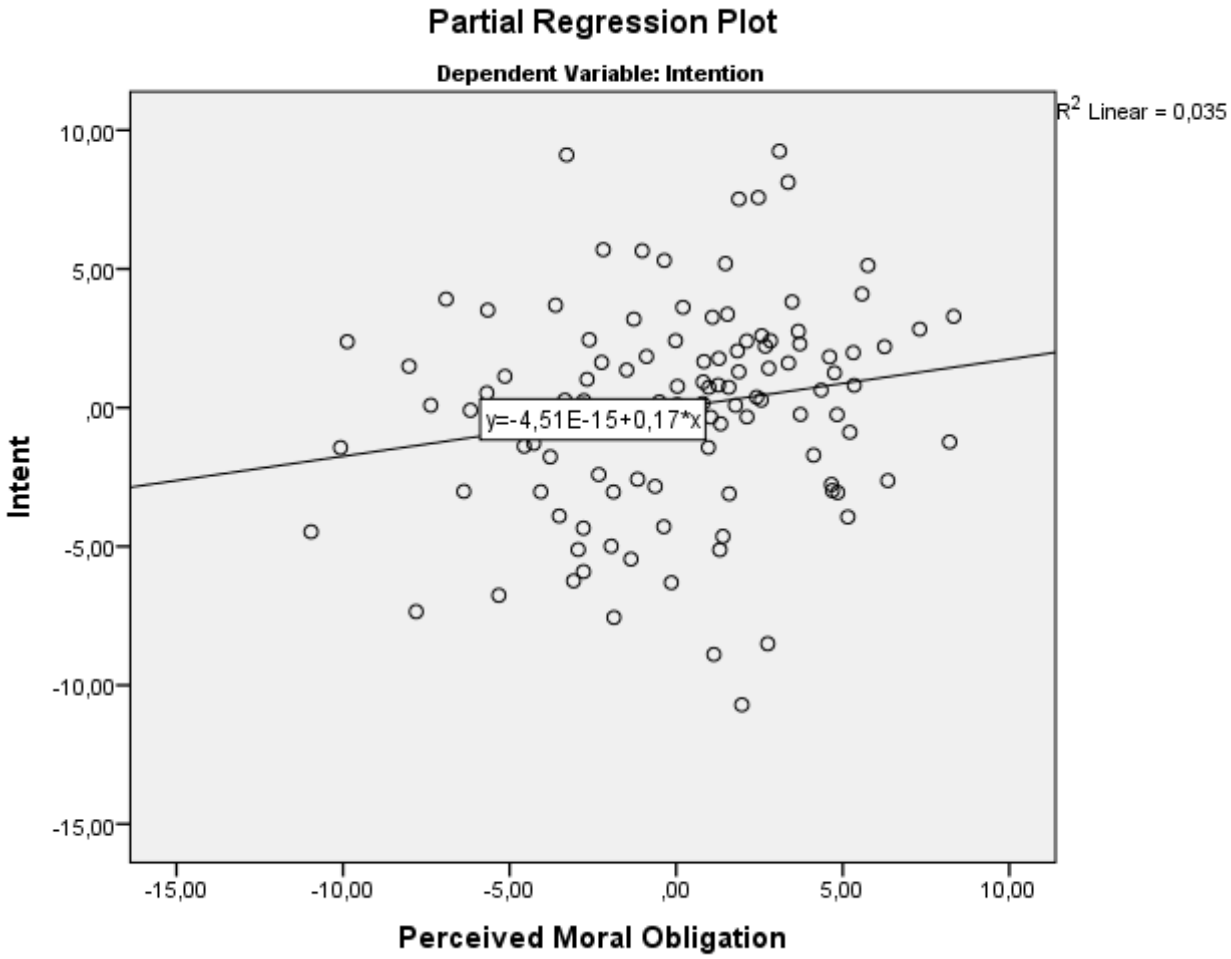


Figure 12 *Residual plot intention against past behaviour*

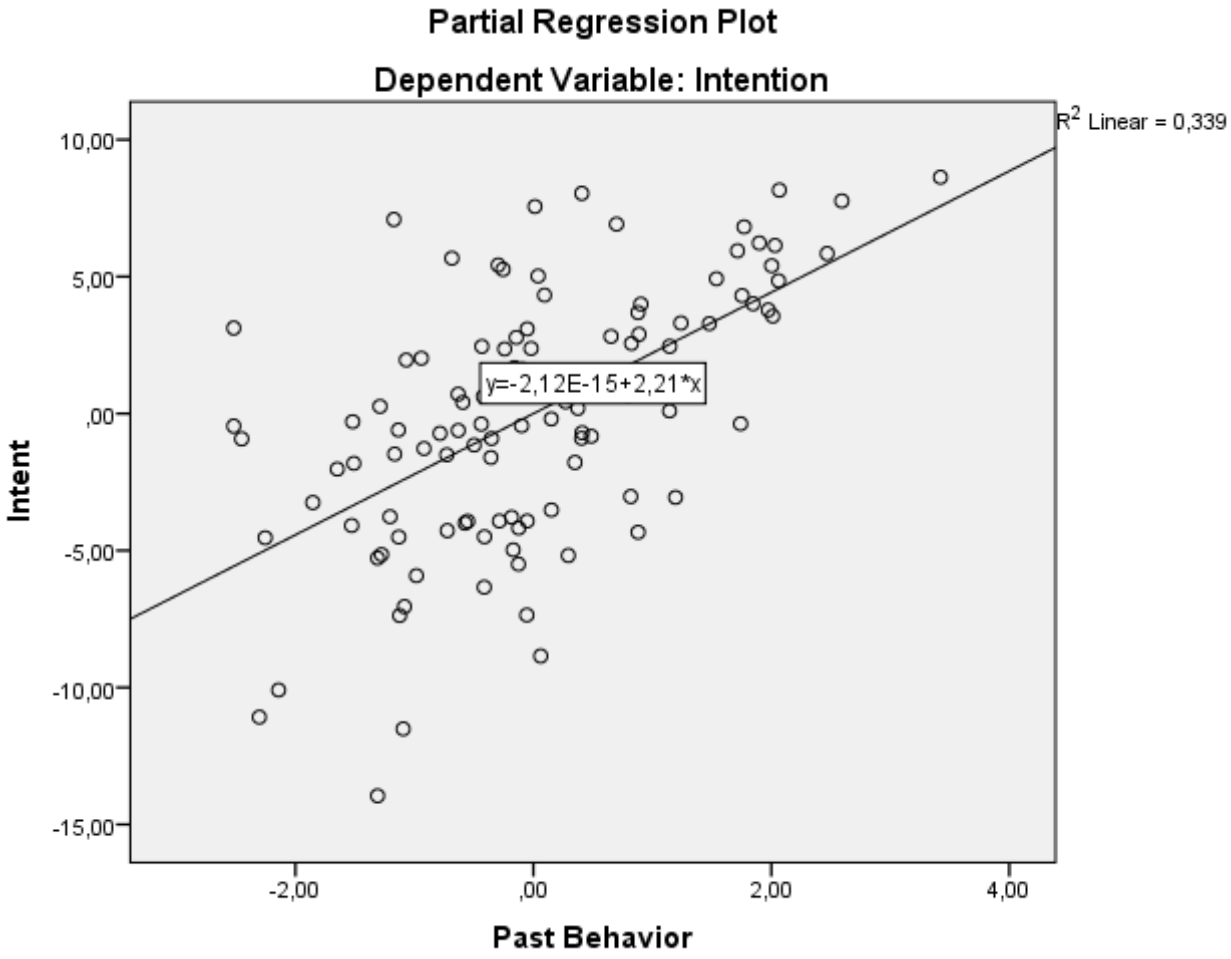


Figure 13 *Residual plot intention against knowledge*

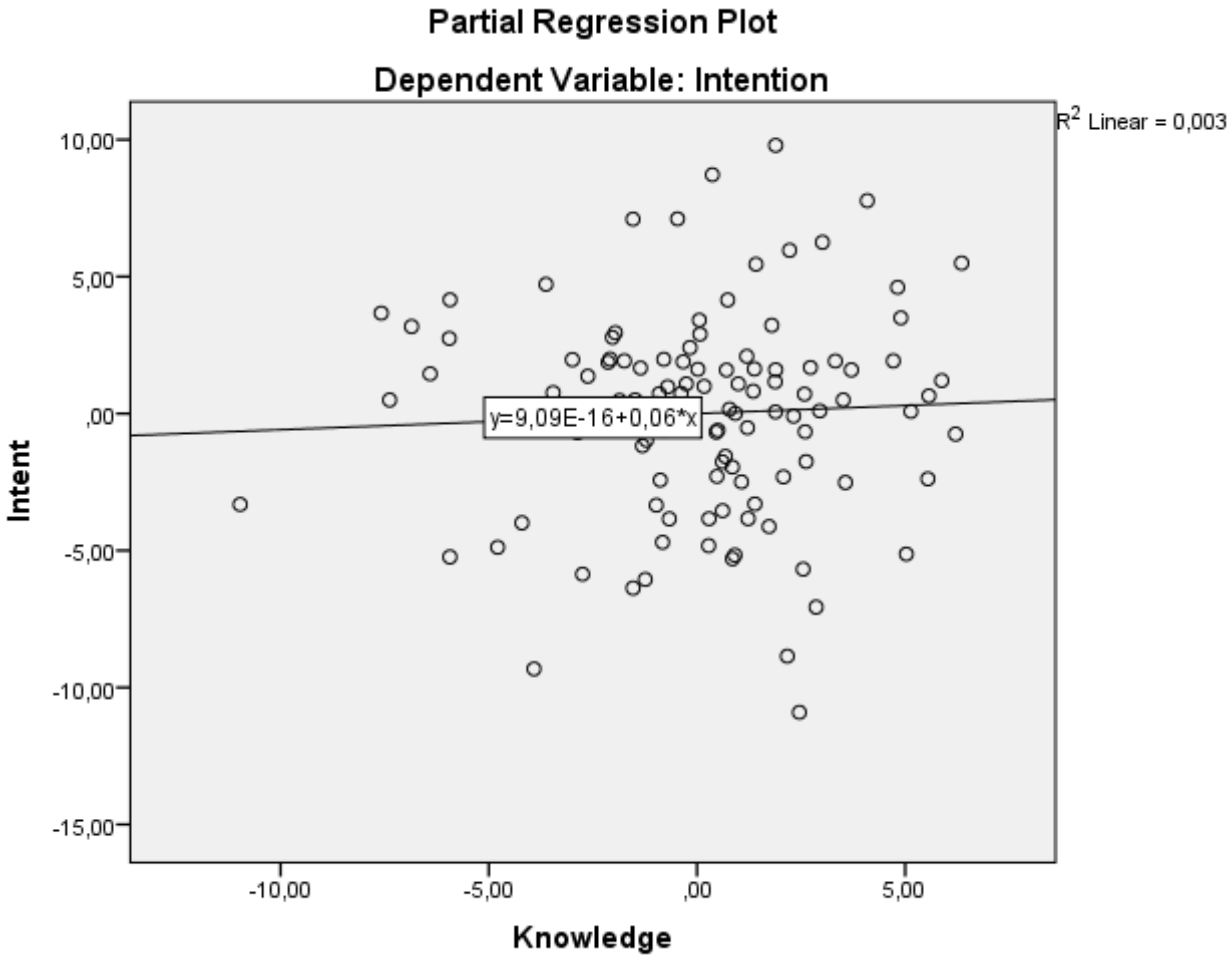


Figure 14 *Residual plot intention against Inconvenience*

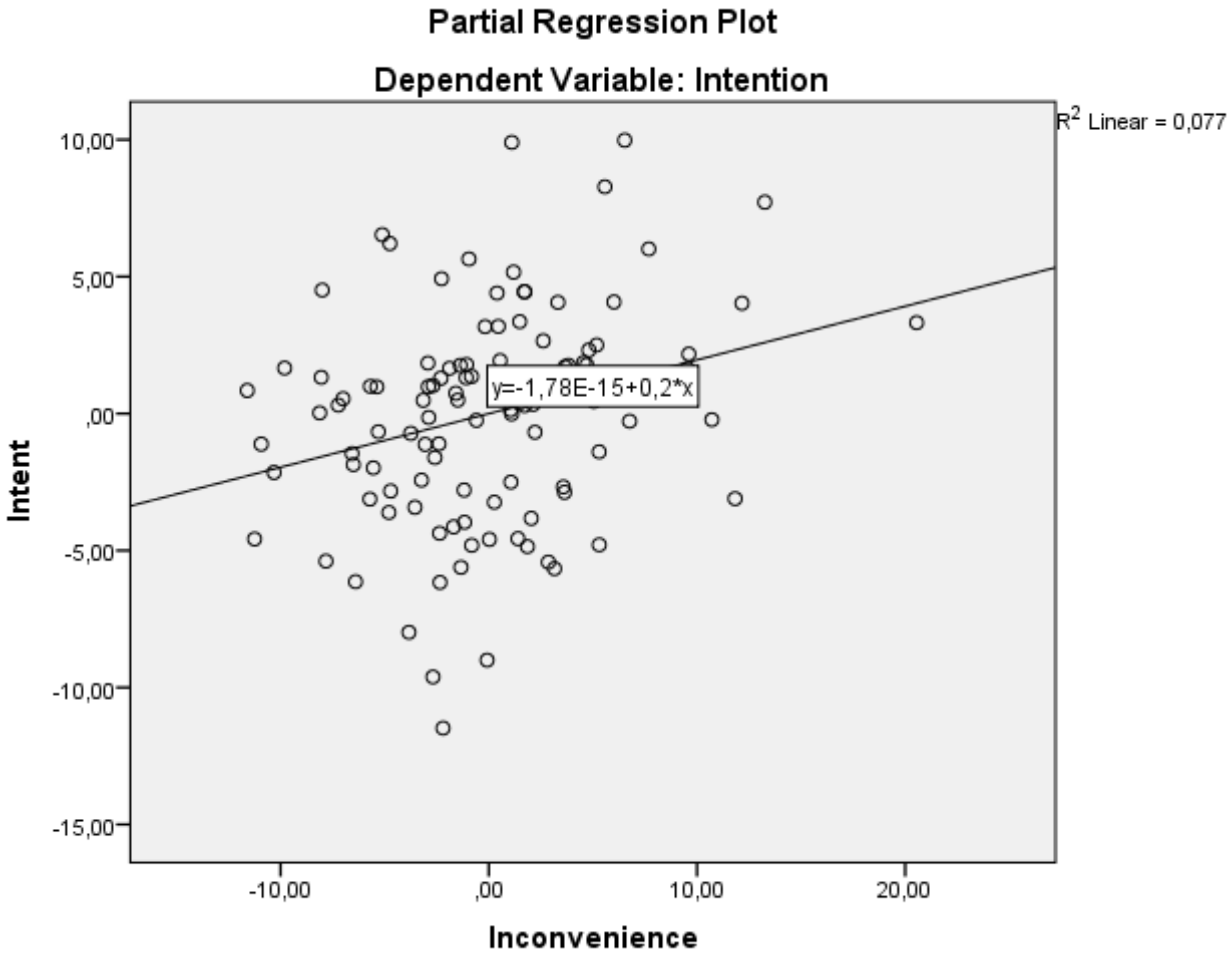


Figure 15 *Boxplot attitude*

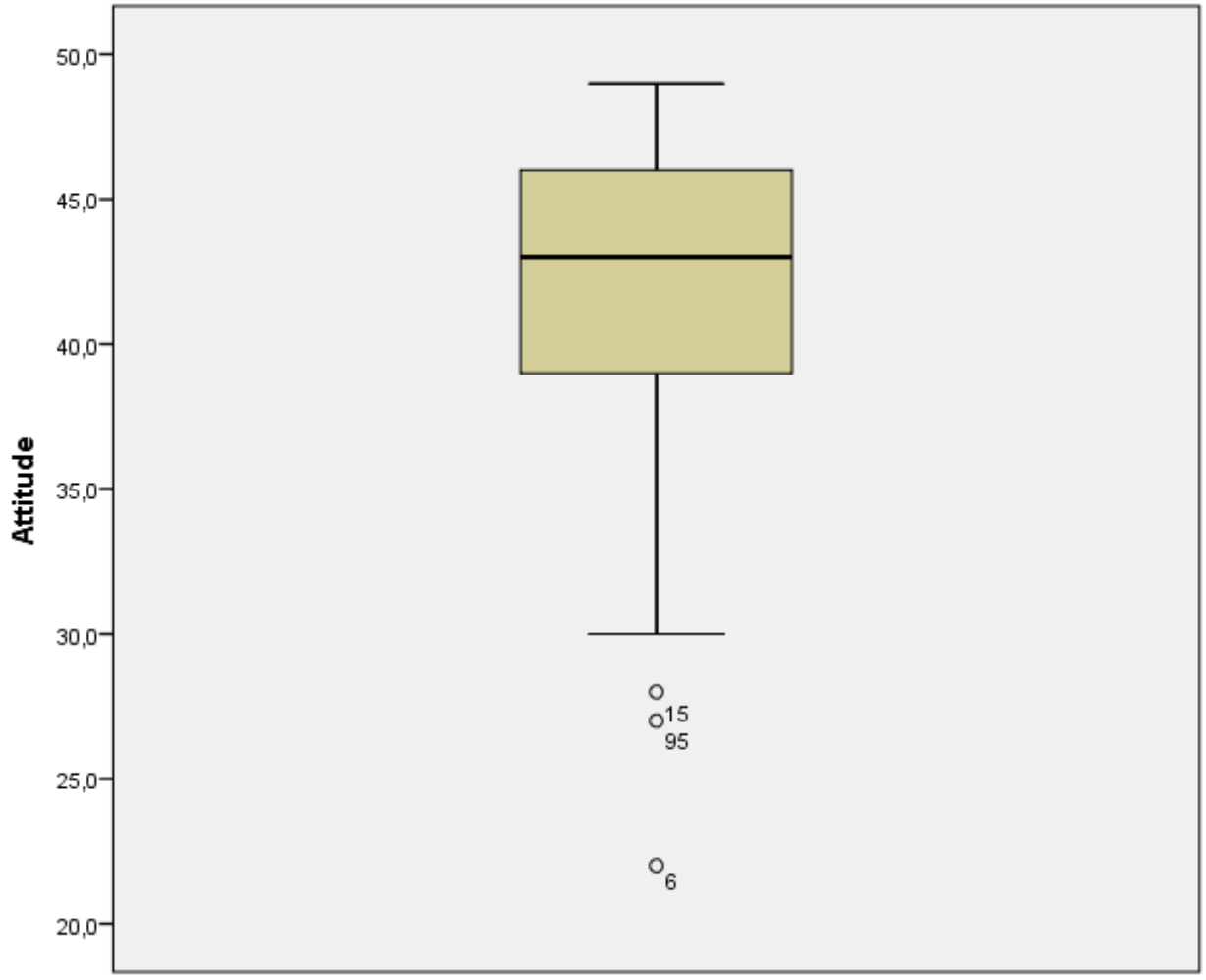


Figure 16 *Boxplot subjective norm*

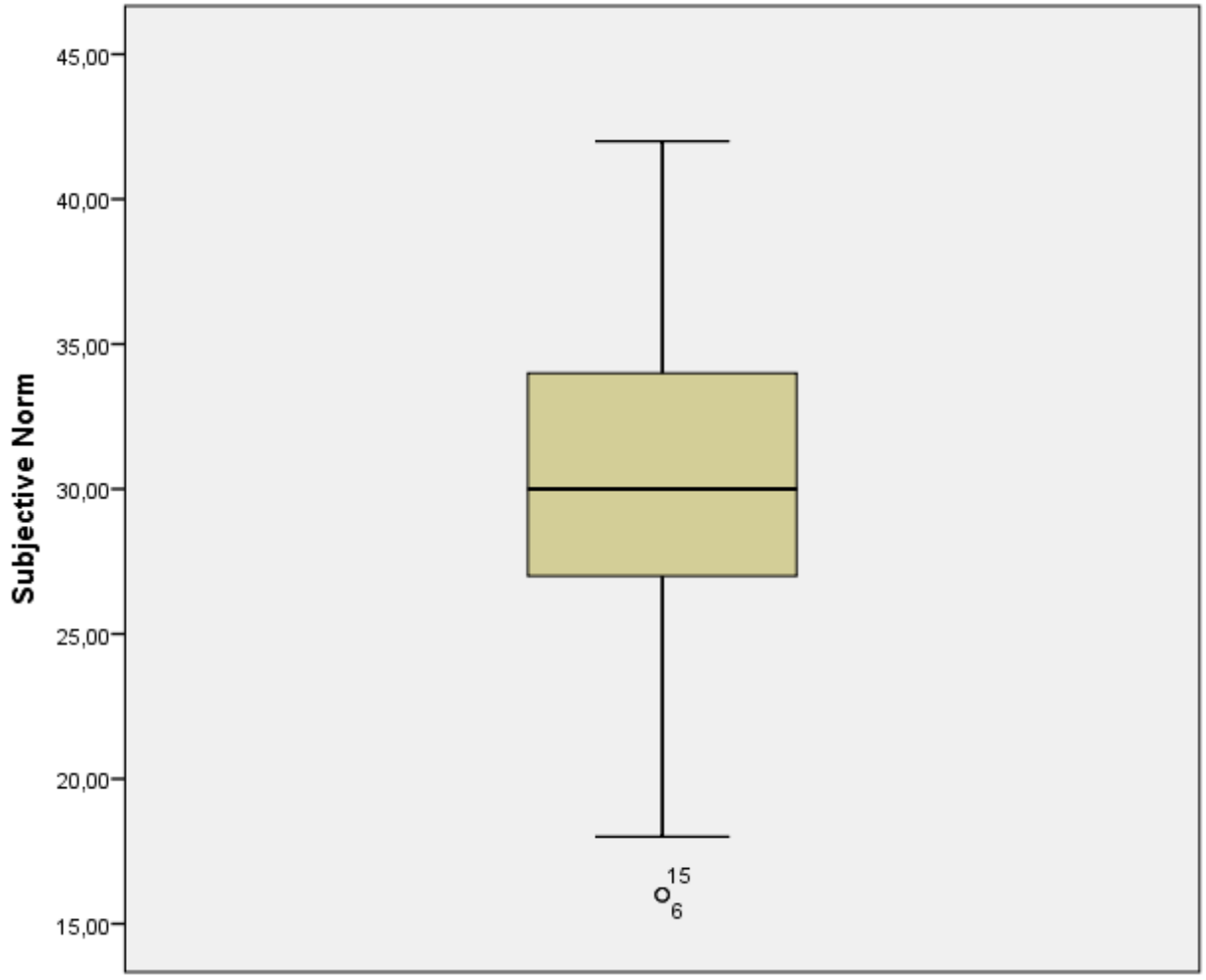


Figure 17 *Boxplot perceived behavioural control*

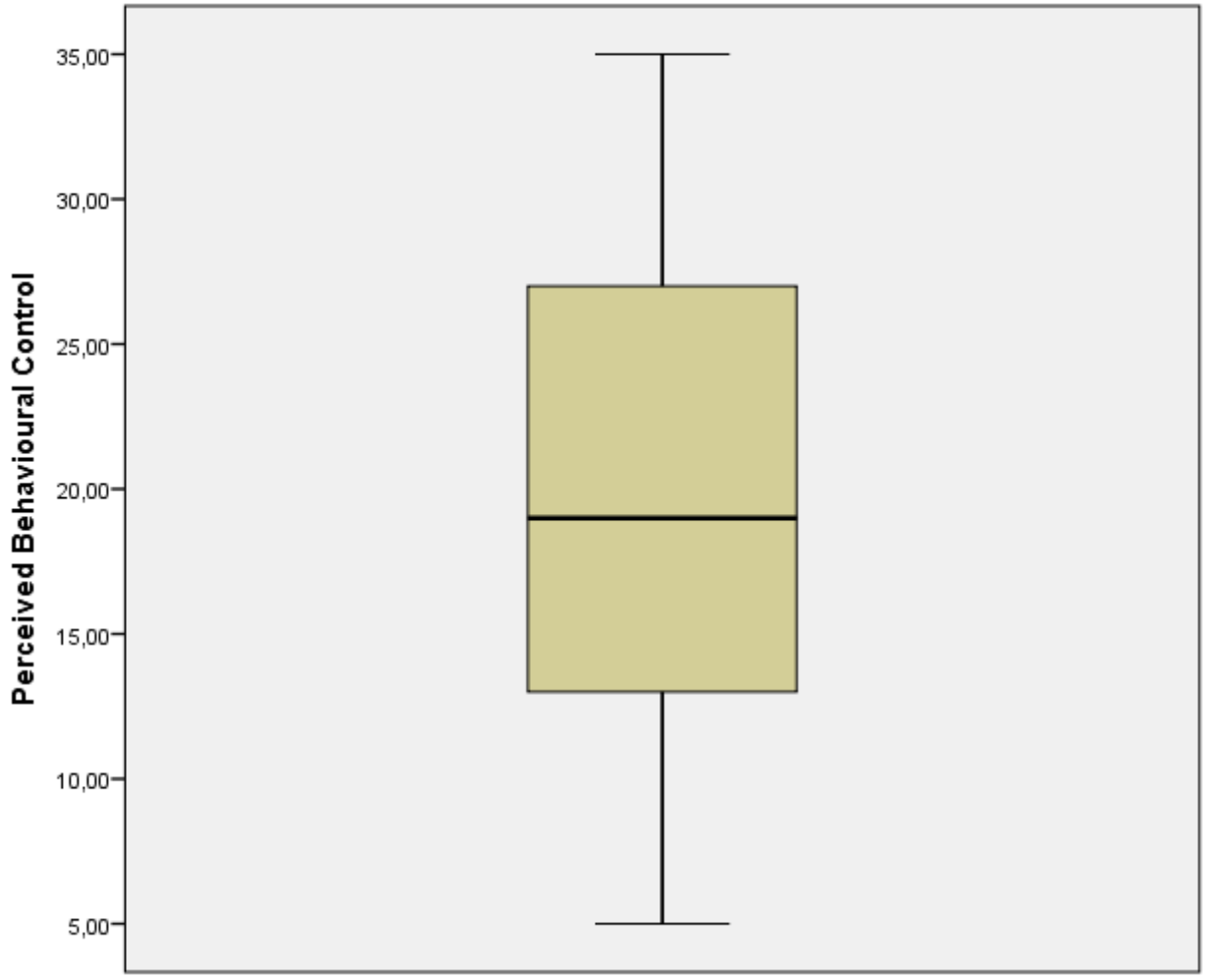


Figure 18 *Boxplot perceived moral obligation*

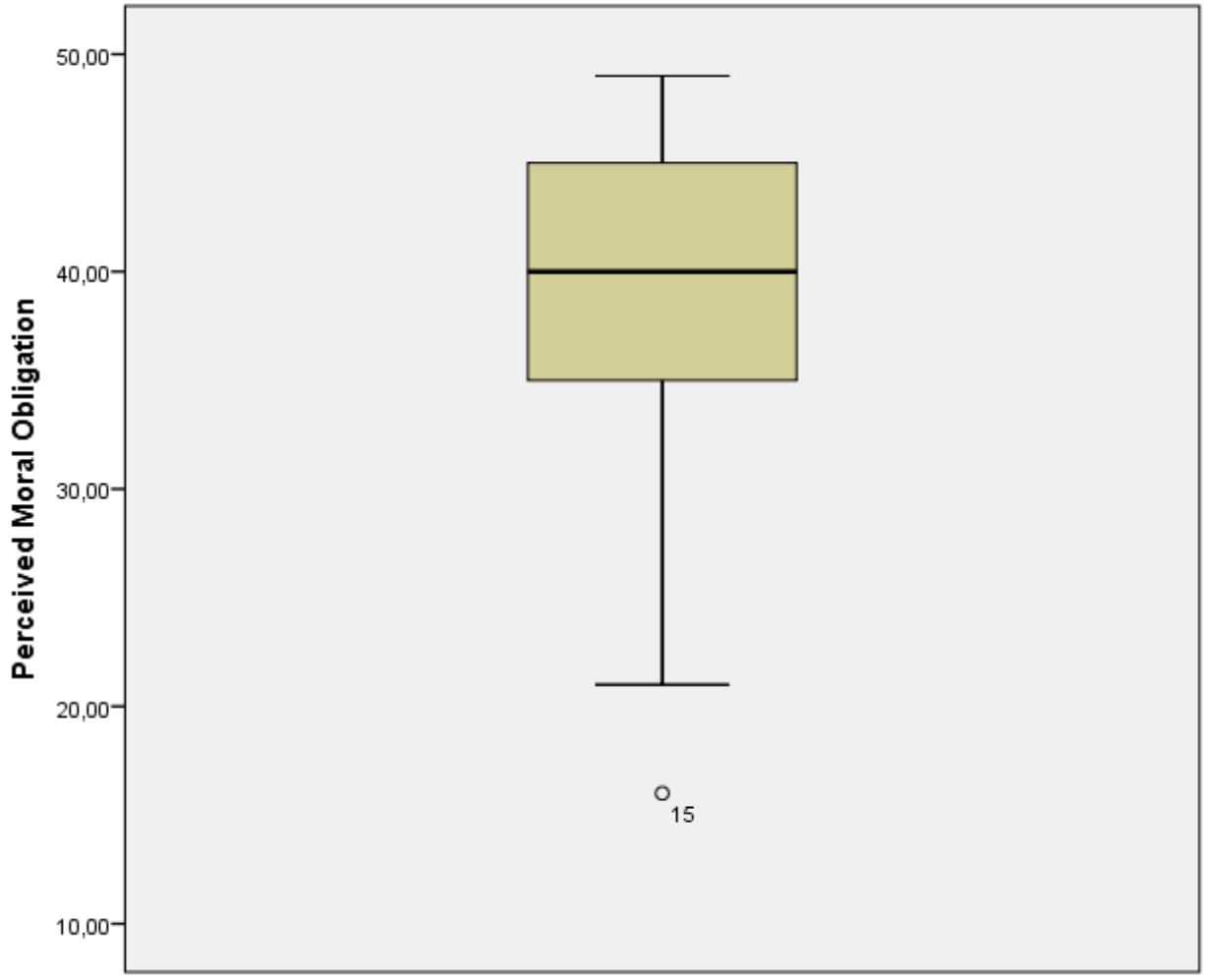


Figure 19 *Boxplot knowledge*

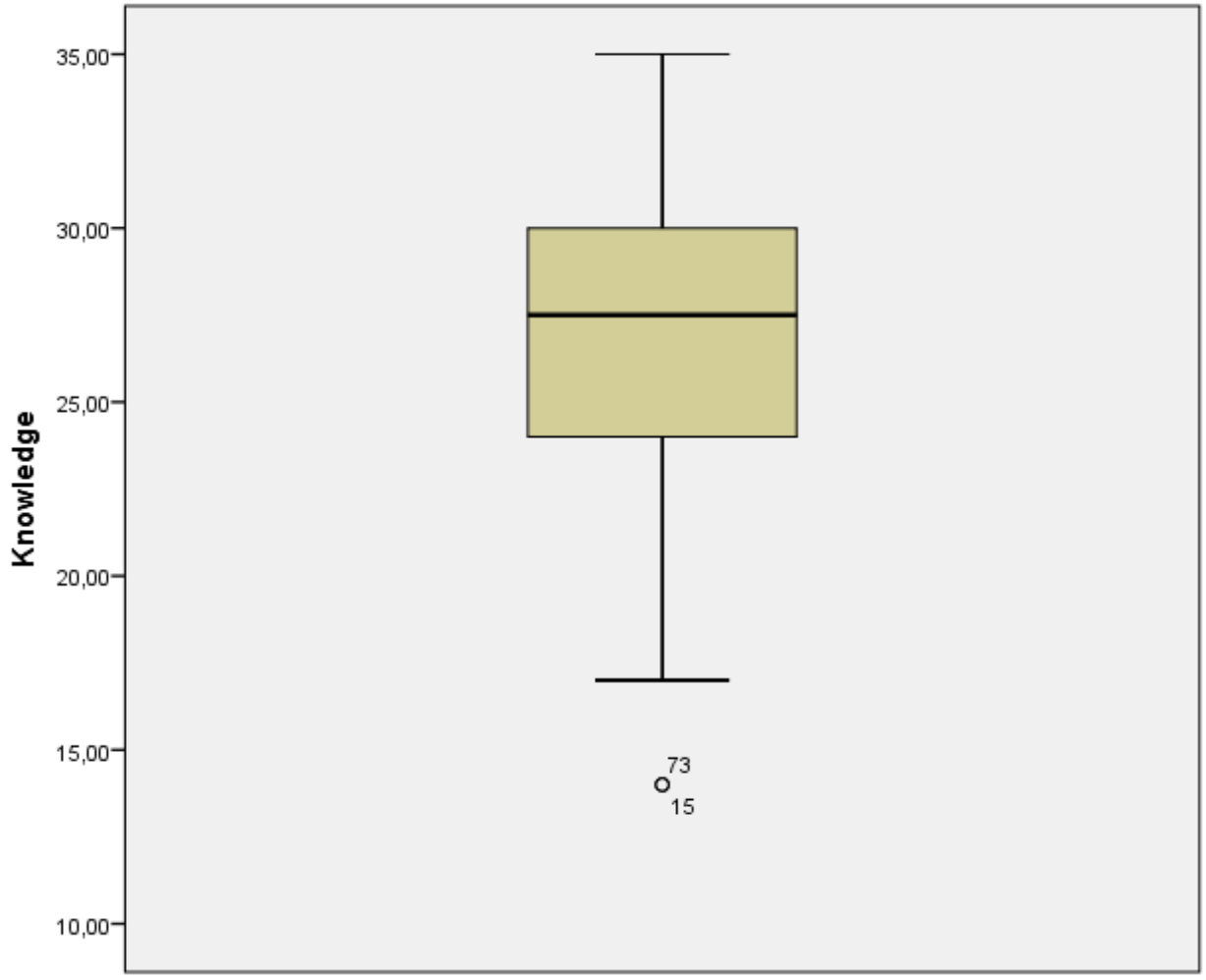


Figure 20 *Boxplot inconvenience*

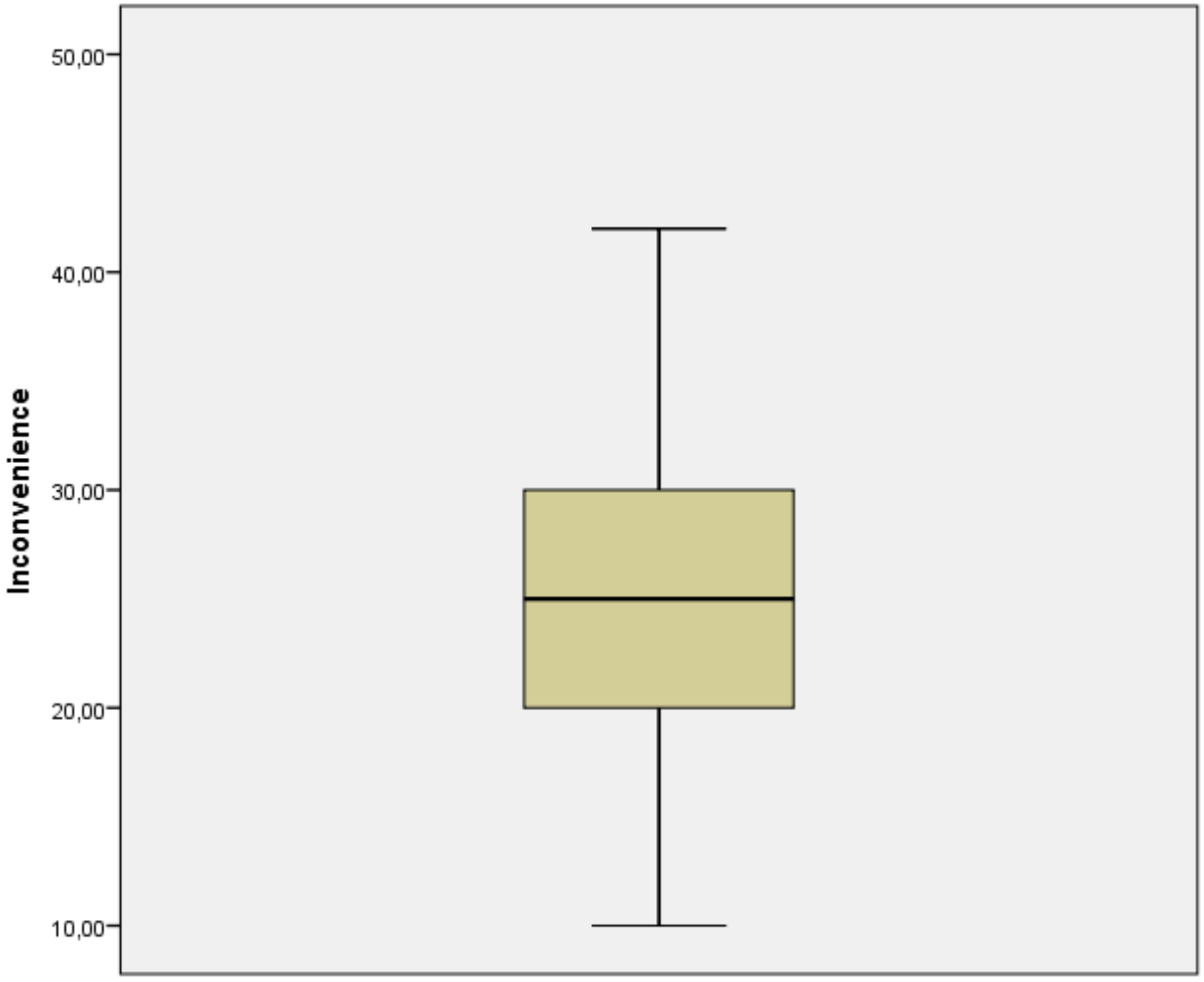


Figure 21 *Histogram normal distribution*

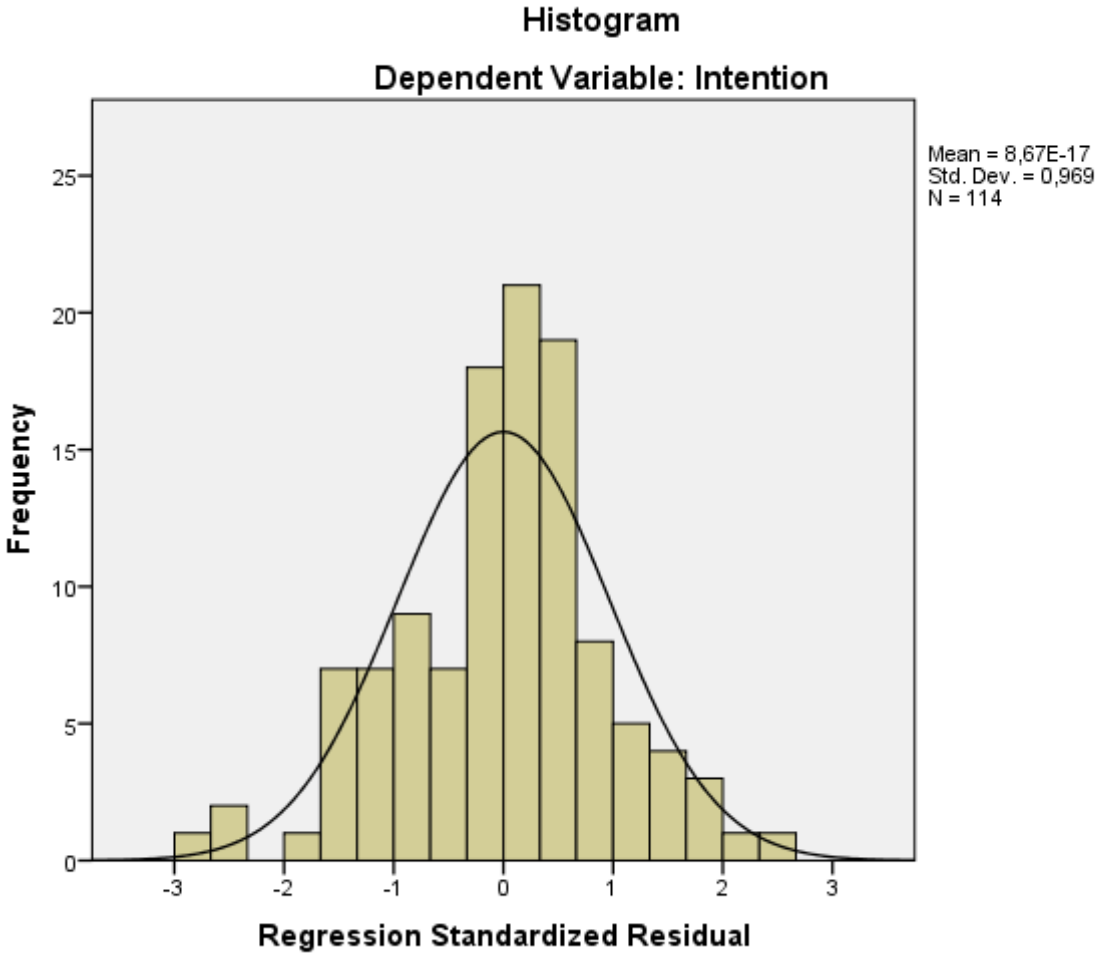
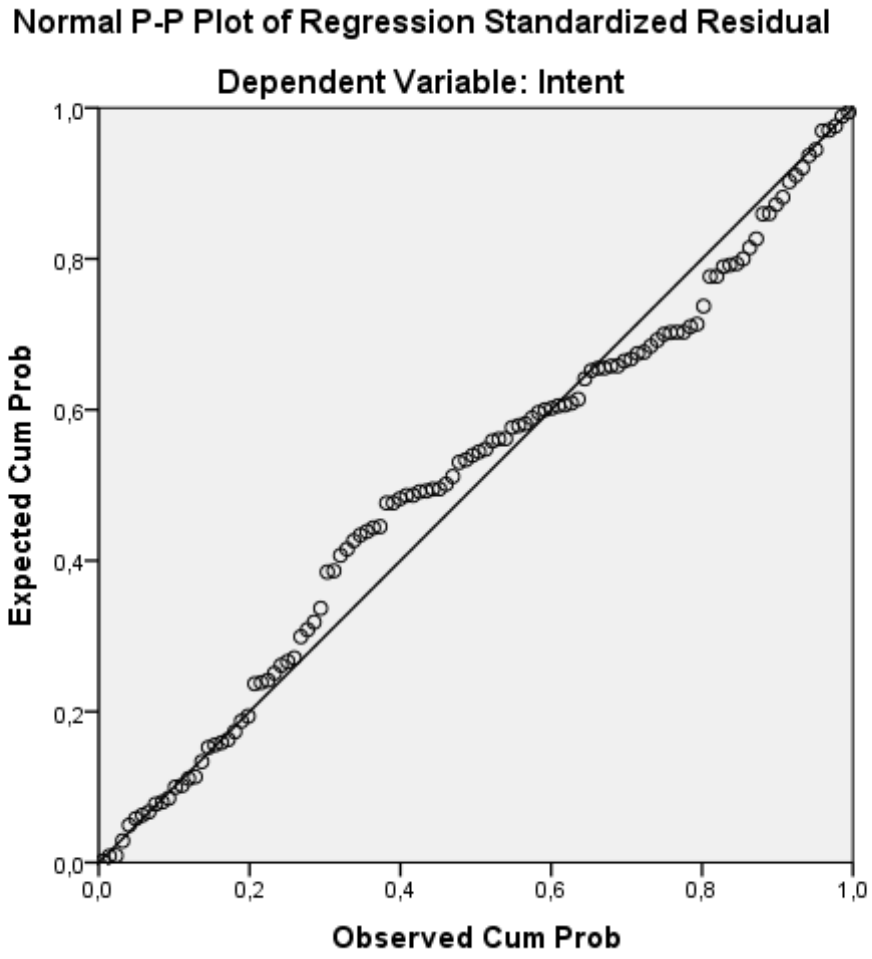


Figure 22 *Residuals aganist predicted values*



APPENDIX E QUESTIONNAIRE

Recycling at the University of Twente

This survey is intended to be filled in by students of the University of Twente only.

Thank you for your understanding.

Dear participant,

The following questionnaire is part of my research project to graduate from the masters of Public administration at the University of Twente. Hence, your contribution to this project will be highly appreciated, in particular if you can send your responds before the 22nd of December, due to my personal time restrictions to finish the masters programme.

To respond to this questionnaire will take you about 10 minutes and in order to facilitate its reading, allow me to mention that you will often encounter the term "recycling", which for the purpose of this questionnaire can be understood as following: ***"Recycling" is defined as "the conversion of waste (as discarded material with no worth) into a useful material"*** (Read, 1999, p.222). Furthermore, the word of "waste" refers to ***"waste from households, including bulky waste, similar waste from commerce and trade, office buildings, institutions and small businesses, yard and garden waste, street sweepings, the contents of litter containers, and market cleansing waste"*** (OECD, 2013a). ***University of Twente*** refers to teaching buildings as well as student housing.

Please try to fill in the following questions as precise as possible by giving intuitive answers. There are no right or wrong answers. All answers will be anonymous and kept confidential. Keep in mind that you can stop the questionnaire at all times.

If you have any questions don't hesitate to contact me through my email: y.philippsen@student.utwente.nl

Thank you for participating in this survey.

Yasmina Philippsen

There are 15 questions in this survey

Attitude

[] *

Please choose the appropriate response for each item:

	Strongly agree	Moderately agree	Slightly agree	Neutral	Slightly disagree	Moderately disagree	Strongly disagree
Recycling waste is good	○	○	○	○	○	○	○
Recycling waste is useful	○	○	○	○	○	○	○
Recycling waste is rewarding	○	○	○	○	○	○	○
Recycling waste is responsible	○	○	○	○	○	○	○
I am not interested in the idea of recycling waste	○	○	○	○	○	○	○
My feelings toward recycling waste are favourable	○	○	○	○	○	○	○
I don't think recycling waste has many positive effects on the environment	○	○	○	○	○	○	○
I make great personal effort to recycle waste as much as possible	○	○	○	○	○	○	○

Subjective norm

[] *

Please choose the appropriate response for each item:

	Strongly agree	Moderately agree	Slightly agree	Neutral	Slightly disagree	Moderately disagree	Strongly disagree
Most people who are important to me think that I should recycle my waste	○	○	○	○	○	○	○
Most people who are important to me would approve me recycling my waste	○	○	○	○	○	○	○
Most people who are important to me want me to engage in recycling	○	○	○	○	○	○	○
Most of my family think that recycling is a good thing to do	○	○	○	○	○	○	○
It is expected of me to recycle my waste at the University of Twente each day in the forthcoming month	○	○	○	○	○	○	○
If more people recycle, I would also recycle more	○	○	○	○	○	○	○

Perceived behavioral control

[] *

Please choose the appropriate response for each item:

	Strongly agree	Moderately agree	Slightly agree	Neutral	Slightly disagree	Moderately disagree	Strongly disagree
There are plenty of opportunities for me to engage in recycling at the University of Twente	○	○	○	○	○	○	○
It will be easy for me to engage in recycling on campus during the next month	○	○	○	○	○	○	○
Recycling is easy	○	○	○	○	○	○	○
The University of Twente provides satisfactory resources for recycling	○	○	○	○	○	○	○
I know where to take my waste for recycling at the University of Twente	○	○	○	○	○	○	○

Perceived moral obligation

[] *

Please choose the appropriate response for each item:

	Strongly agree	Moderately agree	Slightly agree	Neutral	Slightly disagree	Moderately disagree	Strongly disagree
I feel I should not waste anything if it could be used again	○	○	○	○	○	○	○
It would be wrong of me not to recycle my waste	○	○	○	○	○	○	○
I would feel guilty if I did not recycle my waste	○	○	○	○	○	○	○
Not recycling goes against my principles	○	○	○	○	○	○	○
Everybody should share the responsibility to recycle waste	○	○	○	○	○	○	○
Recycling should be an essential part of our way of life	○	○	○	○	○	○	○
Recycling seems like the right thing to do	○	○	○	○	○	○	○

Knowledge

[] *

Please choose the appropriate response for each item:

	Strongly agree	Moderately agree	Slightly agree	Neutral	Slightly disagree	Moderately disagree	Strongly disagree
I would recycle more waste if I had more information on recycling waste	○	○	○	○	○	○	○
More information about how to recycle waste should be available at the University of Twente	○	○	○	○	○	○	○
I know how to recycle my waste	○	○	○	○	○	○	○
If I knew what was happening to the recyclables after I dispose them, I would recycle more often	○	○	○	○	○	○	○
There is little information of recycling at the University of Twente	○	○	○	○	○	○	○

Inconvenience

[] *

Please choose the appropriate response for each item:

	Strongly agree	Moderately agree	Slightly agree	Neutral	Slightly disagree	Moderately disagree	Strongly disagree
I don't have time to recycle	○	○	○	○	○	○	○
Recycling at the University of Twente is inconvenient	○	○	○	○	○	○	○
Recycling at the University of Twente is too complicated	○	○	○	○	○	○	○
Recycling at the University of Twente is too much trouble	○	○	○	○	○	○	○
It is convenient for me to recycle at the University of Twente	○	○	○	○	○	○	○
Recycling takes up too much space at home	○	○	○	○	○	○	○

Recycling behavior

[] *

Please choose the appropriate response for each item:

	Always	Very Frequently	Frequently	Neutral	Rarely	Very Rarely	Never
How frequently do you recycle your waste at the University of Twente?	○	○	○	○	○	○	○
How frequently do you recycle your waste at home?	○	○	○	○	○	○	○

[] *

Please choose the appropriate response for each item:

	Extremely likely	Very likely	Somewhat likely	Neutral	Somewhat unlikely	Very unlikely	Extremely unlikely
How likely are you to recycle your waste at the University of Twente in the next four weeks	○	○	○	○	○	○	○
How likely are you to recycle your waste at home in the next four weeks	○	○	○	○	○	○	○
I intend to recycle my waste at the University of Twente every day in the forthcoming month	○	○	○	○	○	○	○
I intend to recycle my waste at home every day in the forthcoming month	○	○	○	○	○	○	○
I will try to recycle my							

waste at the University of Twente each day in the forthcoming month	○	○	○	○	○	○	○
I will try to recycle my waste at home each day in the forthcoming month	○	○	○	○	○	○	○
I plan to recycle my waste at the University of Twente each day in the forthcoming month	○	○	○	○	○	○	○
I plan to recycle my waste at home each day in the forthcoming month	○	○	○	○	○	○	○

[] *

Please choose the appropriate response for each item:

	Always	Very frequently	Frequently	Neutral	Rarely	Very rarely	Never
In the past three month how frequently did you recycle your waste at the University of Twente	○	○	○	○	○	○	○
In the past three month how frequently did you recycle your waste at home	○	○	○	○	○	○	○

waste at the University of Twente each day in the forthcoming month	○	○	○	○	○	○	○
I will try to recycle my waste at home each day in the forthcoming month	○	○	○	○	○	○	○
I plan to recycle my waste at the University of Twente each day in the forthcoming month	○	○	○	○	○	○	○
I plan to recycle my waste at home each day in the forthcoming month	○	○	○	○	○	○	○

[] *

Please choose the appropriate response for each item:

	Always	Very frequently	Frequently	Neutral	Rarely	Very rarely	Never
In the past three month how frequently did you recycle your waste at the University of Twente	○	○	○	○	○	○	○
In the past three month how frequently did you recycle your waste at home	○	○	○	○	○	○	○

Additional comments

[]Would you like to share some good experiences of recycling at high education institutions?

Please write your answer here:

Demographics

[]How old are you *

Please write your answer here:

[]What is your gender *

Please choose **only one** of the following:

- ○ Female
- ○ Male

[]In which study programme at the University of Twente are you enrolled in? *

Please write your answer here:

[]Which student status applies to you *

Please choose **only one** of the following:

- ○ Undergraduate fulltime student (bachelor)
- ○ Undergraduate parttime student (bachelor)
- ○ Graduate fulltime student (master)
- ○ Graduate parttime student (master)
- ○ Ph.D. candidate
- ○ Post Ph.D.
- ○ International student
- ○ Other

[]Where do you live? *

Please choose **only one** of the following:

- ○ On campus
- ○ Off campus