



MSc Facility Management

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Reducing Students' Littering Behaviour by Application of Persuasive Techniques, A Master Thesis Research



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This master thesis is dedicated to our wonderful colleagues
who clean our universities, schools, offices, hospitals, railway stations
and restaurants, every day again and again...

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“Schoonmakers zijn er om schoon te maken, niet om op te ruimen.”
(Beryl Kostverloren)

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“Wie is toch die kabouter die hier ‘s nachts altijd schoon maakt?”
(Saida El Jaddaoui)



Preface

This master thesis is carried out as the final assignment for the Master in Facility & Real Estate Management at Saxion University of Applied Sciences and Greenwich University. Except where stated otherwise, this thesis is based on the candidate's own work.

Over a year ago, when I started orienting on the subject of my thesis, my knowledge about persuasive techniques was zero, I did not know much about influencing behaviour and the meaning of nudges and gamification was a mystery to me. However, after 'the job is done', I am happy to have chosen this interesting subject. Littering behaviour of students is a menace to many facility managers and cleaning companies and I noticed many of them struggling to solve the problem. By broadening my knowledge about human behaviour, persuasive techniques and design, new and interesting worlds came into view, with exiting possibilities to reduce this annoying issue. I do hope this thesis will contribute to a solution for 'the litter bottleneck' at schools and universities!

I hope you have as much pleasure in reading this thesis, as I had in writing it! Moreover, I do hope that facility managers and cleaning companies might profit from it in order to reduce littering behaviour on their universities and schools.

Rianda Mulder
Amersfoort
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Management Summary

Litter is a social and environmental problem with undesirable consequences. Facility managers and cleaning companies of universities of applied sciences, consider indoor litter as a hot topic.

Universities should take the litter issue serious. Less litter could contribute to cost reduction, customer and employee satisfaction, positive study results, the image of the organization and it fulfills strategic sustainability objectives.

Current anti-litter approaches of facility managers and cleaning companies mainly have a practical character, aiming at preventing and solving symptoms. Current measurements are using the right means on the right places, result driven cleaning, surveillance and maintaining house rules, communicative measures, day-cleaning, internal and external partnership and (commitment to) a sustainable strategy. Short term measures, tensions between the facility manager and the cleaning company and a lack of commitment do not support anti-litter approaches.

However, the solution lies beyond an approach of preventing and solving symptoms only. When a university seriously aims to reduce litter, the behaviour of an important stakeholder, the student, should be the starting point. The question arose if perhaps recent persuasive tools, such as gamification and nudging, are feasible instruments for behaviour change. Therefore, the main research question is: "How effective are persuasive techniques to reduce littering behaviour of students at a university of applied sciences?" The research questions are:

- 1 Why is it relevant to reduce indoor littering?
- 2 Which anti-litter approaches have proved to be effective and which did not?
- 3 Why do students litter?
- 4 How can behavioural insights be applied to design persuasive interventions?
- 5 How can persuasive interventions be applied to influence students into less littering behaviour?

Features of the students and habitual behaviour were studied. Based on these findings, persuasive interventions were selected and experiments were designed and conducted at the Hogeschool Utrecht in Amersfoort. The research methods were literature review, group-wise- and individual interviews, observations and experiments.

The research amongst students show that awareness and positive intentions do not automatically lead to non-littering behaviour. Littering is habitual behaviour, it is hard to refrain of. It is reinforced by multiple unconscious behavioural mechanisms. The motivation amongst students to clear up is low and the perceived effort is high. Awareness campaigns are less effective because littering is habitual behaviour. It could best be approached by unconscious norm-activating interventions.

The main research question concerned the effectivity of persuasive techniques to reduce littering behaviour of students. Although the results showed clear directives towards the selection and appliance of persuasive norm-activating interventions, the exact answer to the question remains uncertain. External variables influenced the validity of the experiments and the findings were ambiguous. Therefore, the extent to which persuasive techniques were effective, is hard to prove. Nevertheless, the real-life characteristics of the experiments contributed to the external validity. The recommendations are: on a strategic level, university Boards are advised to start by incorporating sustainability ambitions and goals in their business strategy. Second, several directives should be taken into account. An integrated approach of facility managers, cleaning companies, designers and social psychologists is needed to avoid failures. The interventions should be adjusted on the target group and features of the building. The right habitual behaviour should be facilitated and the wrong habitual behaviour should be disturbed, by unconscious norm-activating interventions in a playful, non-intrusive way. A holistic approach of interventions should be applied. Best practices will be discovered by the principle of trial and error. Third, a list of extensive recommendations is given on a social cognitive-, a physical- and organisational level.

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Definitions

Automatic / habitual behaviour	Habitual, almost unconscious ways of behaving, often on a regularly base (Ouellette and Wood, 1998).
Cognitive bias	Creating a 'subjective social reality' based on the perception of other people and situations. This dictates the opinions and behaviour instead of the objective input (Bless et al., 2004).
Descriptive norm	Describes what is typical or normal. It is what most people do, and it motivates by providing evidence as to what will likely be effective and adaptive action (Cialdini et al., 1990; Reno et al., 1993).
Egocentric bias	The tendency to make oneself appear more worthy or competent than one actually is (Mullen, 1983)
Gamification	The use of game design elements in non-game contexts (Deterding et al., 2011a).
Implementation intention	Self-regulatory strategy in the form of an 'if-then plan' that can lead to better goal attainment, as well as help in habit and behaviour modification (Gollwitzer, 1999).
Informational social conformity	If a person is not sure about how to behave, he uses the behaviour of others as an indicator for how to behave ourselves. These are called normative beliefs, resulting in perceived social pressure (Aronson et al., 2005).
Injunctive norm	Refers to rules or beliefs as to what constitutes morally approved and disapproved conduct. They concern what the particular culture approves or disapproves (Cialdini et al., 1990; Reno et al., 1993).
Negation bias	People tend to remind the subject of a message and not the negative context (Beukeboom et al., 2010).
Normative beliefs	Beliefs / assumptions of a person about how others will judge him (Ajzen, 1991).
Normative social conformity	Adapting behaviour to the social norm in order to be accepted (Aronson et al., 2005).
Nudge	Any aspect of the choice architecture that alters people's behaviour in a particular way without forbidding any options or significantly changing their economic incentives (Thaler and Sunstein, 2008).
Perceived behavioural control	The degree to which someone allows himself to conduct in a certain way, depends on his control beliefs, which are determined by earlier positive or negative experiences (Ajzen, 1991).
Perceived social pressure	People conform to the social norm, based on real behaviour of others and on normative beliefs. These are assumptions of how others think of us (Ajzen, 1991).
Priming	Non-conscious activation of social knowledge structures by stimulating the senses (Bargh, 2006).
Prompting	Using visual or auditory aids which remind people to carry out an activity that they might otherwise forget (McKenzie-Mohr, 2013).
Routing	Using visual cues to stimulate people to walk along a certain route (Boutelle, 2001).
Social identity	A person's self-concept based upon their perceived memberships in a relevant social group (Turner and Oakes, 1986).
Trigger, cue	Something that tells people to perform a certain behaviour (Fogg, 2009). Synonyms: nudges, primes, prompts, (visual) cues.

Rationale

Litter is a social and environmental problem with undesirable consequences. Field research amongst facility managers (FMs) and cleaning companies (CCs) shows that litter inside buildings of professional organisations is considered a hot topic, possibly as a spin-off effect of recent attention for sustainable corporate strategies (Cotts et al., 2010; Hoekstra et al., 2015; Shah, 2007). And although cleaning costs are a substantial part of the facility budget and littering increases the costs considerably, academic literature about the subject is scarce. In practice the indoor litter issue is mainly approached on a remedial base: 10% of the available cleaning time is spent on clearing away trash (Anonymous cleaning company, 2013¹; Van Vliet, 2014). In addition to curative measures, preventive measures are taken, primarily on an operational level and mainly based on previous experiences and common sense (El Jaddaoui, 2014; Kostverloren, 2014; Prumers, 2015; Van Vliet, 2014; Wolsing, 2015; Zeeuwen, 2014). However, the solution may lie beyond an approach of preventing and solving symptoms only. The influence of an important stakeholder should not be underestimated: the customer. According to Lovelock's principles of service marketing, the value of perceived services is being created partly in interaction between service provider and customer (Lovelock, 2010). When an organization seriously aims to reduce litter in buildings and on premises, the behaviour of the customer should be the starting point.

Someone who litters, throws rubbish onto the floor and leaves it indefinitely or for others to dispose (Reference Encyclopedia, 2014). Approximately 95% of behaviour is habitual and so is littering behaviour in most cases (Ouellette and Wood, 1998; Ruitenburg, 2015). In the past, researchers tended to explain habitual behaviour by focusing on a person's intentions, considering this to be a predictable indicator for behaviour. Creating awareness was thought to be an effective way to change intentions and thereby the behaviour (Ajzen, 1991; Sheeran, 2002; Fishbein and Ajzen, 2011). This approach is currently visible in many anti-litter projects (Kenrick et al., 2005; McKenzie-Mohr, 2013). However, research showed that awareness projects are less effective because the habitual behaviour is insufficiently taken into account. Despite awareness and positive intentions, people find it hard to change habitual behaviour towards for example healthy eating, body exercises and sustainable behaviour (Aarts et al., 1998; Constanzo et al., 1986). Therefore, approaches aimed at changing littering behaviour should be based on knowledge about automatic behaviour instead of changing the intentions and creating awareness (Bargh, 1994, 1997; Aarts and Dijksterhuis, 2000a, 2000b; Holland et al., 2005). This insight is an important directive for this thesis.

Another directive is a development within the field of social sciences. Lately, insights from psychology related sciences have been used to design behavioural interventions in the domains of sustainability, health and mobility (Behavioural Insights Team, 2011; Hermesen et al., 2014). Several behaviour change models promote environmental sustainability, such as the Enabling Change Model of Robinson (2009), the Community Based Social Marketing (CBSM) of McKenzie-Mohr (2013) and the Mindspace Model from the United Kingdom Institute for Government (2014). Although the presence of these conceptual frameworks, designers often view cognitive psychology research as 'impenetrable' and hard to understand and to apply (Fogg, 2009; Hermesen et al., 2014). As a result, many attempts to design persuasive interventions aimed on behavioural change, fail or even lead to the opposite effect, because designers neglect and/or misinterpret the factors that drive human behaviour. Ineffective techniques continue to be used, while effective techniques are underused, difficult to replicate and their mechanisms of action are poorly understood (Michie and

¹ The cleaning company which provided this figure, wishes to remain anonymous. Information available on request.

Johnston, 2012; McKee et al., 2011). Hence, a disconnect remains between the fields of design research and service design on one hand, and psychology on the other. Several behavioural scientists strive to bridge this gap. They state that evidence based research, aimed on the specific features of the target group within their unique context, is a suitable way to find out whether interventions are effective or not (Fogg, 2009; Hermesen et al., 2014; Hoekstra et al. 2015). The effectiveness of experimental interventions is variable, and there is no full understanding yet of what accounts for this variability. Evidence about effectiveness, sources of variation and mechanisms of action are accumulating slowly (Michie and Johnston, 2012). Therefore, the second important directive for this thesis is awareness of the importance of an integral approach, with several disciplines collaborating together, aiming their interventions at the specific target group in their unique context.

This thesis focuses on littering behaviour of the main customers of a university of applied sciences, the students. Preliminary research shows that littering behaviour of higher educated students on universities is an underestimated topic in scientific research (SenterNovem, 2009). Research on this subject mainly focuses on the public environment and secondary schools (Finnie, 1973; Reich and Robertson, 1979; O'Neill, 1980; Cialdini et al., 1990; Newhouse, 2009; Goldstein et al., 2010; Payne, 2012) and so do anti-litter campaigns (The Inspiration Room, 2008; The Fun Theory Campaign, 2009; OVAM, 2013; Gemeente Schoon, 2015a; Nederland Schoon, 2015; ROVA, 2015). In literature about sustainable facility management (FM), the indoor litter problem is rarely mentioned as well.

The behaviour of the student could be the key towards litter reduction. Hence, the challenge is how to influence the student into less littering behaviour? Which scientific knowledge is available to make substantiated choices towards anti-litter measures? And are perhaps recent persuasive tools, such as gamification and nudging, feasible instruments? This thesis research aims to answer these questions. Therefore, the main research question is:
 “How effective are persuasive techniques to reduce littering behaviour of students at a university of applied sciences?”

The research hovers on the interface of several domains: FM, cleaning services, behavioural sciences and design. It aims to develop a holistic, integral approach to reduce litter, based on knowledge of habitual behaviour of students. This contributes to both the educational environment, the effectivity of FM and cleaning services and in a larger context, a sustainable environment.

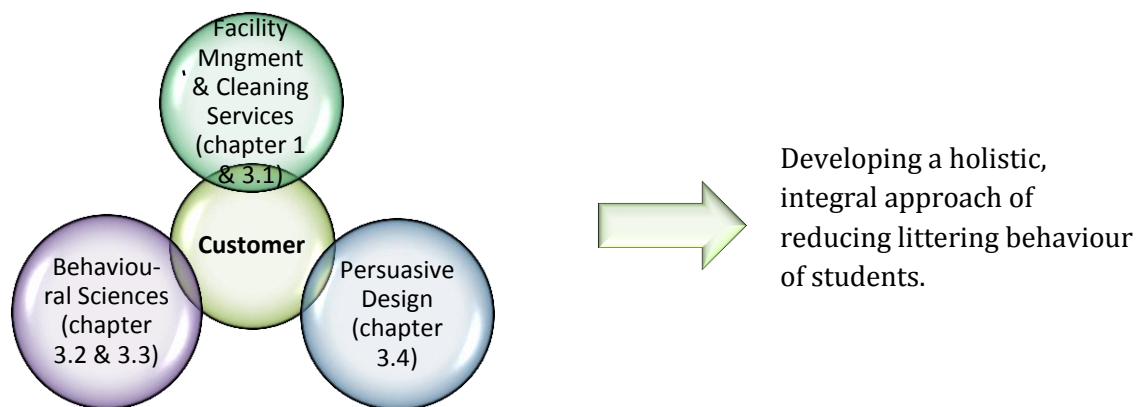


Figure 1: Global framework of the thesis.

The limitations of the research are: it focuses on a specific target group in a specific context. The recycling of waste was not taken into account.

Framework of the thesis

This thesis has been organized in the following way. Chapter 1 is an elaboration of the Rationale and describes the relevancy to reduce indoor littering from several perspectives: university, customers, FM department and CC. Chapter 2 describes the research approach, followed by the research results in Chapter 3, which is divided in four sections. The first section describes the effectiveness of current operational approaches by FMs and CCs. In section 3.2 the features and underlying psychological mechanisms for automatic littering behaviour of students are revealed, by combining theoretical research with the findings from field research amongst students. This knowledge enables designing effective behavioural interventions. Section 3.3 describes how several persuasive techniques influence people into less littering behaviour. Research has been done by means of literature reviews and by studying empirical research of (semi) governmental organizations. In section 3.4, the findings of the experiments at Hogeschool Utrecht in Amersfoort (HUA) are presented. Based on the findings of previous research as described in section 3.2 and 3.3, several persuasive interventions were selected and carried out to investigate the effectiveness. Chapters 4, 5 and 6 concern respectively an Analysis and Discussion, Conclusions and Recommendations.

A general remark has to be made towards the use of literature- and field research. Academic FM-related literature concerning the litter topic was scarce. Therefore, the results of Chapter 1 and section 3.1 are mainly based on field research. Academic sources concerning behaviour and persuasion were available on large scale, these were mainly used in section 3.2 and 3.3.

Chapter 1 Elaboration of the Rationale: The Relevancy of Reducing Indoor Litter

Several negative implications of litter in the physical surroundings of universities are imaginable. What are the consequences for customer satisfaction, cleaning costs and motivation of cleaning staff? Does litter indeed have a negative impact on the organization's image? And how does the presence of litter relate to sustainability? This chapter will show that there are five compelling reasons to reduce littering, namely cost reduction, improving customer and employee satisfaction, contribution to positive study results, the image of the FM department, CC and organization as a whole, and fulfilling strategic sustainability objectives.

The research for this chapter is related to research question 1, "Why is it relevant to reduce indoor littering?". FM-related literature on this topic was scarce, therefore the research was mainly carried out by interviews with stakeholders who look upon 'the litter issue' from several perspectives. Five facility- and contract managers, three managers from cleaning- and waste companies and 43 users including 39 students, were interviewed. The users of the university are labelled as 'customers' from now on, being defined as students, lecturers, managers, support staff and visitors. To increase the readability, the names of the interviewees are abbreviated in the footnote below², except from the customer/students' names, which are abbreviated in Appendix III.

Financial implications

The presence of litter increases costs in several ways. First of all, clearing away trash takes a considerable part of the available cleaning time. CC1 says in an interview he estimates it on 8-10%. HagoNext recently measured at Saxion University of Applied Sciences in Enschede that trash picking takes 15-20 minutes, $\pm 10\%$ on a two hour cleaning task. According to FM1 and 2, this excludes the transport of extra garbage bags to the waste storage, all at the expense of the total cleaning quality. Now, the average gross wage of a cleaning employee is €12.50 an hour (RAS, 2014). An organization could thus save up until € 1.25 an hour on cleaning costs. It is unlikely that litter will disappear completely, but a calculating example shows that, if it would decrease with for instance 50%, HUA, a 18,000m² building could potentially save € 5,250 a year.

Calculation: The HUA cleaning contract covers 41 labor hours a day \Rightarrow Number of workable days in 2015: $365 - (104 \text{ weekends} + 6 \text{ national holidays} + 50 \text{ school holidays}) = 205 \Rightarrow 41 \text{ labor hours} \times \text{€}1.25 \times 205 \text{ workable days} \Rightarrow \text{expected costs for 2015 to remove litter at HUA: } \pm \text{€}10,500.$

²

Interviewee	Abbreviation
Van Vliet, owner of cleaning company SVP Diensten (2014)	CC1 (Cleaning Company 1)
Van Waes, account manager at waste company EcoSmart (2014)	CC2
El Jaddaoui, entrepreneur at cleaning company HagoNext	CC3
Prumers, contract owner at Saxion University of Applied Sciences (2015)	FM1 (Facility Manager 1)
Wolsing, contract owner at Saxion University of Applied Sciences (2015)	FM2
Kostverloren, former hospitality manager at HU University of Applied Sciences (2014)	FM3
Schelhaas, hospitality manager at HU University of Applied Sciences (2014)	FM4
Zeeuwen, facility manager at Wageningen University & Research Center (2014)	FM5
Luimes, lecturer SBRM at HU University of Applied Sciences (2014)	CUS1 (Customer 1)
Van Laar, lecturer Social Work at HU University of Applied Sciences (2014)	CUS2
Molenaar, manager SBRM at HU University of Applied Sciences (2014)	CUS3
Schouten, visitor of HU University of Applied Sciences (2014)	CUS4

Second, good cleaning maintenance elongates the lifetime of building and inventory, hence decreasing the total life cycle costs (De Zwart, 2004). The presence of litter does not support a long lifetime of furniture and materials, leading to more frequent investments and a rise of exploitation costs. For instance, citrus fruit peels and fluids from abandoned soda cans can cause permanent damage to carpets. It can be cleaned solely through scrubbing, which takes extra time at the expense of other cleaning activities (CC1).

Last of all, a clean environment supports general hygiene and health circumstances. Food waste attract mice and cockroaches, which leads to extermination costs (CC3; De Zwart, 2004).

Apart from these implications, other financial related circumstances should be taken into account. CCs are challenged to calculate realistic prices however, litter picking is mostly not included. This causes tension between supplier and the FM. CC1 says: "It is a challenge to clean properly within the available time. No one (of the tendering suppliers, RM) dares to say he is not able to clean more than 500 meters an hour in a circulation area, because there is too much litter. Everyone calculates minimal prices because they want the contract." FM1 notices a tension between customer and supplier as well, from her perspective as a customer: "Recently a CC offered an extreme high price, including litter picking. But I obviously never get permission of my manager to make such an expensive deal. They say it is a matter of attitude and behaviour and they expect me to manage it." Furthermore, CC1 notices that once the contract is agreed upon, customers generally do not want to additionally invest in means, such as more and/or larger waste bins. But during the tender process, he is reluctant to mention when extra measurements are needed, because too much additional costs might deter the FMr. CC1 assumes that therefore some managers take litter for granted.

The impact of litter on customer satisfaction

Delivering high quality services in the most cost effective way is one of FM major tasks. Speaking about services in general, Van Looy et al. (2003) state that "the majority of economists agree today that services make an important contribution to economic development. (...) Value creation is not confined to producing and consuming goods only; enhancing quality of life by means of services is equally important." Jensen et al. (2012) adds that FM was previously considered as management of mainly operational services, but that is changing after introducing the concept of added value. The focus moves more towards the business impacts and effects of FM, instead of on the economic value only. How the work environment adds value to an organization, is also being explained by Atkin and Brooks (2009). "The work environment has an enabling or hindering impact upon productivity. Environmental factors affecting the productivity include air quality, noise control, thermal comfort, privacy, lightning and spatial comfort." De Zwart (2004) states that cleaning maintenance is increasingly being seen as a service that conditionally supports an effective and efficient core process. Cleaning services maintain and improve working circumstances and an agreeable working climate, leading to a representable environment, to decreased wear and aging and to compliance to the ARBO- and environment legislation.

FM4 assumes the presence of litter negatively influences the customer satisfaction because customers perceive a dirty building. The customers at Hogeschool Utrecht (HU) indeed showed negative emotions towards the presence of litter. Employees say they feel irritated, repelled (CUS1; CUS3; CUS4) and disappointed (CUS2). Eight students mention annoyance. Especially food rests of someone else are considered to be disgusting. Student D1 says: "Some behave just like animals, it is disgusting." CUS3 says: "The act of littering gives an unpleasant feeling and an urge to do something about it. The act of throwing a candy wrap on the floor, is unacceptable." Five interviewees mention to be irritated, but at the same time, they accept litter as a given fact. Three students say they are not really aware of litter. Student Ri2: "I think most students are not disturbed by it, but then again, it is pretty clean here (the HUA building, RM)."

FM5 states that a proper building and fast reactions to complaints, adds value to customers' experiences. She gives the following remark: "Rubbish distracts, people do not like to be in dirty surroundings, because they cannot focus on their priorities. I think it is very important to keep my building clean and proper. This supports the performance of lecturers and students." CC2 adds: "Cleaning services add value by facilitating people in their professional achievements. When a building looks shabby, people feel repulsed to be there, so they will not function in an optimal way." These statements are substantiated in a recent research of Kok (2015). He explored whether the built environment of educational institutions affects learning outcomes. The results show there is a statistically significant positive relationship between the perceived quality of cleanliness with study success. Although his research included other aspects than cleanliness solely and it focused on cleanliness and not specifically on litter, it seems possible that the presence of litter affects the perceived quality of cleanliness. Kok states that this is strongly and positively related to study success, as are front office and classrooms, classroom conditions, ICT facilities and local printing. These aspects should be seen as distinguishing factors contributing to the well-being and convenience of the teachers, enabling them the opportunity and means to perform their core tasks in a proper way (Kok, 2015).

'First impression counts', implications for the universities' image

The findings show that the presence of litter should not be neglected. It can certainly damage the corporate image of a university. In the interviews, 75% of the customers and suppliers instantly and without being asked, mentioned that the first impression counts. "A clean building is the calling card of the company", CC3 says. FM4 states that "the presence of litter does not support a professional image of our university, instead it gives a wrong impression. Being a university, you want to present your organization as a professional institute with qualified lecturers and means." CUS2 says she associates litter with a lack of hospitality. "I like it particularly when the entrance has got a pleasant, friendly appearance. However, the floor of HUA's entrance is often covered with cigarette ends and garbage. I also do not like the red colour of the waste bins."

Several statements of the interviewees support the theory of Bitner's Servicescape model (1992). Bitner claims that the physical surroundings influence the beliefs of people towards the company, the people working at the company and the services they deliver. CUS4 says: "If a company cannot even manage to keep the building clean, the management does not seem to have grip on organization and staff. I assume that behind the screens the organization probably is a bit 'messy' too. For example, I would think they will not keep to their promises." CUS3 says: "It appears seedy, like there is no budget available. The presence of litter clearly sends a negative signal, for instance that the management is not functioning well, or employees are unsatisfied about their salary." CUS1 thinks that litter at the entrance immediately causes an untended impression of the organization as a whole. Previous statements are fine examples of cognitive bias (Bless et al., 2004). FM5 is more nuanced. In her experience, litter alone does not affect the way customers look upon the organization as a whole. Only if more organizational aspects are experienced negatively, this leads to negative beliefs. If it comes to litter solely, customers blame the FM department for it. Negative beliefs may cause negative publicity about an organization as well. Three of the interviewees mentioned they sometimes complain to relatives about untidiness in the building.

The research of Kok (2015) shows that although factors such as cleanliness "are not directly related to the primary process of education, high quality does tell something about the order and discipline that exists at the institute and the extent to which the FM organization can respond rapidly to any temporary discomfort of its users. This appears to create circumstances that are beneficial to teaching and learning. Therefore we argue that being attentive to the small things is a good indicator of quality in the great things."

Implications for the image of facility management and the cleaning company

Although most interviewees stated the user is responsible for clearing up his own waste, a certain unfairness can be detected. Because when it comes to the perceived quality of cleaning services, the organization and users will hold the cleaners responsible, although based on contractual agreements, the CC is not responsible for certain aspects of pollution (Lemmens, 2008). However, people react in an emotional way: noticing litter + noticing the cleaner = assuming the cleaner does not perform well. A quotation of CC1: "Sometimes it feels unjust when we are being called to account the presence of litter. Of course our prime task is to clean, but on the other hand, when the litter would not have been there in the first place...".

The presence of litter negatively influences the outcome of quality measurements as well. Although the value of objective quality measurement systems, such as DKS and KMS of the Vereniging Schoonmaak Research is no point of discussion, a remark should be made about the influence of littering behaviour on the outcome of the measurements (VSR, 1979).

However, FM3 and FM5 noticed that customers blame the facility department in the first place. This is confirmed by several customers. CUS1 says: "Perhaps the cleaner does not get enough time to do the job. I would be inclined to hold the facility department responsible for not outsourcing cleaning services in the right way." CUS3 thinks it is the task of FM to manage and collaborate with the CC but he holds the CC secondly responsible. FM4 says that from a hospitality point of view, the university buildings should be cleaned up constantly and cleaners should appoint the customer to right behaviour.

Furthermore, littering behaviour of customer effects the motivation of cleaners on a personal level. According to CC1 and CC3 and based on the researcher's observations and conversations with cleaners, they experience littering behaviour as a nuisance. Cleaners especially feel irritated when a waste bin is within reach on a visible place and still people do not bother to make the effort. Some rather sad stories came along in the interviews. CC1 tells his employees often feel treated like a doormat. "It seems like the mindset of people is 'Who cares if I throw my waste on the floor? Someone else is there to clean it up.' I think cleaners are looked upon with certain disdain, because of the large amount of immigrants working in this business. Unfortunately, I have heard all prejudices about immigrants coming along, but people just do not realize that they are the ones that clean up their mess, either very early in the morning or very late in the evening. And then starting all over again next day." CC3 adds: "Cleaning has no 'sexy' image. It is often approached in a negative way or people take it for granted. Once when the waste bins are not emptied, people start to notice the added value of cleaning." FM3 says: "I regularly got emails from cleaning employees with cries for help, because they actually have no time for cleaning up litter. They get a certain amount of time to clean, but if they are mainly busy picking up waste, it is very frustrating when they get blamed when it is not clean or because they are too late cleaning the sanitary." FM1 tells that once a cleaner started to cry when he entered the floor which he had to clean. "It was such a mess that he just did not know where to start. So yes, I think litter is a significantly demotivating factor."

The relation between litter and sustainability

Remarkably, in literature about sustainable FM, the indoor litter problem is rarely mentioned. If waste is mentioned, it is always in the context of reducing, separating and recycling (Shah, 2007; Cotts et al., 2010). Preventing littering behaviour does not seem to be high on the sustainability priority list, although it obviously influences an agreeable and healthy working climate (De Zwart, 2004).

Second, it contributes to recycling practices. Although the interviews show that the average person does not relate litter to sustainability, there is a direct connection. Valenbreder (2014), program manager sustainability at HU, tells that one of the strategic objectives for 2020 is to change the way HU handles waste. Waste is to be considered as material for reuse. In order to achieve this, waste should be collected separately so it can be recycled and reused. Now, litter includes waste which actually should have been 'divided at the source' by the users. They should throw paper, greens, plastics and solid waste in separate waste bins. Hence, the more litter lies around, the less recycling is able to take place. Litter eventually ends in the container with mixed, remaining trash.

Summary of research question 1: Why is it relevant to reduce indoor littering?

The findings show that reducing littering behaviour is relevant because of several reasons. First of all, it leads to cost reduction in multiple ways: clearing up litter takes approximately 10% of the total cleaning time and reduction of litter will thus increase the exploitation costs. Good cleaning maintenance elongates the durability of building and inventory, thereby decreasing the total life cycle costs. Less litter prevents from vermin and thus investments for counter measures. Second, the presence of litter does not contribute to adding value concepts, which many FM departments aim at nowadays. A clean and tidy building adds value in multiple ways: it improves working circumstances and compliance to ARBO regulations, hence contributing to customer satisfaction. It is likely to have a significant influence on study success. Furthermore, a clean building supports the image of the organization. The presence of litter in the physical surroundings negatively influences the beliefs of people towards the all over quality of the university. The presence of litter harms the image of the FM department and CC as well. Although most interviewees say they are ultimately responsible for clearing their own waste, litter annoys them and they expect the cleaners to clear it up. On their turn, cleaners are irritated by littering behaviour. It makes them feel threatened like doormats, which does not contribute to motivation and job satisfaction. Last of all, reducing littering behaviour will support strategic aims concerning sustainability, recycling and reusing waste. Reducing indoor litter is relevant because litter disables optimal recycling and reuse. Indirectly it can save costs as well, because organizations can re-earn money through recycling.

Now the relevancy of the topic is clear, the question is how to persuade students to decrease their littering behaviour. This will be supported by literature on behaviour and persuasive techniques, described in paragraph 3.2 and 3.3. The main question is:

**“How effective are persuasive techniques
to reduce littering behaviour of students at a university of applied sciences?”**

Chapter 2 Research Approach

Now that the motive and the research problem are clear, the research approach can be defined. In this chapter the research approach will be explained by describing research questions and research methods.

Research questions

The main question was broken down into five research questions:

3 ***Why is it relevant to reduce indoor littering?***

3.1 What are the implications of littering for the customers?

3.2 What are the implications of littering for the service delivery of the facility management department and cleaning company?

4 ***Which anti-litter approaches have proved to be effective and which did not?***

4.1 Which (un)successful measures are taken by facility managers to reduce littering behaviour at Universities of Applied Sciences?

4.2 Which (un)successful measures are taken by cleaning companies to reduce littering behaviour in organizations?

4.3 Which (un)successful measures are taken by (semi) governmental organizations to reduce littering behaviour in public areas?

6. ***Why do students litter?***

7. ***How can behavioural insights be applied to design persuasive interventions?***

8. ***How can persuasive interventions be applied to influence students into less littering behaviour?***

The break down structure clarifies the relation between the main question and mutual research questions.

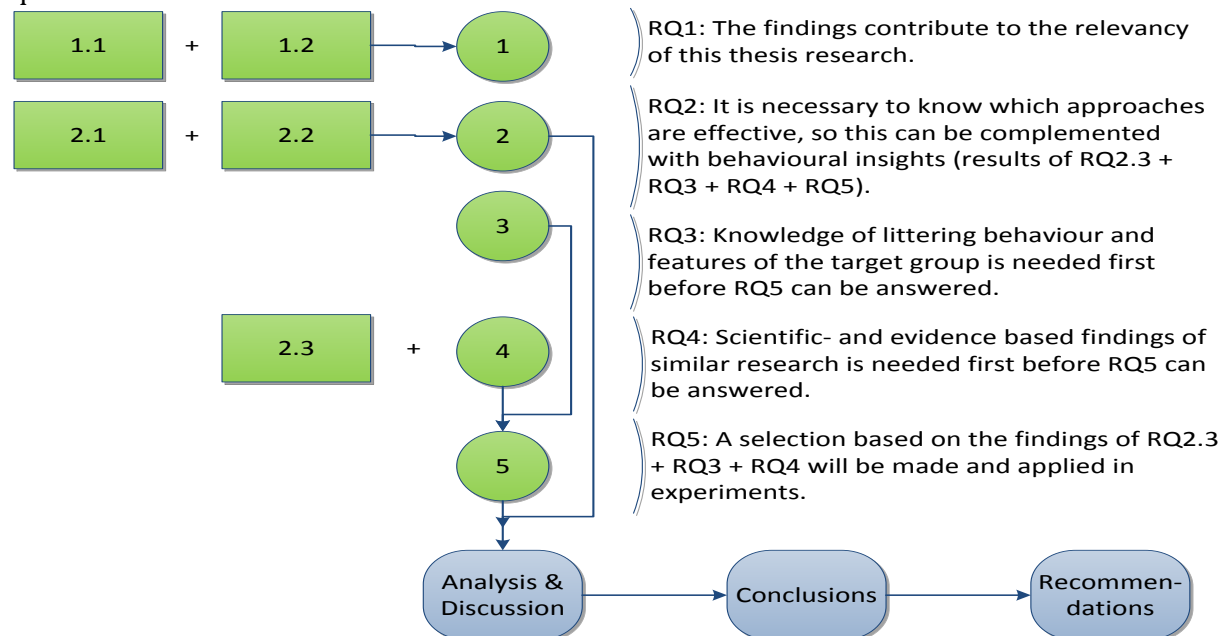


Figure 2: Research break down structure

Research Methods

This section describes how the research is carried out, which research methods will be applied, what the measurement procedures are and how data is analyzed.

Several research methods were applied, both qualitative as quantitative. Qualitative research methods used were literature review, group-wise- and individual interviews and observations. Quantitative research methods were applied in experiments. Informal conversations, attending meetings and collaboration with relevant stakeholders are no formal research methods however, they provided useful information and are therefore described as well.

Literature Review

The first research method was literature review, starting in the phase of orientation, in order to get an overview of the (context) of the subject and second, to develop the research proposal. In the phase of depth research, the literature review continued towards specific topics related to the research questions (hereafter noted as RQ). The theoretical results were compared with the findings from the interviews and experiments to investigate occurring differences and similarities, hence increasing the validity of the total research. Resources reviewed were relevant books, scientific reports, internet- and media sources and internal documents. Data analysis took place by analyzing the content of the sources and comparing it with the other results.

In-depth interviews

Semi-structured in-depth interviews were carried out with several stakeholders and experts. The respondents were chosen by purposive sampling, based on their profession or position, interest, involvement with the subject and communicative abilities. Only the students were selected by convenience sampling. The interviews contributed to the validity of the research.

1. Customers of HUA (two lecturers, one manager, one visitor, 39 students) were interviewed about their individual experiences with litter and about how they consider the implications of littering in general. The sample represented the main customer groups of the FM department of HUA. They are each likely to have their own paradigm towards litter and littering behaviour. FM staff and FM lecturers were deliberately not interviewed because presumably they are more conscious towards litter. Regarding interviewing the students: see explanation below at 'group-wise interviews'.
2. Five facility-, hospitality- and contract managers of universities were interviewed on the subject of implications of indoor littering and measures already taken. The sample represented four managers of universities of applied sciences and one of a university.
3. Two managers of CCs and one of a waste company were interviewed on the same topics as the FMs. The sample represented companies with schools and universities in their portfolio.
4. Two social psychologists were interviewed about 'reasons' for littering and non-sustainable behaviour in general and about influencing habitual (littering) behaviour through persuasive techniques. They were chosen by purposive method based on profession and expertise. One respondent is a professor in media communication in the public domain, the other was involved in anti-litter experiments at ROC schools. She was interviewed about her specific experiences with influencing scholars into less littering conduct by applying persuasive techniques. Furthermore both respondents were asked for advice about ways to approach the student research belonging to RQ3.
5. One manager of an organization involved in public anti-litter campaigns was interviewed about (un)successful measurements to reduce outside littering in the public domain. The respondent was chosen by purposive sampling because of her knowledge and experience with anti-litter

campaigns. Although public settings (streets, parks, shopping malls) differ from an indoor school situation, learning from the experiences of resembling organizations can be instructive. This interview was conducted by telephone.

The interviews were recorded and transcripts were made. Data analysis took place by open and axial coding. An overview of interviewees is shown in Appendix I, the interview questions in Appendix II. The transcripts are available on request.

Group-wise interviews

The Rationale showed that littering behaviour of higher educated students is an underestimated topic in scientific research (SenterNovem, 2009). That is why students were asked about their beliefs and ideas concerning their own littering behaviour. To increase the validity of this research, the findings were compared with theoretical research about habitual behaviour. This type of qualitative research is typified as interpretive and is often used in social sciences. Texts, observations and stories are leading and the researcher is looking for the explanation given by the interviewees to certain situations (Verhoeven, 2011).

The researcher decided not to carry out the interviews by herself but to delegate it to senior students. This decision was based on the presumption that students are willing to share more (reliable) information with their peers as they would do with an adult researcher, especially given the fact the researcher is a lecturer. Conducting the interviews by peer students, avoided desirable answers and holding back information.

The student interviewers were selected based on their seniority, interviewing skills and interest in the subject. The researcher prepared open-ended questions and explained it to them beforehand. They received instructions about the interviewing method (probing, posing impersonal questions, speaking in an alternate way). The interviews were conducted group-wise in order to increase conversation, yielding more information. To avoid mutual influencing amongst the interviewees, the chosen method was similar to the Delphi method, with only one round: the interviewed students first wrote down their individual answers to the questions, then the answers were inventoried and discussed together. The questions were formulated in an impersonal way, in order to avoid egocentric bias. This is the tendency to make oneself appear more worthy or competent than one actually is (Mullen, 1983). For instance, the students were asked "Why do you think students litter sometimes?" instead of "Why do you litter sometimes?"

Seven group interviews took place with in total 39 students, 1.4% of the total HUA population (2.700 students). The respondents were chosen by convenience sampling: as a part of their study, the senior students took part of an assignment to coach teams of mostly first year students on a project. These students were assigned to them by a lecturer. The senior students requested the first year students to attend the group interview. The sample represented business management students (28%) and FM students (72%). The average age was 17-24 years. 54% of the respondents was female and 46% male.

Recordings were made and afterwards, relevant quotations were noted. Data analysis took place by open and axial coding. Interview questions are shown in Appendix II, the results in Appendix III.

Experiments and observations

Triangulation of several research methods were used to increase the quality of the research. To verify the results of the literature research and the interviews with social psychologists, experiments at HUA were carried out to determine the effectivity of persuasive techniques on the littering behaviour of students. Furthermore, the insights of the group-wise interviews toward the features of the students and habitual behaviour, were taken into account in the set-up of the experiments.

Eight sections of the building were indicated by HUA's CC as highly litter-intensive areas. Four types of litter were counted: study related (papers, paper shred), food related (pet bottles, plastic cups, candy wraps, fruit peels, food rests, sandwich bags), cigarette ends and various (everything which could not be defined in the other categories). All pieces of waste, disposed on floors and furniture, were counted.

First, baseline measurements were carried out during three months, by counting the litter in all eight sections twice a week. The measurements took place between 4.30-6.00 p.m. The baseline measurements were done to receive insight in the average amounts of litter and eventual differences and fluctuations in each section, so they could be compared with measurements after the interventions later on. The choice to conduct baseline measurements for the relatively long period of three months was made to increase the reliability of the research. This was needed because first observations showed that relatively small numbers of litter were left behind.

After three months, several consecutive experiments were executed over a period of five months at six sections of the building. One section, the ground floor, was appointed as 'blank control section'. No interventions were done there, in order to find out if the average littering went on as usual or if there were perhaps different patterns compared to the first three months.

The effectiveness of the interventions was measured by counting litter and regarding the gamification objects through participative observations in an open setting. Data of the counts was analyzed by tabulation in the SPSS statistic software program. A protocol for the experiments, photographs and maps of the experimental areas can be found in Appendices V, VI and VII.

An overview of the experiments:

1. On 3 December 2014 six trails of red footprints were applied on the 2nd floor section. The trails led from the student workplaces to large waste bins.
2. On 9 March 2015 six trails of green footprints were applied 4th floor section, in order to research the effect of- and possible differences between red and green coloured footprints.
3. On 1 April 2015, multiple interventions were applied in several sections. In the lecture halls, the prohibition to eat and drink was temporarily abolished for a period of three and a half month. Lecturers were informed about the experiment by email and requested to remind the students after class to throw away their waste. They were reminded by a Holle Bolle Gijs poster (for British readers: explanation in par. 3.3.3) on the lecturer desk. Posters with persuasive texts were placed on walls and waste bins.
4. Posters with persuasive texts were applied on waste bins, walls and tables of the student workspaces on the 2nd floor as well, in the same area of the red foot trails.
5. A gamification object was placed at the smoking area at the main entrance, named 'Puike Peuken Long'. It consisted of two large bottles ('lungs') with a funnel on top in which people could throw their cigarette end and guess in which lung it would drop.
6. A second gamification object was placed, a large rubbish chute at the staircase between the 1st and 2nd floor, through which garbage can be thrown. A large waste bin was placed underneath. When opening the lid of the chute, a triangle is moved and makes a gong like sound.

Informal conversations

Apart from formal interviews, several informal conversations were held with:

1. HU staff members of the marketing and communication department, about involving posters with persuasive texts in the experiment.
2. The coach and members of the HUA cleaning staff, about their experiences with the littering behaviour of students and about their feedback of the results of the experiments.
3. HU's program manager sustainability, about the possibilities of reducing litter in order to increase the recycling of waste.

Meetings

Several instructive meetings were attended. Relevant information was minuted by the researcher and analyzed by open and axial coding.

1. A presentation about persuasive design, presented by a social psychologist.
2. A meeting about reducing litter in the public domain, including a presentation of a social psychologist specialized in behavioural change through persuasion. The meeting was commissioned by Stichting Nederland Schoon and Stichting Gemeente Schoon.
3. A meeting in which ideas were exchanged towards circularly economy in relation to reducing litter at universities of applied sciences. Several stakeholders 'within the chain' attended: Windesheim, Saxion and HagoNext.

Research framework of the thesis

Research Question	Section	Research methods	Appendix
1. Why is it relevant to reduce indoor littering?			
1.1 What are the implications of littering for the customers?	1	- Literature review - Interviews with customers - Group-wise interviews with customers / students (qst 4, 5)	- I + II II + III
1.2 What are the implications of littering for the service delivery of the FM department and CC?	1	- Literature review - Interviews with facility managers and cleaning companies	- I + II
2. Which anti-litter approaches have proved to be effective and which did not?			
2.1 Which (un)successful measures are taken by FMs to reduce littering behaviour at universities of applied sciences?	3.1	- Literature review - Interviews with facility managers	- I + II
2.2 Which (un)successful measures are taken by CCs to reduce littering behaviour in organizations?	3.1	- Literature review - Interviews with cleaning companies	I + II
2.3 Which (un)successful measures are taken by (semi) governmental organizations to reduce littering behaviour in public areas?	3.3	- Literature review - Interviews with social psychologists and a director of governmental organization	- I + II
3. Why do students litter?			
	3.2	- Literature review - Interviews with social psychologists - Attending meeting about behaviour and persuasive design - Group-wise interviews with students	- I + II - II + III
4. How can behavioural insights be applied to design persuasive interventions?			
	3.3	- Literature review - Interviews with social psychologists and director of governmental organization - Attending congress about reducing litter in the public domain	- I + II -
5. How can persuasive interventions be applied to influence students into less littering behaviour?			
	3.4	- Experiments - Observations	IV + V + VI

Figure 3: Research framework

Chapter 3 Results

3.1 The Effectiveness of Current Anti-litter Approaches

Facility managers and cleaning companies made many attempts already to reduce indoor litter. This chapter will show eight successful approaches: using the right means on the right places, result driven cleaning, surveillance and maintaining house rules, communicative measures, day-cleaning, partnership and collaboration and (commitment to) a sustainable strategy. Short term measures, tensions between the facility manager and the cleaning company and a lack of commitment should be avoided.

The research for this section is related to RQ2, “Which anti-litter approaches have proved to be effective and which did not?”. Five facility- and contract managers and three managers from cleaning- and waste companies were asked about their initiatives, either successful or not. Their comments are integrally combined with theoretical findings.

3.1.1 Successful Approaches

Keeping the environment clean

Awareness of the importance of keeping the environment clean is moreover an underlying basic principle than a direct measure. A clean environment is conditional to the success of the cleaning activities as a whole. This is confirmed by scientific research and field research, further to be elaborated in paragraph 3.3.3. FM5 says: “We have experienced people leaving more trash behind if the environment looks messy. People definitely tend to behave tidier in a clean environment.” CC1 confirms the importance of keeping the appearance of the waste bin and its surroundings clean: “If we do not continuously take care of pollution, people will litter. Therefore we aim to remove any disturbances as soon as possible.” This can be achieved by result driven cleaning.

Result driven cleaning

According to De Zwart (2004) the service delivery of the cleaning services is being appreciated through a combination of two factors: the duration of which a person is confronted with the pollution and the nature and gravity of the pollution. Therefore, the FM needs to have good insight in the way the building is used, in order to prevent a too long and severe confrontation with pollution. He also has to be aware of the customer’s general behaviour, in order to anticipate properly on the pollution degree. If the ‘ups and downs’ in the pollution degree are known in advance, he can adapt the planning of staff. Cleaning activities within a building should continually change, depending on fluctuations in the building occupancy and the activities performed. These lead to changes in the volume of waste arising. Hence, result driven cleaning is effective and saves time and money. In addition, the cleaners can provide information about areas which quickly pollute, so it becomes clear where interventions are needed (CC3; Shah, 2007; Stichting Nederland Schoon, 2015). Therefore, it is crucial that the FM has a partnership with the CC (page) and that he remains aware of the customers’ complaints, by informing himself through well-structured procedures for handling complaints and instruments, such as a Facility Management Information System (FMIS) (Lemmens, 2008).

Using the right receptacles on the right place

A number of practical interferences aim at simplifying the act of throwing away waste, making the good behaviour as easy as possible. This called the ‘least effort principle’ (Kingsley, 1949).

- *Visibility:* removal of under desk bins and replacing them to visible places (Shah, 2007; Luyben and Cummings, 1981). The back-lying thought is to empathize with the users. Waste bins should be placed on locations where users expect them, for instance on places where people have to wait, on walking routes and transition spots (Wildeboer, 2015). In an experiment Luyben and Cummings (1981) introduced more conveniently located recycling containers and using prompts in apartment complexes. This increased the amount of newspaper recycling from 50 to 100%.
 - *Avoid walking distances:* too long walking distances should be avoided, according to CC1: “It can be too much effort for a student to walk ten meters to the nearest bin. Then it is likely he just drops his waste.” This behaviour was affirmed by almost 50% of the students who attended the group-wise interviews.
 - *Numbers:* taking care of enough waste receptacles is an obvious measure. In an American experiment along highways, social psychologist Finnie (1973) found out that the presence of more litter cans reduced littering. At the Willem I College the positioning of extra waste bins led to an decrease of 68% litter on the premises (Ruitenburg, 2015).
 - *Size:* waste bins should be large enough to contain the amount of daily waste. When the HUA building was delivered in 2010, the waste receptacles were too small, resulting in lots of trash lying on the floor. HU invested €1,500 in larger waste bins, which decreased the amount of litter (FM3, 2014).
 - *Eye catching designs:* because visible waste bins catch more waste, they should be real eye catchers with cheerful colours, shapes and/or attractive illustrations (CC1; Nederland Schoon, 2015). In an experiment of O’Neill et al. (1980), a conventional waste receptacle and a specially designed bin with a plywood ‘hat’ were alternated in a football stadium. This container used provided movement (tipping of the ‘hat’) which focused attention to proper litter disposal. More than twice as many items were deposited in the experimental container than in the conventional one. This indicates that the design of the bin is an important factor (picture 1).
 - *Functionality:* the shape of the waste bin influences behaviour. Functional aspects of the design increase proper litter disposal. For instance, people do not like to get dirty hands. A foot pedal to open the lid makes usage of the waste bin easier. Using open bins is a possibility, but to avoid stench they should be emptied on a daily base.
- Furthermore, waste bins with small openings lead to an increased risk of littering behaviour (CC1). At HUA, some waste bins have a small opening, so some waste just does not fit in. In a best case scenario, customers place their waste neatly on top (picture 2).



Examples of ‘wrong’ waste bins.

Picture 1: Uninviting waste bin at HUA’s entrance; crooked lid and repellent colour (left).

Picture 2: Too small: both waste receptacle and opening are too small (right).



Surveillance and maintaining house rules

All interviewees mention that surveillance and maintaining the house rules by janitors and cleaners is needed, although there are some limitations. CC1 mentions that it is not realistic to keep 100% surveillance in large school buildings. When staff members are out of sight, the littering behaviour restarts, says FM1 (2014). FM3 adds: "It is not a pleasant task, but if we want to keep the place tidy, we have to check on it constantly." Both CC1 and FM3 mention large mouthed reactions by students and even by lecturers. 50% of the interviewed FMs and CCs mention that some lecturers do not to accept facility- and cleaning staff requesting them to clean up their waste.

When FM3 found out about this, she decided to send the janitors on a communication training, where they learned how to provide effective feedback on littering behaviour. Unfortunately, the training did not succeed. "The trainer noticed there was more going on. It seemed like the janitors find it hard to address lecturers because of status differences. They also said 'Well, now we know how to address the lecturers, we expect them to adapt as well. But they don't'. In other words: why should we bother?" (FM3)

At Wageningen University and Research Center (WUR) it turned out to be effective to allow food and drinks in the lecture halls and request people afterwards to throw their waste in the bin. Prohibiting eating and drinking was not effective because most lecturers did not cooperate.

Day-cleaning

According to Nederland Schoon (2015), people throw less waste on the floor if they see the cleaner actively cleaning. Day-cleaning implicitly conveys the message that it is anti-social to throw waste on the floor and that a clean environment is being normative. People feel addressed on their responsibilities, but on an unconscious level (Van Zutphen, 2014). Based on their field experience, both CC2 and CC3 promote cleaning at day time instead of outside office hours. CC3 noticed that customers showed positive reactions shortly after day-cleaning was introduced. "Some clients told me they litter less because it makes them feel uneasy seeing the cleaner cleaning up." She gives an example of a secondary school in Breda. "Hardly no litter can be detected on this school. There is a common strategy to address students on their littering behaviour and it is totally 'normal' that students are corrected by cleaners. We have a solid team and everyone knows the cleaners by name." CUS3 confirms this statement: "I once came in very early before cleaning was done and I noticed the mess lying on the floor. I saw them sweeping piles of sand and dirt. It actually is interesting to see what happens, because most of the time cleaners are invisible persons on the background."

The advantages of day-cleaning work vice versa as well. CC3: "If you want to show the cleaners respect and appreciation, you should make them part of the team. This can be done by personalizing the cleaning activities, by enabling cleaners and customers to get acquainted. Cleaners get bonded with 'their' section of the building. By feeling more responsible they will do a better job."

However, a critical remark has to be made: in the group-wise interviews, six students mentioned that day-cleaning is one of the reasons for their littering behaviour. Ri1: "You notice the cleaner walking around, so you think they will take care of it." Ri3: "I throw my cigarette ends on the ground, because there is always someone swiping." Ro4: "If students see the cleaners clearing up litter, they will leave it behind more easily."

Communicative measures

Furthermore, the customer's behaviour can be influenced through effective communication. Over the past decade EcoSmart, a waste company specialized in recycling practices, experienced extensively with it. Their strategy aims at recycling and reusing waste and is based upon four aspects: 'people, methods, media and means'. The people and media aspects are the most important critical success factors (CC2).

An example of using the media aspect is reiteration of the same kind of messages in several ways, through narrow casting systems, intranet and banners. CC2: "We communicate about our successes, but we advocate openness and therefore we also share if things do not go well. For instance, on the waste trolley is a poster attached on which percentages and a red arrow pointing down or a green arrow pointing up, show how (un)successful the recycling activities went in the previous month." Another example of the similar kind are showing photographs to the public of the litter they produced, in order to create awareness (FM3; FM5).

The second critical success factor is related to the people aspect. The employees get trained about how to address users on their recycling behaviour. Both EcoSmart and HagoNext believe in sending positive, stimulating messages instead of punishing. They think it is important to share successes instead of approaching customers in a negative way (CC2; CC3).

WUR successfully combines people and media aspects as well. FM5 states that communication is essential: "For instance, we acquaint fresh students with the house rules. At the start of each academic year, two senior students walk around in our restaurants and on the premises to explain that at our university, we clean up after ourselves. In this way we try to make clear that we hang on to certain, proper behaviour." WUR also informs students and staff through their narrow casting system, to make the necessity of recycling and sustainability clear (FM5).

Other awareness stimulating measure aims on showing what happens. Some people think recycling has no use, they are convinced that all waste is thrown together (CC2; FM5). EcoSmart therefore enables the customers to actually follow the recycling process by showing them the waste collection point (CC2). At WUR the customers are informed what useful things happen with recycled waste, by showing photographs of objects made of trash. This motivates people into both less littering behaviour and recycling in the right way, according to FM5.

Finally, a communicative measure of WUR is to stimulate people to drink out of plastic bottles instead of plastic cups. The latter causes higher risk of falling and causing stains on furniture and carpets. In addition, using plastic bottles is a more sustainable solution because they can be reused. FM5 tells they hardly find any litter in the form of plastic cups anymore .

Partnership between supplier and customer

A more indirect measure concerns improving the partnership between CC and the FM department. Partnering is the most common form of cooperative relationship for managing service providers and suppliers. Cooperative partnerships imply working towards goals that have to be shared by the client organization and service supplier alike (Atkin and Brooks, 2009). They state that "suppliers have traditionally been regarded simply as someone paid to provide. Where a supplier is responsible for something that can be provided easily by many others, such as cleaning, there may seem little need to bother about a relationship beyond that straightforward commercial arrangement. However, this ignores the possibility that the supplier's knowledge about products and processes could be used to reduce waste and raise productivity." The FM can, of course, hold the CC responsible for the litter problem, but it is more effective to regard it as a common problem. Both parties can contribute with their own expertise and knowledge.

HagoNext brings this theory into practice. One of their principles is adding value by showing ownership and taking responsibility. CC3 says this goes beyond writing a tender. The account manager should question (new) customers about relevant organizational aspects, so the cleaning process can be adapted. For instance, what are the most problematic areas? Are there any snack bars or shops in the surroundings, causing waste on the school premises? The CC should collect this kind of knowledge in order to provide proper advice about cleaning frequencies and methods. Gaining knowledge about the behaviour of students is important as well, in order to choose cleaners with the right personality.

Partnership includes the operational level as well. HagoNext expects their employees to be the eyes and ears of the customer. CC3: "We walk around in every corner of the building. We should alert the FMr about imperfections, such as the presence of litter on certain places. And we should coach the cleaners in developing this responsible behaviour."

Partnership with external partners

Litter is not confined to certain areas, it simply lies everywhere. Collaboration with external partners within the same area can be successful. Secondary schools are advised to collaborate with local police and shops in the vicinity, making agreements about keeping the environment clean between shops and schools, the so called 'candy trails' (Senternovem, 2009; Stichting Nederland Schoon, 2015).

An example took place on the campus grounds of 'de Uithof' in Utrecht, HU and the University of Utrecht collaborated by positioning extra waste bins on the premises, especially near the entrances of university buildings (FM3).

3.1.2 Unsuccessful Approaches

Until so far, successful measures were described. The research showed some measures were ineffective as well, either by direct reasons or indirectly when there is no compliance with certain necessary conditions.

Short term measures

Saxion University of Applied Sciences hired an actor who walked around in the school canteens around lunchtime, yelling funny things in order to stimulate people to clean up their mess. However, the effects did not sustain for a longer period of time. Both Saxion and Windesheim University of Applied Sciences collaborated in a project with an organization for mentally disabled people. People with Down syndrome were employed to clean up litter and in that way, they hoped to create awareness as well. According to FM1 this only had a short term effect. It concurs the symptoms instead of really solving the problem at the source.

Tensions in the partnership between supplier and customer

Earlier results showed that partnership between FM and CC is considered to be a successful measure. Nevertheless, in daily practice it is not always easy to realize, due to financial dependency and working pressure. CC1 is careful when it comes to innovative partnership. During tender processes in the past he experienced that 'thinking out of the box' was not always rewarding. "If we suggested ways to improve the cleaning quality by taking anti-litter measures, I often got the impression that customers thought I was too demanding. Taking extra measures obviously means an investment in time, money and effort. It seemed to scare them off." Hence, it seems that financial independency causes CCs to be reluctant in being progressive with innovative ideas, which obviously does not contribute to a common approach of littering behaviour.

Another non-contributing factor is the high working pressure in outsourced situations, due to performance measurements. Lemmens (2008) states that “customers are demanding an equal or sometimes higher quality of the cleaning services against a lower prize, or a higher quality for the same prize. Besides, there is a trend whereat quality is not only defined in technical terms but also in terms of experience.”

Lack of commitment

In his book about sustainable practice for the FM, Shah (2007) mentions that waste management became a topic of conversation and concern however, “the principles of waste management (avoid, reduce, re-use, recycle and recover) are well established but seldom implemented in their entirety as part of a well-planned business strategy. (...) The role of FM in managing waste including legislative requirements, recycling, awareness programs and performance measurement is discussed.”

Several interviewees mention the absence of a sustainable strategy and/or priorities. FM2 claims commitment of the management is needed in the first place, CC3 notices that many organizations do set targets and make agreements however, these are top-down decisions and often they are not maintained on the long term. FM3 thinks anti-litter measures do not endure because litter does not have the highest priority. She noticed anti-litter initiatives getting passed by other, more urgent projects and activities. Hence, sustainable strategic goals and getting priorities straight, can be seen as critical success factors.

Summary of research question 2: Which anti-litter approaches have proved to be effective and which did not?

FMs and CCs have undertaken numerous more or less successful attempts to fight litter, such as using enough right receptacles on the right place, result driven cleaning, surveillance and maintaining house rules, a diversity of communicative measures and internal and external partnership and collaboration. Furthermore, the research showed the positive effects of the underlying principle, ‘keeping the environment clean’ and of day-cleaning, although the opinions of cleaning experts towards day-cleaning contradict with the students’ opinions. Measures of which a short term effect may logically be expected, should be avoided. Finally, a sustainable strategy aimed at the target groups is conditional for a successful anti-litter approach. Ideally, there should be commitment on both a strategic and operational level.

3.2 Littering: Underlying Behavioural Mechanisms

This section reveals a brief typology of higher educated young adults and an explanation of underlying behavioural mechanisms for littering. It will show that awareness and positive intentions do not automatically lead to non-littering behaviour. Littering should be considered as habitual behaviour, is hard to refrain of and is reinforced by several behavioural mechanisms, such as pre-dominant self-interest and normative social conformity. The interaction between students’ features and habitual behavioural mechanisms have a predictive value for persuasive solutions to be developed.

This section is related to RQ3, “Why do students litter?”. In order to develop persuasive interventions, knowledge of the target group in the context of the build environment, and underlying behavioural mechanisms of littering should be gained first. Therefore, the ideas, opinions and values of 39 students towards their own littering behaviour are compared with literature and interview results with two social psychologists. This section is not separated in a theoretical and empirical research part in order to create an integral overview.

3.2.1 Typology of the Student

The target group of this thesis research consists of students of universities of applied sciences. This study takes four years and provides a Bachelor degree. The age of full time students varies between ± 17 -27, born between 1988-1998. Most students are 18 to 22 years old.

The founder of the Modern Generation Theory, Mannheim (1952), claims that a generation is formed by “a group of people in a similar social location experiencing similar social events”. Such a ‘group’ shares similar experiences, they form specific value sets in the formative phase in their lives (ages 16-25). Though not unattested, many authors have described characteristics of specific generations. Experiences might be local or globally-shared, and this insight has led to both globally and locally applied characteristics of generations (Eisner, 2005; Bontekoning, 2007; Boschma and Groen, 2007).

In this thesis a local approach has been taken, using the description of the Dutch ‘limitless generation’, developed by Spangenberg and Lampert (2013). They labeled the youth born between 1986-1995 as the limitless generation. This can either be explained in a positive way, such as ‘the world is at your feet, that the impossible becomes possible.’ This point of view is applicable to mainly higher educated students, who are designated as self-reliant, stable and positive. The shadowy side of ‘limitless’ means ‘not knowing how to get away from poverty, emotional neglect, debts, over consumption, truancy and moral decay.’ This is mainly applicable to lower educated youth, who lack confidence and need structure, clear guidance and examples of adults. In general, the limitless generation can be described as energetic, venturesome, critical, confident and focused on themselves. They have an aversion to fuzzy talk and prefer a business like, matter of fact approach. Large ideals and collective values are considered of minor importance, however small social networks are. Their interests and involvement in a sustainable environment and responsible behaviour is limited. They are not very dedicated to societal issues, ‘everyone should take care of himself’.

Some of the findings of Spangenberg and Lampert (2013) were affirmed by students who stated they assume that they litter more compared to older generations. The following reasons are mentioned: a less severe upbringing, more easy-going rules and feeling less responsible for the university environment. Student F1 says: “People older than 30 have their own household, they are used of taking the responsibility to clean up. If you still live at your parents, perhaps they do it for you.” Two students reflect on the fact their behaviour changed since they have jobs. F2, a student who worked for several years already, says: “If you have a job where they expect you to focus on cleanliness and tidiness of the place, you become more aware of it.” His fellow student, F4 agrees: “Since I have a job in the hospitality business, I take more notice of my own littering behaviour.”

Spangenberg en Lampert (2013) write: “Many youth react laconically toward the litter issue: ‘It is being cleaned after all, so why bother?’ They assume all problems will be solved somehow, so ‘Why messing things up with annoying rules?’” Student D1 says: “I don’t think students will address each other when they litter. The current mentality prescribes not to interfere with each other too much.”

A number of aspects moderate littering behaviour, such as level and type of education. FM5 tells that litter is not a large bottleneck at WUR. She thinks this is because the institute focusses on the theme ‘healthy food and living’ and therefore their students have a strong affinity for sustainability.

How the theoretical findings further relate to the opinions of the students towards their own littering behaviour, will be described in the following section.

3.2.2 Why do Students litter?

In general, people are very well aware of the social norm towards littering: it is non-social behaviour and it ought not to happen. Nevertheless, everyone litters sometimes. Just take a good look around at an average university and the existence of littering behaviour can hardly be denied. A research about non social behaviour commissioned by Sire (2009), showed that over 95% of the Dutch population shows non social behaviour now and then. Often they are unconscious of the fact that they disturb others, although 12% mentions they are annoyed by littering behaviour of others.

Awareness and positive intentions

Ajzen (1991) investigated the reasons why people tend to have difficulties to refrain from certain behaviour. He developed the Theory of Planned Behavior (TPB), an influential and proven theory within social sciences. The TPB is based on the intentional behaviour, the intentions of a person to change. An intention can be defined as an attitude or opinion about a certain issue. The intentional behaviour is guided by three kinds of variables: attitude toward the behaviour, subjective norm and perceived behavioural control. The three variables “lead to the formation of a behavioral intention. As a general rule, the more favorable the attitude and subjective norm, and the greater the perceived control, the stronger the person’s intention to perform the behavior in question. Finally, given a sufficient degree of actual control over the behavior, people are expected to carry out their intentions when the opportunity arises. Intention is thus assumed to be the immediate antecedent of behavior.” (Ajzen, 1991)

However, critics, including Ajzen himself, claimed the TPB has some limitations. The model presumes a decisional process based on conscious considerations and planning (Ajzen, 1991; Sheeran, 2002; Fishbein and Ajzen, 2011). It does not provide an explanation for automatic, habitual behaviour such as littering. Most people have no intentions at all to litter on purpose, but sometimes they just do.

The interviews with the students substantiated this. Seven students explicitly expressed the attitude in keeping a clean environment, although they admitted that in some cases their behaviour claims otherwise. They say they are fully aware that it is wrong, but still “it just happens sometimes” or “we don’t do it on purpose” or “we just forget”. The insight that awareness and positive intentions do not always lead to the desirable behavioural, is an important directive for this thesis.

Pre-dominant self-interest

Apparently, it is hard to change habitual behaviour, even if people are aware and motivated. The question arises how the disparity between the expressed attitudes and the actual behaviour can be explained. A main reason is conflicting goals and pre-dominant self-interest (Hermesen and Renes, 2014). The statements of the students show that this is often the case:

- *Attitude.* Ten students speak rather negatively about themselves. They appoint themselves as “lazy, less mature, cheeky, non-social and egoistic”. When they were posed the question ‘why do students litter sometimes?’, 19 (out of 39) students immediately said they are just being lazy. W5: “I just don’t feel like standing up and walking five steps to the waste bin and back (sniggering).” Five other students mentioned ‘the far distance’ to the waste bin as well. All students in group G agreed they were lazy because “everything is facilitated nowadays.” Student G3 provides an example: “My colleagues told me that previously, they had to clean themselves. Now, our manager hired cleaners to do it.”
- *Upbringing.* Nine students assume it depends of the upbringing by the parents. According to six students, student litter when they are ‘spoiled’ by their mother. G3: “If your mother is tidying up everything for you, you are not used to clean up your waste.” This is being nuanced by student

F: "It is a matter of effort. I am raised in a good way but must confess I sometimes leave trash behind too."

- *Being distracted and therefore forgetful*, are mentioned several times. They forget to clear up because they are busy socializing with friends. In observations, the researcher noticed as well that students often leave their trash behind when they are in conversation with others or when they have their earphones plugged in. Actually this is not a matter of distraction and forgetfulness but about peer pressure. Student M2: "If I leave the building with a group of friends and the waste bin is in the other direction, I won't bother to go there and just leave my trash behind." What this student actually says, is that being part of a group is more important to him than adapting to the social norm. This behavioural mechanism will be explained later on.
- *Being in a hurry* for class or to catch a train was mentioned by eight students. Being in time apparently has got a higher priority than clearing up.

Renes, social psychologist and professor cross media communication in the public domain, explains in an interview (2014): "If I strictly lived according to the rules, I would have to eat healthy, I would have to leave my car at home and bicycle instead, I would clean up my mess. So, I should actually refrain from immediate satisfaction. (...) And although we are generally very well aware of what is good and healthy for us, we just lack the willpower to change it." The short term behavior is often much more satisfying on the short term. We rather choose the easy way (O'Donoghue and Rabin, 1999), even though this may lead to conflicts when our socialized behaviour does not comply with our focus on short term comfort and pleasure.

Avoiding tensions when attitudes collide with the behaviour

Each individual strives toward consistency with himself, so the conflict between the social norm and self-interest may lead to tensions, mental stress and discomfort. However, people developed clever strategies to avoid this tension. The well-known and respected Cognitive Dissonance Theory of Festinger (1962) explains what people do in these kind of situations. Figure 4 shows these strategies in the left column, with examples provided by the students are in the right column.

Strategies to reduce inner stress	Citations of students in the group-wise interviews
Adapting the cognition	Student G4 says that students litter because "You know that there are cleaners around and when the waste bin is too far away...".
Adapting the behaviour	Student W1: "I have left waste behind intentionally sometimes, because I was too lazy. But I felt guilty afterwards."
Justifying littering behaviour by changing the conflicting cognition	Student W3: "When I (...) go home, I just leave it behind. It is a combination of laziness and forgetfulness. I don't clean up at home either. I think a lot of people don't." This student justifies his behaviour by saying: 'no one does, so why should I?'
Adding new cognitions.	Several students state that "it is the cleaners' task to clean". In this way, they actually provide themselves with an excuse for littering.
Ignoring or denying the information	Student F3: "I sometimes think to myself: 'why does it matter if I leave just one piece of paper behind?'" Several students stated that littering small pieces of waste is considered to be less worse than larger pieces of waste.

Figure 4: Cognitive Dissonance Theory applied on littering behaviour.

Disparity between injunctive and descriptive norms

Another explanation of the disparity between intention and behaviour can be found in the Focus Theory of Normative Conduct (Cialdini et al., 1990). When considering normative influence on behaviour, it is crucial to discriminate between the *ought* (injunctive) and the *is* (descriptive) meaning of social norms, because each refers to a separate source of human motivation. Descriptive norms depict what happens while injunctive norms describe what should happen.

The injunctive meaning of norms refers to explicit rules or beliefs as to what constitutes morally approved and disapproved conduct. Injunctive norms concern what the particular culture approves or disapproves of. It often motivates action through the threat or promise of social sanction. Descriptive norms are based on our perception of the behaviour of others. It is our interpretation of 'how we should behave' in certain situations, based on what most others do. It motivates by providing evidence as to what will likely be effective and adaptive action: 'If everyone is doing it, it must be a sensible thing to do.' (Cialdini et al., 1990; Reno et al., 1993). For instance, lots of trash on the premises of a university transmits the descriptive norm that it is normal to litter.

The descriptive norm is powerful and often contradicts with the injunctive norm. Renes (2014): "We do not always comply to injunctive norms. If you notice people around you behaving in a certain way, their behaviour indicates the rules which are obviously accepted around here." Four students provided fine examples of this mechanism. G1 says: "When I notice rubbish lying around, I think to myself 'who cares if I leave my trash too, it is a mess anyway'. Ri3: "Because others don't do it either. If there is waste lying around, I won't clean up too."

And according to Renes, it goes beyond one type of undesirable behaviour only. A certain 'chain reaction' may occur: "If I notice other people ignoring the injunctive norm, for instance by talking loud in the library, it is probably all right to ignore injunctive norms towards other domains as well.(...) So, when I notice litter, I can litter too and perhaps I can also come too late in class. Often, and this is certainly the case with litter, it is a negotiable thing. Of course there are rules: 'Everyone knows 'you ought not to litter', but if people notice littering behaviour by others, it seems like breaking rules apparently is not really a bad thing to do."



Picture 3: 'Please... keep of the grass'. The power of descriptive norms over injunctive norms (De Bruin, 2013).



Picture 4: Choosing the easy way, although the injunctive norm says otherwise (Anonymous internet source, 2015).

Normative and informational social conformity

This behaviour relates to two social mechanisms. First, the so-called normative social conformity. We tend to conform ourselves to our peer group because we want to be accepted. Second, informational social conformity plays a role. If we are not sure about how to behave, we use the behaviour of others as an indicator for how to behave ourselves. These are called normative beliefs. Normative beliefs result in perceived social pressure or subjective norm (Ajzen, 1991; Cialdini et al., 1990). People are motivated to do things that win them social acceptance and avoid being socially rejected. “The power of social motivation is likely hardwired into us and perhaps all other creatures that historically depended on living in groups to survive. As fables and folktales show, being banished from a community was a severe punishment for humans. For other creatures, being ostracized from a pack may have meant certain death. Regardless of the origin of the social motivator, the power over us is undeniable”. (Fogg, 2009)

These psychosocial mechanisms are confirmed by the students, although there are slight differences between them. Eleven students say they will follow the example of their peers, either littering or not. When they were asked about to what extent they agree to the assumption that students litter because they are sensitive to group pressure, some interesting statements were made. Ro1 says his generation is very suggestible: “If someone ‘likes’ a nice bikini on Instagram, this post immediately has got 8000 followers.” Student D5 admits she is sensitive to social norming: “If, in a certain group, people are not used to clear away their waste, it will not be considered ‘cool’ when someone does. So, if you are a member of that group, the norm prescribes you to not clear up.”

That clearing up or not is not the main issue, shows the statement of student Ro1: “If we work in a team and someone starts to clean up, so will I.” D4 says: “If we work together in our team and I would stand up to throw my waste away, I would take yours as well. But if we would stand up together and everyone would leave their empty water bottles behind, perhaps I would leave mine too.” Nine students say they would clear away their own waste and the waste of their class mates. They will certainly not clear away waste left behind by unknown people, especially not when it concerns food left overs. In that case, they consider it to be the cleaners’ task. Student G2 says: “I noticed that, after we have worked together and we stand up to leave and one person forgets his waste, others will pick it up to throw it away.”

A practical reason: eating habits and packaging

Last of all, students of several groups assume that this generation litters more, because of different eating habits and the increase of packing materials. Ro1: “The older generation used to take their sandwiches from home in a box. We don’t, we are used to buy our food and drinks in the nearby supermarkets. We all earn money so we can afford it. And the food we buy is wrapped in a lot of packing materials, so this leads to extra litter as well.”

3.2.3 Linking the Students’ Features to Behavioural Mechanisms

A research of Hoekstra et al. (2015) about effective sustainable strategies shows they often fail because the typologies of different target groups are neglected. When the sustainability values of different consumer groups are not taken into account, it leads to non-effective strategies. Therefore it is necessary that this thesis research relates the features of the students with the underlying behavioural mechanisms of littering. Then the following conclusions can be drawn.

The students’ attitude towards clearing up is not necessarily negative. Awareness and positive intentions are present, which accords with their positive attitude towards life in general. Although, when it comes to the point of actually clearing up waste, their behaviour often seems to be unresponsive and disengaged. Often they rather chose for the easy way instead of making the effort

to walk to the waste bin. Obviously, this conflict between the social norm and pre-dominant self-interest does not only apply to students, although certain features of the students are likely to increase littering behaviour. They tend to focus on themselves and show less sensitivity to large ideals and collective values. Their interests and involvement in societal issues, a sustainable environment and responsible behaviour is limited. There is no commonly shared feeling of responsibility for a clean environment and this may reinforce the pre-dominant self-interest even more. Another diminishing variable is the fact that small social networks are considered to be important, which increases the power of descriptive norms and informational social conformity. This can either have a positive or negative effect, depending of the social norm in the peer group. Finally, it is important to notice that behavioural changes should not be forced, because the current student dislikes rules.

Summary of research question 3: Why do students litter?

Higher educated young adults are designated as self-reliant, stabile and positive, confident, energetic, venturous, critical and focused on themselves. They do not appreciate too many rules. Their interests and involvement in societal issues, a sustainable environment and responsible behaviour is limited. Large ideals and collective values are considered of minor importance, however small social networks are.

Both theoretical- and field research showed that awareness and positive intentions towards clearing up waste do not automatically lead to non-littering behaviour, because littering behaviour should be considered as habitual. It is reinforced by several underlying behavioural mechanisms. First, the conflict between the social norm and pre-dominant self-interest. To avoid conscientious objections, we apply cognitive dissonance to excuse ourselves when our attitudes conflict with our behaviour. Another explanation for littering can be found in the power of the descriptive norm over the injunctive norm. This behavioural mechanism is related to normative social conformity: conformation to the peer group in order to be accepted, resulting in perceived social pressure. The students' interviews showed this can either work out the positive or the negative way. If the majority throws their litter in the bin, everyone does and vice versa.

The findings show it is hard to refrain from habitual behaviour. Attempts to behavioural change will lead to resistance, especially if it is being forced.

When linking the students' features to the behavioural mechanisms, it becomes clear that the absence of a commonly shared feeling of responsibility for a clean environment, reinforces the psychological mechanism of pre-dominant self-interest. Furthermore, the appraisal of small social networks increases the power of descriptive norms and informational social conformity. This can either have a positive or negative effect, depending of the social norm within the peer group. Behavioural changes should not be forced, because the average student dislikes too many rules and resistance will occur.

3.3 Applying Behavioural Insights to Design Persuasive Interventions

This section starts with a brief typology of social psychology. A description of relevant developments shows that change of automatic behaviour should best be approached by unconscious norm-activating interventions, and that the increased interest in applying insights from social sciences to design behavioral interventions is not always successful. Furthermore, four evidence based anti-litter approaches will be described: social cues, norm activating environments, embodiment and applying injunctive and descriptive norms.

In this section, RQ4 is answered, “How can behavioural insights be applied to design persuasive interventions?”. Research has been done by studying empirical research results of social scientists and (semi) governmental organizations, by interviewing a director and social psychologists and by attending a congress about reducing litter in the public domain.

3.3.1 Brief Typology of Social Psychology

According to psychologist Allport, social psychology is a discipline that uses scientific methods "to understand and explain how thoughts, feelings and behavior of individuals are influenced by the actual, imagined or implied presence of other human beings" (Allport, 1985). Social psychologists usually explain human behaviour as a result of an interaction between personal factors, the social situation and previous history. Lewin (1951) stated this interaction can be looked upon as a formula, whereat behaviour is the function of the person and the environment, $B=f(P,E)$ (1951). Gergen (1973) added that the historical context of behavior is an explanatory factor as well. Behaviour change interventions are usually complex, comprising many interacting components (Craig et al., 2008).

Relevant developments

Two developments within social psychology are relevant for this study. First, the increased insight that changing littering behaviour should be approached by knowledge about automatic behaviour instead of by aiming at changing the intentions and creating awareness (Bargh, 1994, 1997; Aarts and Dijksterhuis, 2000a, 2000b; Holland et al., 2005). As described on page 23, researchers tended to explain habitual behaviour by focusing on the intentions and creating awareness was thought to be an effective way for behaviour change (Ajzen, 1991; Sheeran, 2002; Fishbein and Ajzen, 2011). This mindset is visible in many current litter approaches, such as media campaigns, neighbourhood projects and primary school contests (Kenrick et al., 2005; McKenzie-Mohr, 2013). However, research showed that this is not sufficiently effective (Aarts et al., 1998; Constanzo et al., 1986).

Habits arise in interaction with specific behaviour, a certain context and certain means. Dijksterhuis and Van Baaren (2015) say that habitual behaviour is deeply ingrained and new behaviour brings along insecurities and effort. Every conscious attempt to behavioural change will therefore lead to resistance, especially if someone else forces you. Research of Broeders et al. (2010) towards changing automatic littering behaviour, states that the behaviour is more likely to be predicted by behaviour in the past than by attitudes. Therefore it should be approached by unconscious norm-activating interventions (Broeders et al., 2010).

The second development is described by Hermesen et al. (2014): “Recent design research literature indicates an increased interest in applying insights from psychology and related sciences to design behavioral interventions. This interest spans the fields of sustainability, health and mobility.” In sales these insights were used already. The tools for creating persuasive products are getting easier to use, with innovations in campaigns on TV and social media, apps, nudges and landscaping. As a result, more individuals and organizations can design experiences they hope will influence peoples’

behaviour via technology channels. However, many attempts at persuasive design fail because designers do not understand what factors lead to behaviour change. Designers often view cognitive psychology research as ‘impenetrable’ and hard to understand, let alone to apply. Hence, a disconnect remains between the fields of design research and service design on the one hand, and psychology on the other (Fogg, 2009; Hermesen et al., 2014). In an interview, Renes (2014) adds that business people often make the mistake to choose a ‘funny nudge’ without having their choices substantiated. Fogg (2009) adds: “To effectively encode experiences that change behaviors, we need a rich yet practical understanding of human psychology, specifically insights into the factors that drive human behavior. Without this understanding, designers of persuasive experiences are mostly guessing at a solution, or imitating techniques that work without understanding why those techniques work.” When designers neglect and / or misinterpret the factors that drive human behaviour, interventions aimed on behavioural change will fail or even worse, will lead to the opposite effect.

Now, without suggesting to provide a complete overview, some examples of persuasive anti-litter approaches in public spaces and on secondary schools will be revealed. A conceptual framework of the Human-Technology Interaction Group (HTIG) of the Technical University Eindhoven is used to categorize several interventions, which are related to automatic behaviour (Broeders et al., 2010):

- Social cues – the influence of social signals on the behaviour (section 3.3.2);
- Norm activating environments – the influence of the environment on the behaviour (section 3.3.3);
- Embodiment - the influence of the sensor motoric system on the behaviour (section 3.3.4);
- Injunctive and descriptive norms (section 3.3.5).

3.3.2 Social Cues

This section will describe several ‘techniques’ whereby social cues can be applied: the implementation intention, social proof, norm activation, communication by means and social identity. The findings are mostly based on empirical results of anti-litter experiments of Nederland Schoon. This foundation, which is financed by corporate businesses and government, is a research specialist in decreasing littering behaviour in public spaces, such as the vicinities of secondary schools and schoolyards (Stichting Nederland Schoon, 2015). They apply awareness programs and unconscious norm activating interventions. The director tells in an interview that social norming is one of their most successful behavioural techniques (Van Zutphen, 2014). Nederland Schoon commissioned a variety of experimental projects to social psychologist, such as Ruitenburg of NoviMores. Examples of three projects she managed at secondary schools³, are given below.

Implementation intention

If a person is willing to change his behaviour, he may strategically call on automatic processes in an attempt to secure goal attainment. He will make a plan in the form of implementation intentions that link anticipated critical situations to goal-directed responses. ‘When situation x arises, I will initiate the goal-directed response y’ (Gollwitzer, 1999). According to Ruitenburg (2015), the implementation intention is mainly effective when a person is intrinsically motivated, although it works from outside-in as well. At ROC Friesland College, pupils were persuaded to the right automatic behaviour by posters saying: ‘Ready with your break? Please throw your waste in the waste bin.’ The aimed underlying implementation intention is: ‘After I have eaten my sandwich, I will automatically throw the package in the waste bin’.

³ ROC Willem I in Den Bosch (2011), ROC Friesland College in Leeuwarden (2013) and ROC Scalda in Middelburg (2014).

Social proof

The school yard of ROC Scalda was deliberately cleaned during coffee- and lunch breaks. A poster with the text 'more than 100.000 people support clean' was collated on the scrubbing machine (Ruitenburg, 2014). When people are uncertain about a course of action, they tend to look to those around them to guide their decisions and actions. They especially want to know what everyone else is doing, especially their peers (Cialdini, 1987). The poster on the scrubbing machine actually conveys the message: 'If everyone supports clean, it will probably be all right to behave clean as well.' In this example two interventions, 'cleaning during day-time' and 'using means to communicate', were combined.

Norm activation

An example of activating the ought norm, is a picture of watching eyes. A well-known research of Beaman et al. (1979), where children were left alone in a room with a bowl of candy, showed that the self-awareness of the children induced by the presence of a mirror placed behind the candy bowl. The children took more candies than they were allowed to when the mirror was not present. Later research showed that images of eyes causes people to behave more cooperatively in an unconscious way (Bateson et al., 2006; Ernest-Jones et al., 2011). Thieme et al. (2012) experimented successfully with a BinCam, a social persuasive system which made digital pictures of disposed waste by young adults and uploaded them on Facebook.

Communication by means

If prompts, such as pictures of smileys, thumbs up or the word 'thank you' are communicated by means, the positive effect enlarges even more. At ROC Scalda, texts were pasted on scrubbing machines, cleaning trolleys and clothing of cleaners. Lecturers can be used as 'messengers of the right behaviour' by throwing their waste in the bin after lecture. These measures are effective because communication takes place on the moment of acting. In addition, it confirms the expected desirable behaviour.

Social identity

Showing people that clean behaviour is 'normal' by communicating the descriptive norm and using the social psychological mechanism of social identity, through a media campaign named 'Supporter van Schoon'. In this campaign, photographs are used on which a famous soccer player (Klaas Jan Huntelaar, RM), gives the right example by throwing his waste in the bin (picture 10 on page 34). People are sensitive to the behaviour of others, especially of public figures whom they admire and even more when this person is a peer. Images are easier to understand and more memorable, so focus on impacts that are easy to visualize (Newhouse, 2009; Trevor, 2008, cited in Perloff, 2010).

3.3.3 Norm Activating Environments

The second category of the HTIG framework (Broeders et al., 2010) is the norm activating environment. People are aware that the norm is to clear up your waste. Adaptations in the environment can stimulate the norm. This section reveals the ways to do so, by gamification, nudging and landscaping, keeping the environment clean, avoiding anonymous places and showing involvement.

Gamification

Probably the oldest successful example of persuasion by applying a norm activating environment is found in the Efteling, an amusement park in Kaatsheuvel. Confronted with such an everyday problem as litter, the Efteling came up with a creative and effective solution: 'Holle Bolle Gijs', or 'Big Mouth' (Efteling, 1959). Children never get tired of filling his chubby belly: 'Paper here, thank you,' he calls as people walk by (picture 5). Big Mouth is a success, however, it should be taken into

account that the bushes in its vicinity are barren, because children pick leaves to throw in Big Mouth. Therefore it seems that Big Mouth catches more waste than the average waste bins. Another remark concerns the short term effect. Big Mouth is a success because people visit the Efteling now and then. If people would be confronted by it on a daily base, perhaps they would get bored with it.

Another well-known Dutch persuasive example is the so called 'Blikvanger', the 'Can Catcher' (picture 6). It looks like a horizontal baseball net and is placed on the side of bicycling paths. Bicyclists are challenged to throw their waste in it. The waste which falls aside, is concentrated on one location and can be taken away easy and cheap (GemeenteSchoon, 2015). The disadvantage of the Can Catcher is that it does not catch small waste, such as chewing gum.



Picture 5: Holle Bolle Gijs (De Efteling, 1959).



Picture 6: Blikvanger (Gemeente Schoon, 2015b).

At the time they were invented, Big Mouth and the Can Catcher were not addressed as nudges and examples of gamification however, they can definitely be appointed as such. Deterding is internationally acknowledged as gamification specialist. He explains that gamification is a collective term for persuasive, playful and gameful design in non-gaming contexts. People get rewarded by incentives, not money or physical rewards but funny, playful and surprising experiences (Deterding et al., 2011b).

Popular examples of gamification can be found on Facebook. For instance, 'the Dancing Traffic Light Manikin', to refrain people to walk through a red traffic light (Smart, 2014) and 'the Piano Staircase', to stimulate people taking the stairs instead of the escalator (Fun Theory, 2009). A litter related example is 'the World Deepest Bin' in a park in Stockholm (picture 7). When you throw waste in it, you hear a funny noise like something is falling from a high distance in a well. Another example is 'the Bottle Bank Arcade Machine', meant to stimulate people to recycle their glass. By doing so, the machine reacts like an arcade machine, with rattling sounds and flashing lights (picture 8). More waste was collected through this waste receptacle compared with regular waste receptacles in the vicinity (Fun Theory, 2009).

Berengueres et al. (2013) introduced an Emoticon-bin, a recycle bin that rewards users with smiles and sounds. In an experiment the researchers showed that by exploiting human responsiveness to emoticons, recycling rates increase by a factor of x3. However, research of Nederland Schoon and SenterNovem shows that young people between 12-18 years find these kinds of waste bins childish and the sounds annoying (2008).



Picture 7: The World Deepest Bin (The Fun Theory, 2009).



Picture 8: The Bottle Bank Arcade Machine (The Fun Theory, 2009).

Nudging and landscaping

The expression 'nudge' was introduced in 2008 by Thaler and Sunstein and is defined as "any aspect of the choice architecture (designing the framework in which choices are made) that alters people's behavior in a particular way without forbidding any options or significantly changing their economic incentives." Nudges can for instance be applied for landscape interferences, giving clues to the user what to expect of a product or service and how to use it (Norman, 2002, cited in Hermesen and Renes, 2014). Landscaping can be described as manipulating the presence, visibility and/or attractiveness of several options (Hermesen and Renes, 2014).

An example was set by Ruitenburg at the school yards of several annexes of ROC Scalda. She used the 'routing technique' by visual cues in the form of green footsteps leading to receptacles and ashtrays. Footsteps are most effective because they approach real behaviour ((Boutelle et al., 2001; Ruitenburg, 2014).

Keeping the environment clean

Based on common sense FMs and CCs apparently do the right thing by keeping the environment clean (section 3.1.1), because indeed, scientific research substantiated that a clean environment stimulates 'clean' behaviour (Finnie, 1973; Payne, 2012, Cialdini et al., 1990). For instance, in an experiment researchers manipulated the littering behaviour in two car parks. One car park cleaned and the other one was strewn with litter. The scientists dressed the car parks with waste receptacles and placed leaflets under the windscreens of cars. The littered car park had the highest incidence of leaflets discarded on the floor, 30% whilst the cleanest car park had 15% (Cialdini et al., 1990).

In a conference organized by Stichting Nederland Schoon en Stichting Gemeente Schoon about waste receptacles in public space, is explained that any signs of 'crime', like graffiti, stickers, dents and rips communicate the wrong injunctive norm (see previous picture 1). Clean waste bins convey the message that the environment is cared for, which gives others the idea they have to do the same (Wildeboer, 2015). Student Ri1 provides a fine example in the group-wise interviews: "I throw my waste in the bin, because it looks clean and tidy inside this building."

Avoid anonymous places and show involvement

Litter does often occur on place where it can be smuggled unnoticed. Therefore, Nederland Schoon (2015) recommends to avoid anonymous places such as silent, remote corners in the building and places where no one seems to care about. Showing involvement is effective is well. If people

experience involvement with the environment, either by themselves or by signals showing the involvement of others, people are less inclined to littering behaviour.

In the group-wise interview, student D3 says he does not feel involved: “It is about feeling responsible. At your job you feel more responsible for the environment compared to school. I experience the school environment as too distant.” G5 says something interesting as well: “At the Mac Donald everyone cleans up his waste. It is simply ‘not done’ to litter, because (...) after you leave, someone else takes your place immediately and it is embarrassing if others see you didn’t clean up. At school it is different. It is not that busy, there is always place to sit.” This statement could be interpreted as ‘the university is an anonymous place and therefore it is easy to litter’.

3.3.4 Embodiment

The third category of persuasive interventions is embodiment, whereby the influence of the sensor motoric system is used to change the behaviour. Embodiment concerns knowledge activating proceedings by stimulating the senses, such as lemon odor and the colour green. These particular primes appeal to the embodied cognition of a common, cultural determined memories of cleanliness (Holland et al., 2005; Service Management, 2015; Wildeboer, 2015). For instance, this is the reason why Nederland Schoon uses green as one of their campaign colours. Another example was mentioned by Broeders et al. (2010). The smell of cleaning solution stimulates clean behaviour, and social behaviour as well. People do not like to approach a smelly waste bin. Dirt in the shape of smelly odours attracts dirt as well.

Priming

The appliance of the embodiment mechanism is called priming. At the ROC Willem I, priming was applied by placing tables with a shiny appearance. The experiment was based on research of Broeders et al. (2011) who stated “the data seem to suggest that the abstract concept of clean is indeed grounded in perceptual shininess. Regarding the problem of littering this could lead to interesting interventions, for example exposing people to a shiny floor leads to less littering and more binning behaviour.” When Ruitenburch combined thumbs up smiley posters with shiny tables, the decrease of cigarette ends improved with another 22%. The amount of remaining litter decreased as well, with 20% (Ruitenburch, 2011).

3.3.5 Injunctive and Descriptive Norms

The theoretical backgrounds of the injunctive and descriptive norms are already described in 3.2.2. This is the last type of the HTIG framework (Broeders et al., 2010).

Activating the injunctive norm

Previous findings showed the power of descriptive norms over injunctive norms. Cialdini (2003) says “norm based persuasive communications are likely to have their best effects when communicators align descriptive and injunctive normative messages to work in tandem rather than in competition with one another.”

Ruitenburch experimented with this principle at the Willem I College, aiming to prevent pupils from throwing cigarette ends on the floor. This is even a larger challenge, because most people do not consider it as ‘a sin’ to throw cigarette ends on the floor (Ruitenburch, 2015). Student Ri2 confirms this: “It depends if I am inside or outside. Inside I throw it in the bin, outside I like it to play soccer with my cigarette end” (laughing). The school facilitated smoking shelters with high tables and smoking poles with integrated ash trays. She activated the injunctive norm through texts on posters to remind pupils of the ought norm, viz throwing their cigarette in the smoking pole.” A resembling example is shown on picture 9.

Prompting

A second persuasive technique Ruitenburg applied at the Willem I College, was prompting. “Prompts are visual or auditory aids which remind us to carry out an activity that we might otherwise forget.” (McKenzie-Mohr, 2013). James (2010) says that you should not tell your customers to save the world, just tell them specifically and in concrete language that you like them to clean up their waste.

In the smoking shelters, posters with friendly texts were applied. It is wise to use the word ‘please’ on in messages. Payne (2012) points out that the most effective way to get things done, is ‘just ask’. It is an inexpensive way which does not require a great deal of infrastructure, only clipboards and webpages. An example is: ‘Please throw you cigarette end in the ash tray’ (injunctive norm), accompanied with a thumbs up smiley (prompting). This measure led to a decrease of 30% cigarette ends (picture 9).



Picture 9: Drop-pit. Combining prompting and injunctive norms, at ROC Friese Poort in Leeuwarden (NoviMores, 2013) (left).

Picture 10: Social Identity. Using a famous soccer player in anti-litter campaigns to set the right example, at ROC Scalda in Zeeland (NoviMores, 2014) (above).

3.3.6 Warnings

Until so far, potentially successful interventions have been described. This section reveals the pitfalls of failed intervention which occur when psychological mechanisms are neglected or misinterpreted. The pitfalls are the Boomerang effect, using instructing, threatening or so called ‘funny’ messages and punishment. Towards financial incentives, opinions differ.

The Boomerang Effect

In Auckland, New Zealand a litter campaign aimed to decrease the amount of litter around bus stops. Every day the litter around the bus stop was collected and presented in a transparent pillar. The yellow sign (picture 11) says ‘This is the rubbish dropped around this bus stop since last Monday.’ However, instead of reducing the amount of litter, it increased because the sign implicitly conveys the message that ‘other people throw litter on the floor at the bus stop, so apparently this is the norm’.

The Boomerang effect occurred in a Belgium poster campaign of the local authorities (picture 12). In a failed poster campaign of the municipality of Amsterdam, negation bias occurred. Research of Beukeboom et al. (2010) showed that denying sentences are in fact interpreted as an acknowledgement. The text on picture 13: ‘Do not leave waste next to the container’, will be

remembered as ‘you can leave waste next to the container’, especially if the picture shows a worn-out couch next to the container, communicating the descriptive norm that this is normal. The Boomerang Effect can be avoided by including an injunctive norm within the descriptive norm.



Picture 11: Boomerang effect (The Inspiration Room, 2008).



Picture 12: Boomerang effect (Anti-litter campaign OVAM, Fost Plus and local authorities Belgium, 2013).



Picture 13: Boomerang effect combined with negation bias (Beukeboom et al., 2010) (right and above).

Do not use instructing , threatening or so called ‘funny’ messages

Reich and Robertson (1979) presented “a theoretical model of how anti-littering messages vary in the kind of social pressure against littering they attempt to impose. Three experiments were performed to test the model. It was found that messages making explicit commands against the act of littering (external pressure) actually generated more littering than messages making appeal to social normative standards concerning littering (internal pressure).” Signs with threatening

messages show to be ineffective because it generates fear and fear does not give a positive stimulus for change.” (Reich and Robertson, 1979)

Hence, it is important to use the right words and images when communicating the social norm. Picture 14 and 15 show ineffective messages in which the customer is instructed to clean up his mess.

Another aspect to be taken into account, is that young people are allergic toward so called ‘funny’ messages, which are invented by adults. Better is to communicate in a brief, matter-of-fact way (Spangenberg and Lampert, 2013; Stichting Nederlands Schoon, 2015).



Picture 14: Dictating message (Ministerie van de Vlaamse gemeenschap, 2007) (above).

Picture 15: Poster with dictating message (HUA, 2015) (left).

Do not punish students

Nederlands Schoon (2015) discourages punishments such as cleaning the school yard. Because cleaning will transform in ‘something for losers’, it would only demotivate. Although this recommendation concerned secondary school pupils, it is likely it concerns students as well.

Financial incentives

Research shows that opinions about the effectiveness of financial incentives are divided. In a study by Burgess et al. (1971), the researchers encouraged children to pick up and deposit litter in a theatre. When they were provided incentives (€0.10) for the appropriate deposit of litter, this resulted in the removal of over 90% of litter, far more than the scores of non-incentive procedures.

Recently, many incentive-initiatives were implemented, such as combined anti-litter / recycling experiments on subway stations in Rotterdam and Greenup machines on secondary schools. People get rewarded with money, soda or a sandwich, when they deliver empty plastic bottles and soda cans into a machine. According to the supplier of Greenup, 98% of drinking packages return (De Weekkrant, 2014; OVAM, 2015; Stichting Ons Statiegeld, 2014; Tomra, 2015).

However, according to Payne (2012) financial incentives are not significantly effective. He states that if people are extrinsically motivated to clean up the litter, they will get bored with it after a while or even try to manipulate the reward.

Summary of research question 4: How can behavioural insights be applied to design persuasive interventions?

Two developments within social psychology are relevant for this study. First, the insight that change of automatic behaviour should best be approached by unconscious norm-activating interventions. This is more effective than trying to change the intentions by creating awareness. Second, there is an increased interest in applying insights from social sciences to design behavioral interventions, although due to the neglect or misinterpretation of psychological mechanisms, the designs sometimes fail or even lead to the opposite effect.

Several kind of interventions which are effective to influence the automatic behaviour can be applied. First, social cues, whereby the influence of social signals on the behaviour is used. Second, norm activating environments, whereby adaptations in the environment are applied to activate the injunctive norm. Third, embodiment, stimulating the senses to influence the behaviour. Last of all, the usage of injunctive and descriptive norms.

The pitfalls are the Boomerang effect, using instructing, threatening or so called 'funny' messages and punishment. Towards financial incentives, opinions differ.

3.4 Applying Persuasive Interventions, an Experiment at HUA

Based on the information in previous chapters, a selection of persuasive interventions was made and applied in experiments at HUA. This section starts with a brief description of HUA, followed by substantiations of the selection and choices made during the experimenting process. Finally, the results of the experiments are revealed.

This paragraph relates to RQ5, "How can persuasive interventions be applied to influence students into less littering behaviour?". Research has been done by means of experiments and observations.

The HUA building and litter

HUA is one of the twelve buildings of HU, settled in a relatively new building in Amersfoort which was delivered in 2010. It is 18.000 m² and seven stocks high building. Approximately 2.700 students are studying at HUA, in six different educational programs. The Hospitality department is responsible for cleaning services at all faculties. Cleaning services are outsourced to HagoNext. To get an overview of complaints of litter at HUA, the registered complaints from 2014 were retrieved from the FMIS. In 2014, 22 calls related to cleaning were done at HUA, either by customers or facility staff. In none of the calls litter was mentioned (Prequest, 2015).

Selection and overview of persuasive interventions

The results of RQ3 and RQ4 were validated by means of persuasive interventions at HUA. The selection was substantiated by combining the features of the students and aspects of their littering behaviour with 'fitting' persuasive interventions, based on comparable research of Nederland Schoon and the HTIG framework of Broeders et al. (2010). Embodiment was not chosen due to practical and financial reasons. When selecting and setting up the experiments, the following directives were taken into account, based on previous research:

- The experiments should be adjusted on the motives of the specific target group and in the specific context, i.e. the built environment (section 3.2.1 and 3.2.3);
- The experiments should be approached by unconscious norm-activating interventions (section 3.3.1 to 3.3.5);
- The experiments should have an evidence based character. Best practices will be discovered by the principle of trial and error;
- The experiments have to be executed within certain practical and financial limits.

The figure below explains the substantiation of the selection. Figure 6 on page 39 shows a timeline with an overview of interventions.







Persuasive interventions and techniques	Symbols
<ul style="list-style-type: none"> ▪ <i>Social cues: social proof, implementation intention, norm activating</i> <p>In general, people are aware that littering behaviour does not apply to the social norm. Social cues can be helpful as a reminder and to ‘push’ the behaviour in the right direction. Two interventions were made: all lecturers were requested by email to remind the students after class to throw away their waste. They received a second reminder by a Holle Bolle Gijs poster on the lecturer desk. Posters with persuasive texts were placed on walls and waste bins (communication by means). The following persuasive techniques were applied to the texts: social proof, the implementation intention and norm activation. Appendix VI shows pictures of the interventions.</p>	 
<ul style="list-style-type: none"> ▪ <i>Norm activating environment: visual cues and gamification</i> <p>The average student does not have a commonly shared feeling of responsibility for a clean environment, which reinforces the psychological mechanism of pre-dominant self-interest even more. They have an aversion of too many rules as well. Therefore several objects were placed in the environment in order to change the behaviour in a playful and non-intrusive way. The first technique used was nudging and landscaping. Visual cues were applied in the form of trails of red and green footprints. Second, two gamified waste objects were placed: the Puuke Puuken Long at the smoking area and a rubbish chute at the staircase between the 1st and 2nd floor.</p>	  
<ul style="list-style-type: none"> ▪ <i>Injunctive and descriptive norms: prompting</i> <p>The power of descriptive norms and informational social conformity is considerably, especially amongst students, who are sensitive for the opinions of their peers. They prefer small social networks in which mutual influence is strongly present. This can either have a positive or negative effect, depending of the social norm within the peer group. Therefore, intervening posters were developed in an attempt to influence the social norm. They were put on walls, waste bins (communicating by means) and placed on students’ open workplaces. Prompting was the persuasive technique applied.</p>	

Figure 5: Substantiated selection of persuasive interventions.

Results of persuasive interventions

In the following section, the data of the experiments will be shown. Details about the execution are described in Chapter 2 and Appendix IV. Because the measurements were not conducted on a regularly base, scatterplots were used to represent the data. The red vertical lines mark the intervention days. The measurements took place over a period of 276 days. The data were analyzed with SPSS. Pearson correlation coefficients were calculated to indicate the correlation between the days and the amount of litter. T-tests for independent samples were conducted to compare the average amounts of litter before and after interventions.

First, the findings of the open workplaces at the and ground floor, the 2nd and the 4th will be described. The ground floor, a section with ± 100 work- and meeting places, was appointed as ‘blank control section’. No interventions were done there. The correlation coefficient is -.086, meaning no pattern can be detected. When comparing the three sections, no intermediate matching patterns can be detected (figure 7 on page 40).



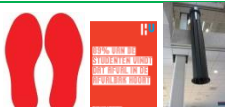




Timeline >	1-9-'14 (day 0)	3-12-'14 (day 99)	9-3-'14 (day 183)	1-4-'14 (day 220)
1. Open workplaces ground floor	Baseline measurements	Baseline measurements	Baseline measurements	Baseline measurements
2. Open workplaces & Staircase 2nd floor	Baseline measurements			
3. Open workplaces 4th floor	Baseline measurements	Baseline measurements		
4. Lecture halls A2.02 and C2.38	Baseline measurements	Baseline measurements	Baseline measurements	
6. Smoking area at entrance	Baseline measurements	Baseline measurements	Baseline measurements	

Figure 6: Timeline with overview of interventions.

At the open workplaces on the 2nd floor, a section with ± 100 work- and meeting places, the red footprints were placed on day 99. The chute and the posters were applied on day 220. Viewing the total period (day 0-276), the amount of litter seems to decrease gradually. There is a significant correlation with a coefficient of $-.672$. In the first period with no interventions (day 0-99), the correlation coefficient was $-.475$, indicating the amount of litter gradually decreased. After the red footprints intervention (day 99), the correlation coefficient was $-.222$, indicating the amount of litter gradually decreased, although less strong compared to the first period. The T-test shows there is a significant difference in the amount of litter between the non-interventional situation and the red feet nudges (.003). After the last interventions (day 220) the correlation coefficient is $.483$, showing the amount of litter gradually increases. The T-test shows there is a significant difference in the amount of litter between the non-interventional situation and the situation with the red feet, the chute and the posters (figure 8).

The scatterplot of the 4th floor, a section with ± 80 work- and meeting places, does not show a pattern before or after placing the green feet nudges on day 183. The overall correlation coefficient is $-.009$. The T-test indicates that the averages remain more or less the same, meaning there is no significant difference in the total amounts of litter before and after the intervention (figure 9).

Now, the results of the lectures hall will be described (figure 10 and 11). On day 220, posters with persuasive texts were placed and lecturers were requested to remind the students to throw away their waste after class. The scatterplot of A2.02 shows a significant decrease. The correlation coefficient is $-.325$. For both lecture halls the T-tests show differences in litter amounts before and after the interventions, although not significant (A2.02: significance of $.202$, C2.38: significance of $.111$).

Last, the Puiké Peuken Long was installed at the entrance. The scatterplot does not show a significant change (figure 12). The correlation coefficient is almost 0 and the T-test does not show a significant difference either (0.685). There is no significant difference in amount of cigarette end before and after the intervention.

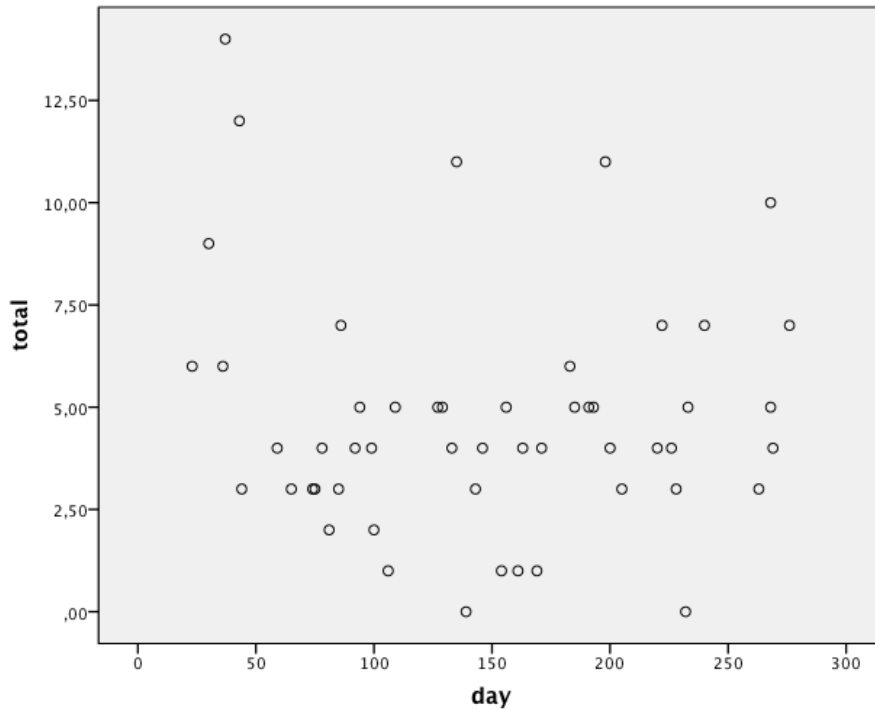


Figure 7: Amount of litter on the open workplaces on the ground floor (blank section).

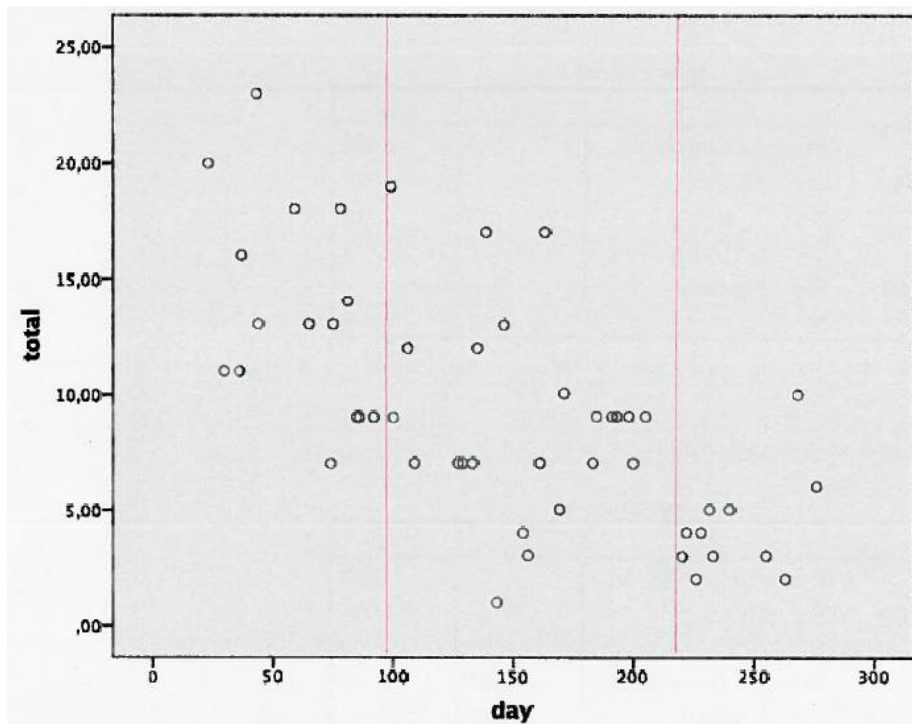


Figure 8: Amount of litter on the open workplaces and staircases on the 2nd floor.

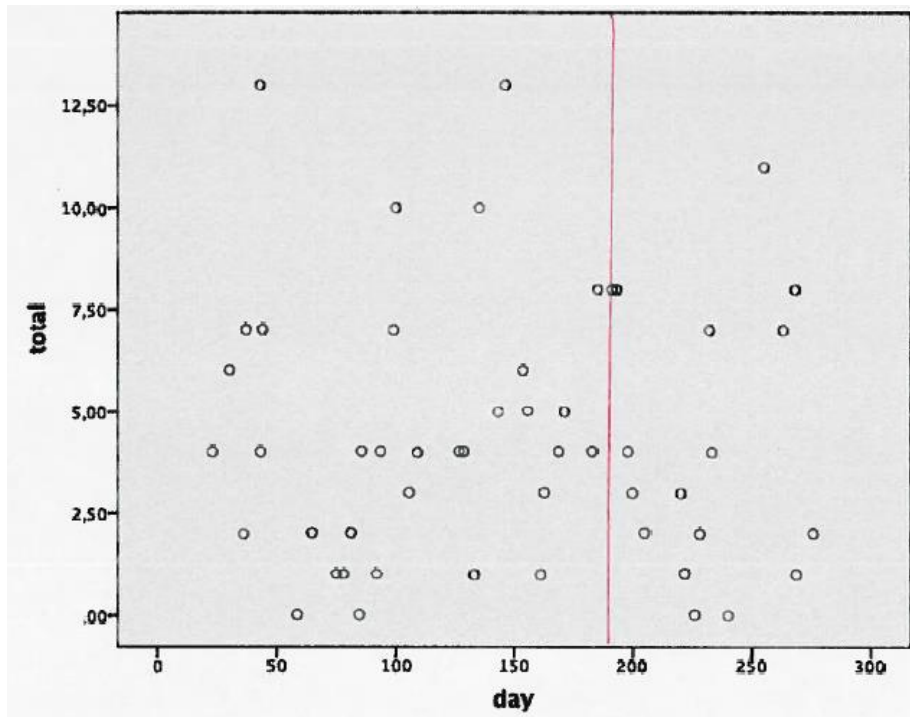


Figure 9: Amount of litter on the open workplaces on the 4th floor.

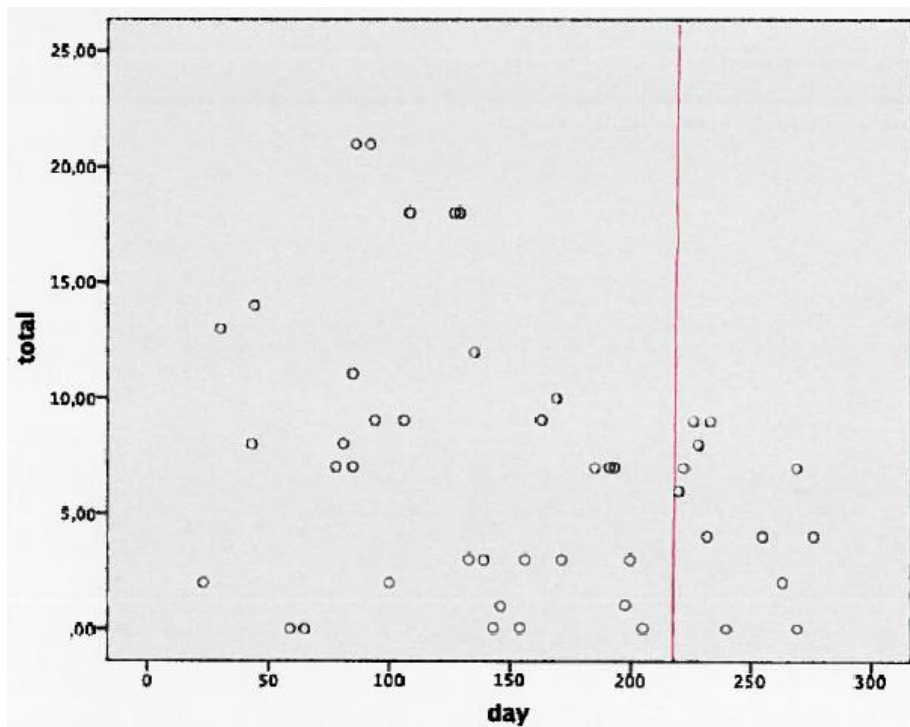


Figure 10: Amount of litter on the open workplaces in Lecture hall A2.02.

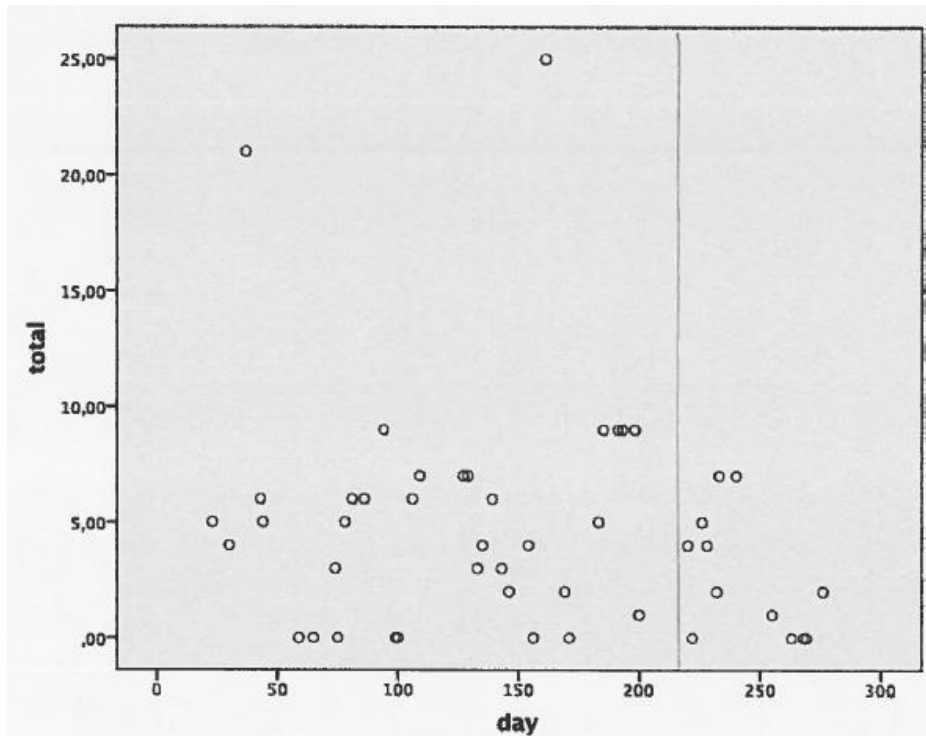


Figure 11: Amount of litter on the open workplaces in Lecture hall C2.38.

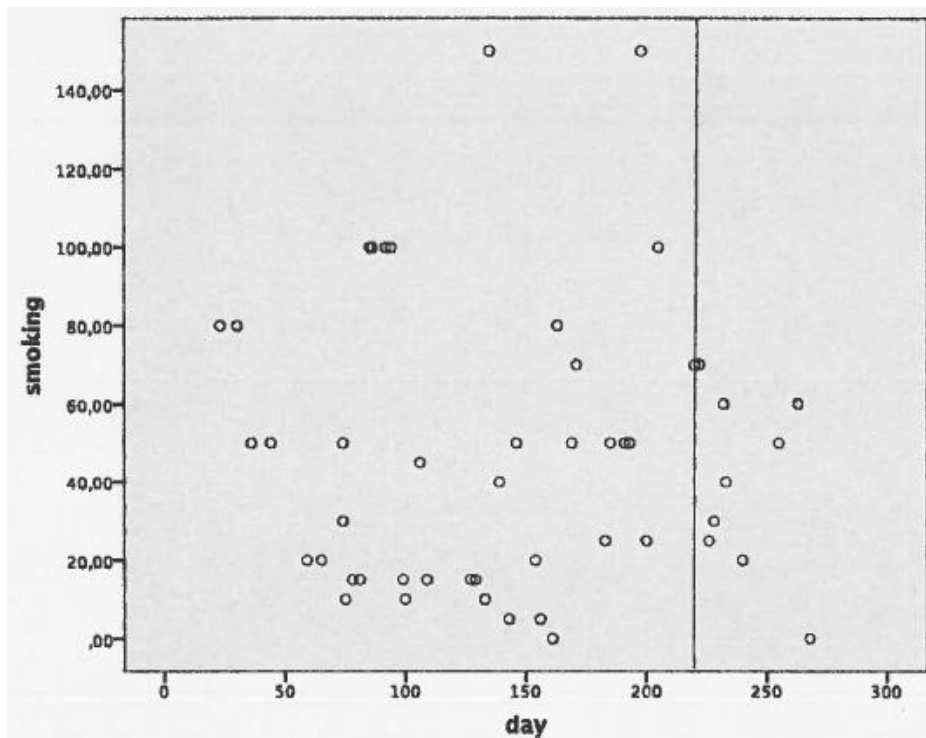


Figure 12: Amount of cigarette ends at the smoking area at the entrance.

Summary of research question 5: How can persuasive interventions be applied to influence students into less littering behaviour?

Persuasive interventions should comply to four directives: adjusted to the target group in the context of the built environment, approached by unconscious norm-activating interventions, having an evidence based character and be executed within practical and financial limits. The selected persuasive interventions for this experiments were based on 1) the principles of social cues, 2) norm activating environments and 3) injunctive and descriptive norms. Several techniques which are related to these interventions, were applied: social proof, the implementation intention, norm activation, visual cues by nudges, gamification and prompting. The results:

At the blank control section, no patterns could be detected. No intermediate patterns with the 2nd and 4th section could be detected either. On the 2nd floor, all techniques were applied in the shape of red footsteps, posters and the chute. From day 0-220 the decrease was significant. There is a decrease in the non-intervention period as well. The blank control section shows no decrease in the similar period. After the red footprints intervention, the litter decreased gradually although less strong compared to the non-intervention period. After the gamification / chute intervention on day 220, the litter increases significantly. On the 4th floor visual clues were applied in the form of green footsteps. There is no pattern and no significant difference before or after placing the nudges. In the lecture halls, social proof, the implementation intention and norm activation were applied in the form of posters and reminders. After the intervention, both lecture rooms show significant decreases however, the decrease of amounts were not significant. At the entrance, norm activation was applied by a gamification object. There is no significant difference in amount of cigarette ends before and after the intervention.

Chapter 4 Analysis and Discussion

In this chapter the quality of the research process and methods are evaluated, followed by a discussion of- and reflection on the research and the results. Finally, the value of the research is discussed and limitations are described.

4.1 Quality of the Research Process and Methods

In this section the reliability and validity of the research will be discussed. Triangulation of both qualitative and quantitative methods was applied to increase the validity (Verschuren and Doorewaard, 2010). The research quality of each separate research question will now be elaborated.

Reflecting on RQ1, RQ2.1 and RQ2.2, the interviewing technique with both suppliers (FMs and CCs) and customers proved to be suitable. Although academic literature towards RQ1 was scarce, the outcome of the interviews confirmed the assumption that litter is harmful for universities. Saturation was achieved, which indicates a sufficient external validity (Verhoeven, 2011). Universities could therefore take the outcome seriously.

Towards the reliability of the results of RQ2.1 and RQ2.2 the following remarks should be made. On one hand, the contribution of the interviewees towards effective anti-litter approaches can be considered as an instructive sharing of knowledge. Colleagues of other universities might find them inspiring and useful. On the other hand, only eight professionals were interviewed. There might still be more anti-litter approaches than those mentioned. Second, their approaches are embedded in the context of their working environment and are therefore not necessary applicable to other universities. Furthermore, later results (RQ2.3, RQ3) showed that FMs and CCs do not always effectively take the behaviour into account. Therefore, in Chapter 6 the recommendations of FMs and CCs will be complemented with recommendations based on behavioral research.

The approach of the research process towards RQ3 contributed to the validity of the results. The research started with conducting literature research, interviews with social psychologists and attending a relevant meeting, yielding insights in the features of young adults and habitual behaviour in general. The outcome was compared with the findings of the students' interviews. The results were used later on to substantiate the selection of the experiments.

Furthermore, the group-wise interviews with students turned out to be a fruitful method in several ways. The absence of an adult/lecturer stimulated free mutual discussion, thus increasing the results. This was affirmed by several attending students. A critical remark should be made towards the fact that 72% of the interviewees were FM students, whereas 28% studied Business Management. FM students probably have a professional paradigm towards the subject. Possibly they appreciate the value of a clean building more than the Business Management students. This could have led to a more positive attitude towards clearing up.

The results of RQ2.3 and RQ4 were combined and are based on extensive literature research, empirical research of best practices, interviews and a congress with social psychologists. The reliability of professional sources increased the external validity of the research. The findings revealed a wide range of possible interventions which are potentially useful to other universities, although further research of the target group and context should be conducted first before persuasive interventions are to be applied.

The experiments (RQ5) can be described as explorative research. Instead of testing a theory, the conceptual framework of Broeders et al. (2010) and empirical research of Nederland Schoon were used for ongoing development of persuasive interventions in the context of a university of applied sciences (Verschuren and Doorewaard, 2010).

Both internal validity and reliability of the experimental results are weak. According to Verschuren en Doorewaard (2010), the experiments should be considered as quasi-experiments, because they did not comply to all necessary conditions. First, the target group members should be appointed randomly by the researcher. However, the students were purposely not informed about the experiments to avoid the Hawthorne effect, “the unavoidable consequence that results when participants know that their behavior is being examined.” (Brannigan, 2004, in Izawa et al., 2011). Students could become aware of the fact that their littering conduct is being investigated and as a result, they could behave differently. In this field experiment, students were confronted with the interventions randomly and unconsciously. Nevertheless, after the group-wise interviews in May 2015, the Hawthorne effect occurred after all. Some students pointed out for themselves that they were the target group of the experiments with the coloured footsteps, the chute and the posters. Of course they spread the news amongst other students. In informal conversations with students, they seemed to become more aware of their own littering behaviour and of others, and they showed positive intentions towards clearing up. A study of Thieme et al. (2012) about motivating reflection and behavioural change in the food waste and recycling habits of young adults, showed similar results.

The second condition the experiment did not comply with, is the absence of external influencing variables. This was obviously impossible to realize, because the behaviour is being influenced by all sorts of non-manipulative variables:

- First, fluctuations in the *number of students*. In some periods few students are present, due to external apprenticeships. Therefore the conclusion may not be drawn that decreases in litter is a direct result of the interventions.
- The second variable is the intensity of *usage of the lecture rooms* related to the time of cleaning and measuring. For instance, if the researcher measured just after a full lecture and the cleaners did not clean yet, the amount of litter is obviously high. However, the figures do not show a reliable average.
- An third variable concerns *the weather*. This could influence the results of the Puik Peuken Long.
- Finally, *individual variables* such as age, matureness, social economical background and the feats and mood of an individual at a certain moment, could influence the outcome of the results.

The reflection on reliability and validity of the experimental research confirms that behaviour change interventions are complex, comprising many interacting components (Craig et al., 2008). The effectiveness of experimental interventions is variable, and there is no full understanding yet of what accounts for this variability (Michie and Johnston, 2012; Renes, 2014). Because the findings were exposed to many coincidental circumstances, the internal validity is weak. Nevertheless, the real-life characteristics of the experiments contributed to the external validity. The results indicate to further experiences and can therefore be valuable for conceptual use at HU and other universities (Verschuren and Doorewaard, 2010).

Last of all, the quality of the research process was improved by having this thesis reviewed by two fellow students.

4.2 Discussion of the Results

This section describes in what way the research results relate to the (theoretical) assumptions and expectations of the Rationale and Chapter 1. New insights will be discussed as well. The Rationale already indicated that indoor litter at universities is considered to be a hot topic. Further research indeed confirmed the relevancy of the problem. Universities should take the litter issue serious. Less litter could contribute to the image of the university, possibly to the educational environment, customer satisfaction, the effectivity of FM and cleaning services and in a larger context, a sustainable environment.

Current anti-litter approaches of FMs and CCs mainly have a practical character, aiming at preventing and solving symptoms. The results suggest a certain awareness towards the importance of the customer's behaviour and some of the interviewees consciously apply persuasive techniques as well, although they seem to be based on common sense instead of on thoroughly substantiated scientific arguments. The findings did not reveal if the approaches were designed specifically to fit the target group and the context.

Then the question arose if the behaviour should not be the starting point of change. This assumption was strongly confirmed by further research, in particular by many empirical studies. Littering should be considered as habitual behaviour which is hard to refrain from. Often is assumed that awareness campaigns are a proper instrument to behavioural change, but research shows its effectiveness is limited. First, because habitual behaviour asks for a different approach, namely by unconscious norm-activating interventions. Second, because young adults are less sensitive to the same motivational triggers as older generations. The results reveal that young adults are rather self-centric and not interested in societal issues, a sustainable environment and responsible behaviour. On the other hand they can be designated as self-reliant, stabile and venturesome. They possess positive, transforming abilities, which could be exploited when behavioural changes are desirable.

Another question posed was if perhaps recent persuasive tools, such as gamification and nudging, were feasible instruments for behaviour change? The results showed that when businesses wish to change their customer's behaviour, a wide range of persuasive interventions is available. The appliance of persuasive interventions beholds both threats and opportunities. Due to the neglect or misinterpretation of psychological mechanisms, the designs sometimes fail or even lead to the opposite effect. This substantiates the assumption that holistic and integral approaches by experts on the field of FM, cleaning, social psychology and design are conditional for success. Furthermore, the recent attention towards persuasive interventions creates opportunities as well. Research on the topic increases, scientific insights improve and this will hopefully yield more effective anti-litter projects.

The main question of the research concerned the effectivity of persuasive techniques to reduce littering behaviour of students. Although the results showed clear directives towards the selection and appliance of persuasive norm-activating interventions, the exact answer to the question remains uncertain, because the research quality of the experiments was insufficient and the findings were ambiguous. Therefore, the extent to which the interventions were effective, cannot be proved.

4.3 Reflection on the Research

In this section will be reflected upon the choices which were made during the research. Connections, similarities and contradictions of the results, and the influence of research circumstances will be discussed.

Choices during the research process

Concerning the choices made during the research, the first issue to encounter was the discovery that literature towards RQ1 was scarce, although this information was needed in order to write the Rationale and Chapter 1. Therefore, the preliminary research was done by gathering information through field research amongst FMs and CCs.

Furthermore, the decision was made that RQ2.3 had to be combined with RQ4, because it turned out that the (semi) governmental organizations were an expert on applying persuasive interventions. The evidence based results of their research at secondary schools were very useful. Finally, choices had to be made towards the content and limits of RQ3, 4 and 5. They changed several times because the research became too extensive otherwise.

Last, some choices were made towards the experiments (RQ5). First, observations during the first weeks showed that relatively small amounts of litter were left behind. To increase the reliability of the results, it was deemed necessary to conduct the baseline measurements over a relatively long period of three months.

Second, the measurements at two places were stopped, because there was too few litter (classrooms on 6 October, Monkey Rock on 24 November 2014).

Third, after applying the red footprints, further research showed that red is not an ideal colour because it is supposed to have a repellent effect. Green was supposed to be a better colour (Ruitenburg, 2015). Therefore a trail of green footprints was added to investigate possible differences between red and green.

Last, a considerable amount of time passed between the first and second intervention. It took time to assign, develop, construct and install the gamification objects. Furthermore, more research had to be done first in order to gain necessary insights which were needed to choose the appropriate interventions.

Connections, similarities and contradictions of the results

Comparison of the field research results with FMs and CCs on one hand (RQ2.1, RQ2.2) and results of behavioural research on the other (RQ2.3, RQ3, RQ4) shows several similarities, such as the relevancy of keeping a clean environment by result driven cleaning, using the right receptacles on the right place and partnerships with external partners. Some of the communicative measures of FMs and CCs have a perfect 'fit' with behavioural insights. For instance, by 'using' senior students to instruct fresh students, the mechanism of social conformity is used. Using positive, stimulating messages instead of rules and punishing, is effective in general and it fits to the aversion of too many rules as well. Most interferences of FMs and CCs are not insufficient however, would the interferences be (re)developed based on persuasive insights, they could probably be more effective.

Contradictions came out as well. According to literature and CCs, day-cleaning leads to a decrease in littering behaviour. However, several students think the opposite is true. This suggests that the persuasive power of day-cleaning is effective when applied on secondary school students and office workers, and it is less/not effective when applied on higher educated students.

A second contradiction shows that some of the communicative measures of FMs and CCs are focused on increasing awareness. However, academic sources show that littering is habitual and therefore asks for an unconscious norm-activation approach. Nevertheless, awareness campaigns

should not be banned. It is not that they are entirely ineffective, but they should not be the main approach. There should be a focus on unconscious norm-activation, supported by awareness stimulating measures.

Furthermore, some anti-litter approaches have benefits and disadvantages at the same time, such as surveillance and maintaining house rules. The interviewees all agree that it is necessary but at the same time, it is hard to carry out, it has a short-term effect and it should not be combined with punishment.

Some difficulties became clear as well: the partnership between FMr and CC seems to be an ideal concept, however in daily practice the benefits are overshadowed by financial issues, leading to tensions in the partnership.

Second, an integral approach within the organisation is crucial, but the results show that there often is an absence of a sustainable strategy and/or priorities.

Comparison of the results to RQ3, 'why do students litter', solely showed similarities between academic results and how the students typified their own behaviour. To analyze the findings of the students' interviews, a model was designed based on two conceptual frameworks (figure 13). First, the 'least effort principle' which presumes that "animals, people, even well designed machines will naturally choose the path of least resistance or 'effort'" (Kingsley, 1949). Second, the Fogg Behavioral Model (FBM). According to Fogg (2009), "behavior is a product of three factors: motivation, ability and triggers (...). The FBM asserts that for a person to perform certain target behavior, he must be sufficiently motivated, have the ability to perform the behavior, and be triggered to perform the behavior. These three factors must occur at the same moment, else the behavior will not happen." If people are not motivated to change, it has no use to persuade them. Therefore, the target behaviour has to be made easier by increasing the ability. Fogg sometimes replaces 'ability' with 'simplicity'. "In practice simplicity is what persuasion designers should seek. By focusing on simplicity of the target behavior you increase ability." (Fogg, 2015) In other words, when the target behaviour is simplified, the perceived effort decreases and the ability to change increases.

Compared to the TPB of Ajzen (1991), the FBM focuses on behaviour change instead of on attitude change. Therefore, it is likely to have a larger effect on automatic behaviour.

The red threshold in figure 13 marks the difference between clearing up (right-above) and littering (left-under). Persuasive triggers are only effective when the combination between motivation and the level of perceived effort (the ability) rises right-above the threshold. Elucidation of the model, clockwise starting at the top right:

- 'Friends do clear up': the social norm amongst student groups depends. Sometimes it matches the ought norm and conveys the message to clear up. This will motivate new students to do the same. The effort will than 'automatically' be perceived as low.
- 'Feeling responsible for the university environment': a minority seems to feel responsible. The students who do, are motivated to clear up and therefore the effort is perceived as low.
- 'Waste bins on the right place': students clear up, even when the motivation is low. If there are sufficient waste bins on the walking routes, the effort is perceived as low.
- 'Friends do not clear up': when the social norm within the peer group is not to clear up, the descriptive norm will defeat the injunctive norm. The motivation decreases and as a result, the effort is perceived as higher.
- "Being in a hurry": the effort is perceived as high, because the student has got other priorities. The motivation at that particular moment is low, although it could increase at another moment,

'Being with friends': striving to belong to the peer group has a higher priority than adapting to the ought norm. When the waste bin is just two steps away, clearing up will usually be perceived as a low effort. However, when a student is walking together with friends, he rather remains with them instead of making the effort, even if the waste bin is just two steps away.

- 'Lazy': predominated interest leads to a high perceived effort and as a result, the motivation decreases. In different circumstances, when the student would not feel lazy, the effort could be perceived as low(er) and the motivation could increase.

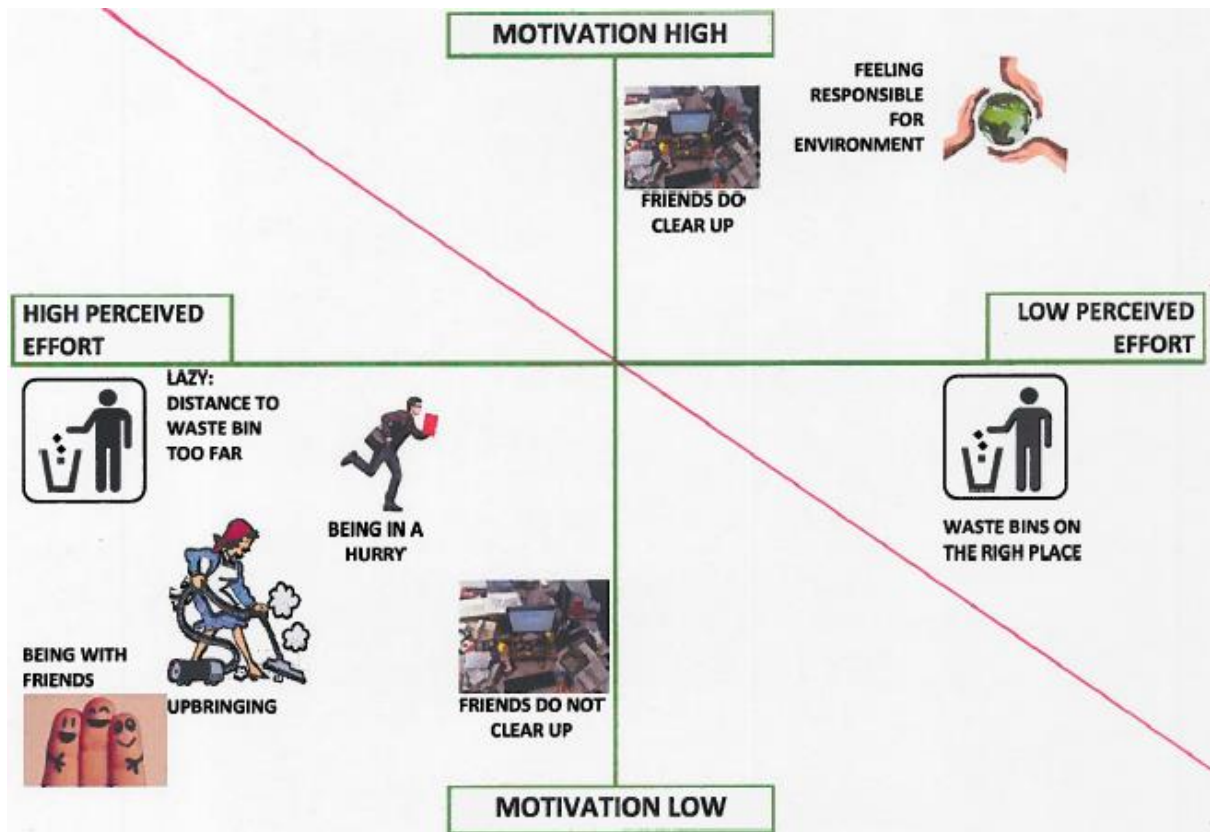


Figure 13: Model of littering behaviour of students (Mulder, 2015).

The analysis towards RQ3 shows that motivation and the perceived effort to clear up, are mutual dependent and therefore instable. They can change from moment to moment (Fogg, 2009). The findings show that the motivation is mostly low and the perceived effort is high.

Furthermore, the research towards RQ2.3 and RQ4 stagnated several times because of the enormous amount of literature concerning behavioural insights, which made it hard to make choices for suitable theories.

At the same time, it was hard to find an appropriate conceptual model to frame the experiment, due to the scarce research towards the indoor litter topic. Finally, the framework of Broeders et al. (2010) was selected however, it is quite generic and does not provide concrete directives. Therefore, the author formulated four directives based on RQ3 and RQ4 (page 37). Fortunately, the empirical results of the research of Ruitenburg (2015) and Nederland Schoon (2014) were available and instructive. The HUA experiments was partly based on them.

Finally, the experiments with persuasive interventions and techniques (RQ5) will be reflected upon.

At the blank control section no patterns in numbers nor in fluctuations were seen. No intermediate patterns with the 2nd and 4th floor could be detected either. This suggests that the interventions on the 2nd and 4th floor had an effect; however, the results have to be analyzed first before this can be sustained. Furthermore, unknown variables could have been influencing the results. For instance, the researcher observed a lower presence of students at the blank section compared to the 2nd floor. If there were other influencing factors, remains unknown.

The data of the 2nd floor show an ambiguous outcome. Between day 0-220, a gradual decrease of both patterns and the amount of litter is shown. Nevertheless, a positive effect of the interventions cannot be confirmed. First, due to the fact that there is a decrease in the non-intervention period as well (day 0-99). On the other hand, this may be caused by the usual failure of first year students at the start of the academic year; however, the blank control section shows no decrease in the similar period. Reasons remain unknown.

After the red footprints intervention (day 99-220), the litter decreased significantly, but less strong compared to the non-intervention period. Again, reasons are unknown.

After the red footprints + posters + chute intervention on day 220, the litter increased because of unknown reasons. Observations showed that during the first three weeks, the chute attracted many curious people, although they often just opened the lid to hear the gong. After three weeks, the chute was gradually used less. In June, it was hardly used at all. This outcome suggests that a gamification object might have a short term effect. This is substantiated by a statement of Verschuren en Doorewaard (2010). In an experiment, people are placed in an uncommon situation. Even minor changes of variables, such as the chute, might result in changed reactions although it is uncertain what happens when a variable becomes commonplace and people get used of it.

On the 4th floor heavy fluctuations occurred. No pattern was detected before and after the intervention, possibly due to the fact that this section is used by PABO students⁴. They have regular apprenticeships and therefore spend less time at HUA compared to other students. A difference between the effectivity of red and green footsteps could not be determined. Drawing the conclusion that there actually is no difference between green and red, is premature due to unclear variables.

Both lecture rooms show significant decreases; however, the decrease of amounts were not significant. An explanation for the low amounts of litter could be the result driven cleaning of HagoNext, which they gradually implemented starting from the beginning of the academic year 2014-2015.

Last of all, the Puik Peuken Long. There was no significant difference in amount of cigarette ends before and after the intervention. When observing, at first the researcher noticed a lot of attention for the object. Students approached it, read the gaming rules and were trying to shoot their cigarette end in the funnel. The Puik Peuken Long even became a topic on Twitter and people texted positive messages about it, although they assumed it was meant to increase awareness towards unhealthy effects of smoking!

The weather is an influential variable. The researcher observed that the sunnier and dryer the weather, the more students smoke outside, the more cigarette ends lying on the floor. Observations showed that rain seemed to be a less influential factor than sun and temperature. If it rains, students shelter under a roof. Possibly, rain could decrease the usage of the gamification object, while sunny and dry weather could increase it.

Unfortunately, a week after the object was installed, vandals kicked a dent in one of the 'lungs'.

⁴ PABO: Pedagogic Academy for Primary Education.

Observation showed that less cigarette were thrown in after the incident. It is uncertain why, perhaps the object was found less attractive and/or perhaps students got used of it. After two more weeks the object was set on fire by a cigarette and the night after it was demolished completely by vandals. Unfortunately, it had to be removed.

The testing period was short and the object was demolished, therefore it is premature to draw any conclusions from the data.

Influence of research circumstances

The implications of littering for other organisations than universities, will be more or less the same although the intensity of the impact could differ. The anti-litter approaches of FMs and CCs in different organisations will probably be similar, although there might be differences as well.

Perhaps they invented other measures than those mentioned in this thesis, depending of the target group and the built environment (for instance, children on a primary school vs. bank employees need different approaches). The results of the experiments are likely to diverge in different situations, due to external variables (page 44-45).

4.4 Limitations

In this section the applicability of the outcome and the delimitation of the research will be discussed. This thesis research aims to support FMs and CCs in handling littering behaviour by means of academic research. The results might be applicable to groups of young adults on other schools and universities (of applied sciences) as well. It is important however, to taken the features of the target group and the built environment into account. Level of education, size of the university and social geographical aspect are influential.

Although the internal validity of the experiments was weak, the real-life characteristics of the experiments contributed to the external validity. The results indicate to further experiences and can therefore be valuable for conceptual use at HU and other universities. However, the effectiveness of experimental interventions is variable.

Delimitation: The research focused on a specific target group in a specific context. The research has been written from the point of view of FM and cleaning services. The recycling of waste was not taken into account.

Chapter 5 Conclusions

In this chapter the most important results are summarized and the main question will be answered.

Indoor litter at universities of applied sciences is a relevant issue which should be taken serious. Less litter contributes to the image of the university, the educational environment, customer satisfaction, the effectivity of FM and cleaning services and a sustainable environment. Current anti-litter approaches of FMs and CCs are mainly practical, preventing and solving symptoms. Some measures have a 'fit' with behaviour however, the behaviour should be the starting point. A recent trend to achieve sustainable behaviour is by applying persuasive interventions. This thesis research focused on the main question: "How effective are persuasive techniques to reduce littering behaviour of students at a university of applied sciences?"

Research approach: the implications of littering were explored to confirm the relevancy of the issue. The effectiveness of current anti-litter approaches of FMs and CCs were investigated, possibly to be complemented with behavioural insights in a later stadium of the research. The littering behaviour and features of the students and scientific- and evidence based findings of similar research were studied. This knowledge was needed before a selection of persuasive interventions could be made. Based on these findings, experiments were applied at HUA. The research methods were literature review, group-wise- and individual interviews, experiments and observations.

Littering is habitual behaviour. This asks for an approach by unconscious norm-activating interventions. The right norm can be activated by social cues, norm activating environments, embodiment and applying injunctive and descriptive norms. An integral approach by expert stakeholders is needed for success.

The interventions should 'fit' the target group. Students share few common responsibility for a clean environment, which reinforces the pre-dominant self-interest. The motivation to clear up is low and the perceived effort is high. Therefore the target behaviour should be simplified. They appreciate small social networks, which increases the power of descriptive norms and informational social conformity. Depending of the social norm within the peer group this can either stimulate or discourage littering behaviour. The positive, transforming abilities of students could be exploited when behavioural changes are desirable. Young adults dislike too many rules, therefore behavioural changes should be approached playfully and non-intrusive.

The experiments applying social cues, norm activation by nudges and injunctive and descriptive norms showed some significant improvements. The gamification experiments did not. The internal validity and reliability was weak. Nevertheless, the real-life characteristics of the experiments contributed to the external validity.

Chapter 6 Recommendations

In this chapter, the recommendations for HU and comparable universities will be revealed. Based on lessons learned, several follow up advices for further research will be given.

Recommendations on a strategic level

Universities of applied sciences should take littering behaviour serious to prevent from harmful effects. University Boards are advised to start by incorporating sustainability ambitions and goals in their business strategy. Behavioural knowledge and research should be applied in the entire strategic process. It is important for a Board to show commitment by initiating anti-litter projects, eventually combined with/or embedded in sustainability- or recycling projects. The impact of the new strategy on budget and perceived work pressure should be taken into account.

Directives and conditions

When universities aim on reducing littering behaviour by persuasion, several directives should be taken into account.

- An integral approach is needed. FMs and CC should seek collaboration with (student) designers and social psychologists.
- The interventions should be adjusted on the target group and features of the building. Therefore research is needed beforehand.
- An essential directive is that the right habitual behaviour (clearing up) should be facilitated and the wrong habitual behaviour (littering) should be disturbed.
- The 'disturbance' of wrong habitual behaviour is best to be approached by unconscious norm-activating interventions in a playful, non-intrusive way.
- A holistic approach is recommended. Combinations of several interventions should be applied, eventually supported by an awareness campaign. However, the focus should be on persuasion. The persuasive interventions can be combined with already existing, effective current anti-litter approaches.
- Concerning experimental interventions, best practices will be discovered by the principle of trial and error.

Interventions

Now, the interventions will be described whereby behavioural insights are combined with best practices of FMs and CCs. The interventions will be divided on a social cognitive-, physical- and organisational level.

On a *social cognitive level*, the following current anti-litter approaches should be maintained and/or redeveloped and improved. They activate the social norm and support the integral, holistic approach.

First, awareness campaigns should no longer be the main approach however, they do not need to be banned either. Awareness stimulating measures, such as sharing (recycling) successes, support norm activation.

Second, keeping a clean environment by result driven cleaning and through partnerships with external partners. This requires knowledge of the behaviour, of litter-patterns in the building and a pro-active attitude of both facility- and cleaning staff.

Furthermore, senior students should be appointed to explain house rules to fresh students. It should have a holistic approach, aiming at all kinds of behaviour, such as placing the bicycles in the bicycle facilities, no feet on the couch, no writing on the back of chairs, etcetera.

Last, surveillance and maintaining the house rules in a non-punishing and positive way, conducted by cleaning staff, janitors and lecturers. This fits to the holistic approach and supports other measures.

Based on behavioural insights, the following ‘new’ approaches are recommended.

Dare to experiment with persuasive interventions, such as social cues (social proof, implementation intention, norm activating, prompting), norm activating environments (visual cues), embodiment (prompting) and combine injunctive and descriptive norms. The interventions should be tested in advance, for instance in pilots, to investigate the most likely ‘fits’ with the target group and the building. Several persuasive techniques should be combined, tried out, be measured, improved, etcetera. It is a matter of trial and error.

Second, lecturers and designers are recommended to involve students in anti-litter projects and make an appeal on their positive, transforming abilities. Behavioural change will be yielded rather from inside out as when it is imposed by adults.

Modeling is important. Lecturers should be a role model by giving the right example. They should clear up their waste, request students to do the same and in particular, not give loud mouthed reactions when a janitor or cleaner asks them to clear up.

Last, some don’ts will be given as well. It is hard to keep the attention attracted, therefore the use of gamification objects is discouraged. Instructing-, threatening-, so called ‘funny’ messages and punishment are dissuaded. A special advise for HUA is to remove the instructive posters (picture 15), because they are not effective.

On a *physical level*, several current anti-litter approaches should be maintained and combined with new insights, because they facilitate the desirable behaviour.

First, communication by means. Apply persuasive texts on cleaners’ clothes and persuasive posters on waste bins and larger cleaning materials. Posters on tables and walls should be avoided.

Second, the motivation of students to clear up is low, so apply the least effort principle by placing the right receptacles on the right place. They should be functional, visible, clean, well maintained and with eye catching designs. There are indications that red is not a favorable colour for a waste bin. The bins should be positioned on walking routes on regular, mutual distances.

Third, concerning the cigarette issue, it is recommended to use drop-pits combining prompting and injunctive norms (picture 9). The CC should always leave a layer of cigarette ends in the drop-pit, but the environment of the pit should be swiped clean. The absence of cigarette ends conveys the norm that it is normal to throw your cigarette end in the drop-pit. A smooth surface of tiles is recommended to ease the swiping.

Furthermore, purchasers and catering companies should aim to decrease packing materials.

Last of all, some suggestions for practical interferences: hang mirrors above waste bins, put shiny tables in smoking zones, take care of fragrance refreshers (lemon), apply colours which are associated with cleanliness (green, white).

A don’t is given as well. Smoking zones are ineffective because of the power of the descriptive norm over the injunctive norms. Unless the smoking zone complies exactly to the smokers’ wishes, it is discouraged. A special advice for HUA: remove the white smoking line at the entrance. It is ineffective and it conveys the undesirable message that HUA’s house rules can be neglected.

The following recommendations can be given on an *organisational level*. Obviously the above mentioned recommendations need organizational effort as well however, that is not what will be discussed here. This section concerns organizational improvements based on the findings.

First, FMs and CCs should regard the litter issue as a common problem. To avoid (financial) tensions, they should discuss mutual expectations concerning responsibilities and tasks in the tendering phase. Thereby they should be aware of the fact that $\pm 10\%$ of the total cleaning time consists of clearing up litter. Costs can be saved by investments aiming to decrease littering behaviour, instead of economizing on time norms and budget.

Second, good employership towards cleaners is needed, because of social considerations and prevention of sickness leave. Furthermore, satisfied employees show a better performance, which indirectly contributes to less litter.

Follow up

Now, recommendations for follow up research will be given. Some of them are based on the lessons learned from this thesis research.

First, the assumption of FMs and CCs that day-cleaning is effective on a university, should be investigated further, because the results of the students' interviews claim otherwise.

Second, towards financial incentives, opinions differ. Further research is needed to find out if a Green machine perhaps could be an effective solution for universities.

Third, the research was based on the features of the limitless generation. However, a new generation already 'arises'. Therefore new research will be needed.

Furthermore, when anti-litter objects are used outside, they should be resistant against vandalism.

Last of all, the HUA experiments were disturbed by external influencing variables. The reliability and validity of experimental research could be improved in several ways:

- By relating the measurements of litter with the amount of students in closed rooms. In the lecture halls, sensors could be placed to measure the frequency of use and the number of students attending.
- When the amount of people is clear, this could be related to the amounts of waste in waste bins, also by a sensor.
- When outdoor experiments are conducted, the litter amounts should be related to the weather forecast.
- Fluctuations in litter could be partly related to the revenues of the catering company in the building.

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Meetings

- Hermesen, S. (2014) Meeting of Project Team "Touchpoints!" *"Persuasive design."* (Attended: 4 November 2014).
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Appendix I: Acknowledgement of Research

RQ	Interviewee or respondent	Profession	Company	Research technique	Date
1.1	Mr. J. Schouten	Director software company (customer of FM department HUA)	BitPress Educatie	Interview	29-9-'14
1.1	Mr. M. Luimes	Lecturer SBRM (customer of FM department HUA)	Hogeschool Utrecht, University of Applied Sciences	Interview	02-10-'14
1.1	Ms. M. van Laar	Lecturer social work (customer of FM department HUA)	Hogeschool Utrecht, University of Applied Sciences	Interview	15-10-'14
1.1	Mr. A. Molenaar MBA	Manager SBRM (customer of FM department HUA)	Hogeschool Utrecht, University of Applied Sciences	Interview	20-11-'14
1.1	Mr. J. Stomphorst	Marketing and communication Staff	Hogeschool Utrecht, University of Applied Sciences	Informal conversation	31-10-'14
1.2 2.1	Ms. B. Kostverloren MSc	Hospitality manager HU (former)	Hogeschool Utrecht, University of Applied Sciences	Interview	15-10-'14
1.2 2.1	Mr. A. Schelhaas MBA	Operational manager railway stations (former)	ProRail	Interview	30-10-'14
		Hospitality manager HU (current)	Hogeschool Utrecht, University of Applied Sciences		
1.2 2.1	Ms. L. Zeeuwen	Facility manager Forum Gebouw	Wageningen University	Questionnaire	31-10-'14
1.2 2.1	Ms. N. Prumers	Contractmanagers / Teamleaders Housekeeping & Technical Services	Saxion University of Applied Sciences	Double interview	5-2-'15
	Mr. P. Wolsing				
1.2 2.2	Mr. Y. Kacmaz	Coach cleaning staff HagoNext at HUA	HagoNext	Informal conversation	9-2-'15
1.2 2.2	Mr. R. van Waes MBA	Accountmanager at waste company	Ecosmart Nederland	Interview	2-10-'14
1.2 2.2	Ms. S. Eljaddaoui	Entrepreneur and cleaning expert cleaning company	HagoNext	Interview	11-11-'14
1.2 2.2	Mr. D. van Vliet	Director cleaning company	SVP Diensten	Interview	26-11-'14
2.3 4	Ms. H. van Zutphen MSc	Director of foundation concerning anti-litter campaigns, marketing and communication specialist	Stichting Nederland Schoon	Interview (phone)	19-11-'14
2.3 4	Drs. L. Wildeboer	Social psychologist, specialist in behavioural change towards littering	Dijksterhuis & Van Baaren Applied Behavioural Science	Attended a congress about reducing litter in de the public domain	29-1-'15
	Mr. H. Klein Teeselink	Project manager Stichting Nederland Schoon	Stichting Nederland Schoon		
3 4	Ms. K. Ruitenbergh MSc	Social psychologist, specialist in behavioural change towards littering, supplier of Stichting Nederland Schoon, owner of Novi Mores	Novi Mores	Interview	7-1-'15
3 4	Dr. J.R. Renes	Professor cross media communication in the public domain, social psychologist	Hogeschool Utrecht, University of Applied Sciences	Interview	17-10-'14

3 4	Mr. S. Hermesen MSc	Lecturer and researcher cross media communication in the public domain, social psychologist and designer	Hogeschool Utrecht, University of Applied Sciences	Attended a meeting about persuasive design	4-11-'14
1.1 3 5	39 students	Students	Hogeschool Utrecht, University of Applied Sciences	Group-wise interviews	May '15
4	Mr. B. Setola	Lecturer, designer	School of Arts Willem de Kooning Academie	Informal conversation about gamification	17-2-'14
5.1 5.2	Mr. B. Kortman	Lecturer, designer, artist	School of Arts Willem de Kooning Academie, Studio Kortmann	Developing a persuasive design assignment	18-11-'14 until 22-1-'15
n.a.	Cleaning staff	Cleaning staff HagoNext at HUA	ISS (former), HagoNext (current)	Informal conversations	15-9-'14
n.a.	Ms. S. Valenbreder	Program manager sustainability	Hogeschool Utrecht	Informal conversation (phone)	27-10-'14

Appendix II: Interview Questions

Interview questions belonging to RQ1.1, used in Chapter 1

RQ 1.1 What are the implications of littering for the customers?

Respondents: Students, lecturers, managers, visitors.

1. How is your impression of the HUA building, specifically when observing tidiness and litter? If the respondent mentions he observes litter:
 - a. How does it affect you as a customer/visitor? What emotions do you experience when noticing litter?
 - b. Alternative question if the respondent mentions he thinks it is tidy enough in the building: Have you ever been in a (school)building where you noticed much litter? If yes: What emotions did you experience when noticing litter?
2. When you notice much litter in the building, how does it affect the way you look upon the organization as a professional school? Or:
3. Onto what extent does litter influence your beliefs and judgment about the company, the products and the people working there?
4. When much litter is lying around in a (school)building, how does it affect your satisfaction about the CC and the FM department?
5. When much litter is lying around in a (school)building, does this confirms possible negative assumptions you have about the CC or the FM department?
6. When much litter is lying around in a (school)building, how does it affect the way you look upon the sustainability level of the (facility) organization?
7. When much litter is lying around in a (school)building, do you submit a complaint at the CC or FM department?
8. When much litter is lying around in a (school)building, do you talk about it with your colleagues/fellow students/relatives/friends?
9. When much litter is lying around in a (school)building, how does it affect the way you experience your own personal hygiene?
10. When much litter is lying around in a (school)building, do you feel the pressure to leave immediately?
11. Your opinion please: who's responsibility is it to clean up litter?

Interview questions belonging to RQ1.2, 2.1 and 2.2, used in Chapter 1 and Paragraph 3.1

- **RQ 1.2** What are the implications of littering for the service delivery of the FM department and CC?
- **RQ 2.1** Which (un)successful measures are taken by FMs to reduce littering behaviour at Universities of Applied Sciences?
- **RQ 2.2** Which (un)successful measures are taken by CCs to reduce littering behaviour in organizations?

Respondents: FMs at HBO Universities of Applied Sciences, a university, CCs and a waste management company.

1. To what extent is indoor littering a major point of concern on schools and universities?
 - a. If you think it is not a major issue, why not?

- b. If you consider it as a major issue, why?
2. What is the added value of cleaning services, in your opinion?
3. How does litter relate to customer satisfaction? Examples?
4. How does litter relate to customer health? Examples?
5. How does litter affect the way FM customers look upon the organization as a professional school or university? Examples?
6. How does litter affect the way FM customers look upon the CC and the FM department? Examples?
7. What is, according to you, the worst implication of litter lying around on floors and furniture?
8. What is, in your opinion, the way litter affects FM customers look upon the sustainability level of the (facility) organization?
9. Based on literature research, I noticed that although the present awareness towards sustainability, indoor litter does not seem to be high on the priority list of FMs. Do you agree? If yes, what would cause this situation?
10. What consequences has 'the litter bottleneck' got for the motivation of the cleaning staff? Examples?
11. Do you have any financial percentages available of how cleaning costs of litter relate to the total amount of cleaning- or waste costs?
12. Which measures were taken already by you and your colleagues to reduce indoor littering?
13. Which measures proved to be successful and why?
14. Which measures proved not to be successful and why not?
15. Which innovative initiatives could be taken in the future? How should the problem be reduced?
16. Your opinion please: who's responsibility is it to clean up litter?

Interview questions belonging to RQ2.3, 3, 4, 5, used in Paragraph 3.2, 3.3, 3.4

- **RQ 2.3** Which (un)successful measures are taken by (semi) governmental organizations to reduce littering behaviour in public areas?
- **RQ 3** Why do students litter?
- **RQ 4** How can behavioural insights be applied to design persuasive interventions?
- **RQ 5** How can persuasive interventions be applied to influence students into less littering behaviour?

Respondents: (Semi) governmental organizations, behavioural scientists, gamification specialists.

1. In order to learn from anti-litter campaigns in the public domain, I am in search of best and worst practices. Which (un)successful examples of anti-litter campaigns do you know?
2. Why did this campaign fail or succeed?
3. How can (in general) habitual behaviour being influenced?
4. What do prominent scientific sources mention about influencing habitual behaviour?
5. In the publication *Ontwerpen voor gedragsverandering* of Renes en Hermesen I read that interventions to change behaviour through persuasive design can be applied more effectively. Could you elucidate your point of view?
6. Which explanations can be given for the disparity between peoples' intentions and their actual behaviour?
7. How true is, according to you, the assumption that students litter more than adults because they are more sensitive for social norming?

Interview questions towards the research approach:

8. In the experiments I would like to apply the principle of 'landscaping', by placing gamified waste bins. This is only successful when littering behaviour can be classified as mechanically, unconscious behaviour. What is your opinion: is littering in all cases to be classified as such? Or can it be classified as reflective, conscious behaviour as well?
9. A second condition to make landscaping a successful measurement, is that the intervention should be focused on the aims and drivers of the receiver. Do you think my experiments suffice to focus enough on the aims and drivers of the students?
10. Do you have any suggestions how to survey the students about their reasons for littering in a way to get reliable results?
11. Do you have suggestions how to use the principles of social feedback in texts on posters?
12. My research covers three fields of knowledge: FM, behaviour psychology and design. I know a lot about a FM and not much about the other subjects. How can I approach this lack of scientific knowledge in a clever way (apart from reading a lot)?

Interview Questions belonging to RQ3, used in Paragraph 3.2

- **RQ 3** Why do students litter?

Interviewees and respondents: Students.

1. Why do you think students litter sometimes?
2. Do you think that littering behaviour of students can be classified as mechanically, unconscious behaviour or rather as reflective, conscious behaviour?
3. How would you explain the difference between intention and real behaviour? Meaning that 89% of the students intends to throw their garbage in the waste bin, but a minority actually does.
4. Your own opinion please: who's responsibility is it to clean up litter?
5. How do students affect towards litter? For example: do they take it for granted, do they even care, does it affect them in a negative way (e.g. irritation, distress).
6. How true is, according to you, the assumption that students litter more than adults? If you think so, why?
7. How true is, according to you, the assumption that students litter more than adults because they are more sensitive for social norming?

Appendix III: Group-wise Interview Results

Below is an overview of relevant statements made by the students attending the group-wise interviews. The results are used in Chapter 1 and Paragraph 3.2. The names of the interviewees are not mentioned, but labelled by the first letter(s) of the surname of the interviewing student, followed by a number for each interviewee. Example: the interviewer is Daphne, she interviewed six students, labeled as D1, D2... until D6. In some cases the interviewer made interesting comments, which is labelled with just the first letter of his/her surname. The citations are grouped per question, per interviewer and in sequence, so the discussion between group members can be retrieved.

Interview question 1: Why do you think students litter sometimes?

D2	It depends of the level of education.
D2	It depends of age. The younger the students, the more they don't care. They think clearing up litter is the cleaners' job.
D3	It is about feeling responsible. At your job you feel more responsible for the environment compared to school. I experience the school environment as too distant.
D1	I don't, I do feel responsible for the school environment.
D5	I must admit I do sometimes forget an empty bottle.
F1,3,4	They do not feel like it. They are lazy.
F1	They are in a hurry, they have to go to class.
F1	They think is the cleaners' job.
F2	I think littering behaviour is stupid, it is wrong.
F3	If I do not see a waste bin, or the distance to the waste bin is too far, I don't feel like walking. Who cares if I leave just one piece of paper behind?
F3	The waste bins are not obvious. A little flag on top would be a good idea, or HUA colours instead of the current black colour.
G all	Laziness, slackness (immediate, joint response).
G4	You know that there are cleaners around and when the waste bin is too far away...
G4	We often get food from the supermarket which we eat without a plate. If we finished lunch, there are bread crumbs everywhere. I clean up larger things, but not the bread crumbs.
G1	I am not going to clean up bread crumbs, because they are being swept by the cleaner.
M1,2	They are lazy.
M3	It is a habit.
M4	Sometimes you just forget.
M5	Because of group pressure.
Ri all	They are lazy.
Ri1	You notice the cleaner walking around, so you think they will take care of it.
Ri3	I throw my cigarette ends on the ground, because there is always someone swiping.
Ri3	Students are also too lazy to walk to the waste bin.
Ri1	I throw my waste in the bin, because it looks clean and tidy inside this building.
Ri2	It depends if I am inside or outside. Inside I throw it in the bin, outside I like it to play soccer with my cigarette end (laughing).
Ro all	They are lazy, easy going.
Ro2	Sometimes you're in a hurry, you just don't think about it.
Ro3	It will be cleaned anyway. The cleaner will do it or the one who is going to sit on the same place after you.

Ro1	I noticed there are enough waste bins in the building, so that cannot cause the problem. Therefore I think it is laziness.
Ro1	Perhaps it depends of the values your parents teach you.
Ro2	If you're used that your mother cleans up after you...
Ro1, 3	I should really not try to leave my trash behind at home, my mother doesn't let me.
W1	They have few time for it or they just forget about it (everyone laughs).
W2	They are too lazy to walk to the bin. I must admit I am like this too. It is not a high priority.
W3	Same for me. When I have been working on the computer at school and going home, I just leave it behind. It is a combination of laziness and forgetfulness. I don't clean up at home either. I think a lot of people don't.
W5	If you know it is cleaned by the cleaners, you think 'someone will show up and clean it for me'. Actually, it is too easy to litter.
W4	I clean up my mess most of the time, but not because of the posters and the footsteps. This doesn't motivate me.
W5	I am just lazy. I don't feel like getting up and walk five steps to the waste bin and back (laughs). Especially when I am in a hurry, when I want to catch my train or something.

Interview question 2: Do you think that littering behaviour of students can be classified as mechanically, unconscious behaviour or rather as reflective, conscious behaviour?

D4	If you are used to clear away your waste, you do it consciously, it's normal.
D1	They don't do it on purpose, but they are aware of it.
F3, 4	It is not on purpose.
F2	You are aware that littering is not okay, but it still happens. It is just laziness.
F1	If you are talking with others, you sometimes forget to clear up your waste.
G all	It depends: when people are lazy, they do it on purpose. Sometimes it is unconscious behaviour too.
G2	Yes, for example when you are in a hurry for class, it just happens.
G3, 4	If your mother is tidying up everything for you, you are not used to clean up your waste.
G4	I think throwing cigarette ends on the ground is automatic behaviour.
M3	For the largest part it is conscious behaviour. They just don't care.
M2	I clean up most of the time, but sometimes I just forget.
Ri1, 2	It is automatic behaviour.
Ri4	It depends. If you're busy, you sometimes forget.
Ri2	You won't litter at home either, now would you? So if people litter here at school, they do it on purpose, I think.
Ro2	It is mostly unconscious behaviour.
Ro3	If your parents didn't teach you to clean up, you are not aware of it.
Ro2	When leaving, you look over your shoulder to check if you didn't leave anything behind. I do so most of the time.
Ro4	But some people see that they littered and still don't clean up. These students litter on purpose.
Ro1	It is not necessarily conscious behaviour. Sometimes you forget it when you are in a hurry. So I think it can be both conscious as unconscious.
W2,3, 4,5	Unconscious behaviour.
W6	I don't agree. I think it is conscious behaviour. People know very well it is their own waste.

W1	I think it depends. I have left waste behind intentionally sometimes, because I was too lazy. But I felt guilty afterwards.
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Interview question 3: How would you explain the difference between intention and real behaviour? Meaning that 89% of the students intends to throw their garbage in the waste bin, but a minority actually does.

D2	They have the intention to do it, but they behave otherwise. This is not only the case with litter. For instance, in traffic you see the same thing happening. So, having the intention does not mean you will really behave like this.
F3	They behave like this because they cannot find a waste bin.
F1, 2	They think is the cleaners' job.
F	It is a matter of effort. However, I am raised in a proper way but must confess I sometimes leave trash behind too.
F2	If you have a job where they expect you to focus on cleanliness and tidiness of the place, then you become more aware of it.
F4	I agree. Since I have a job in the hospitality business, I take more notice of my own littering behaviour too.
F1	Since I talked with R (researcher, RM) about the subject of littering behaviour, I am more aware and I changed my behaviour too.
F2	I think even this interview will lead to more awareness amongst all of us.
G4	I think it doesn't interest the students.
G1	When I notice rubbish lying around, I think to myself 'who cares if I leave my trash too, it is a mess anyway'.
G1	Perhaps the percentage is high because people do not admit they litter. They are embarrassed.
G5	Or they are just not aware of their own behaviour. They think they always clean up, but they don't.
M3	Because of group pressure.
M2	If I leave the building with a group of friends and the waste bin is in the other direction, I won't bother to go there. Then I will leave my trash behind.
Ri2	They don't feel standing up and walking to the bin.
Ri3	Because others don't do it either. If there is waste lying around, I won't clean up too.
Ri all	Agree.
Ri1	Again, I think it is because they see the cleaners walking around.
Ro1	Because they are in a hurry. When you are on your way to class and there is no waste bin along the way, you just leave it behind.
Ro4	I still don't understand why people litter.
Ro1	Well, last week it happened to me too. I was in a hurry and someone came after me and handed me my empty bottle. He said 'I think you forget to clean this up'. I thought it was all right that he reminded me. I was just unaware of myself leaving that bottle behind.
Ro1	Would I do the same as this student did? I am not sure. If someone behaves really rude, I would. For instance, if someone throws half a bag of Mac Donald food on the ground.
W4	They just forget.
W3	Because of peer pressure.
W5	Perhaps, if you notice others don't clean up, you'll feel stupid if you are the exception.

Interview question 4: Your own opinion please: who's responsibility is it to clean up litter?

D2	This is obvious: the student of course.
D1	Some will say it is the cleaners' task, but I think it is your own responsibility.
D3	You have to bridge the gap between intention and behaviour, for instance by these trails of footsteps. However, I do not know if they are effective.
D2	I think it is childish. It belongs on secondary school. I think it ridiculous and paternalist. You do not feel taken serious.
D1	I think it's fun.
D3	It increases the awareness.
D1	I think most of the students clean their waste and sometimes they will forget, but not on purpose. However, I think 10% or so really doesn't care.
D1	I think, the lower the degree of education, the more students will litter.
D3	On the other hand, if you take a look around in the Vondelpark on a Sunday, it is a mess. However, all kind of social classes come to that park.
F2	First, the student. Second, the cleaner.
G1	The cleaners.
G3	They are hired to do so, aren't they?
G5	I don't agree. I think it is not right to leave your empty cup behind.
G4	If waste is lying on the floor and it is someone else's, I am not going to clean it up. But when it is mine, I would.
G all	Agree.
G4	If we have worked together at school and we leave, and waste is left behind on the tables, there is always someone of us cleaning it up.
M3, 4	The people and then the cleaner.
M4	You cannot expect everyone to clean up after himself, so cleaners are needed. It is part of the job.
M3	If you are used of your mother cleaning up after you, you won't clean up at school neither.
Ri2, 4	It's your own responsibility.
Ri2	I am certainly not willing to clean up the mess of others. The cleaners have to do it.
Ri5	I am willing to clean waste from my team mates, but not from someone I don't know.
Ri1	It depends what kind of waste it is: I am willing to clean up a friends' piece of paper or an empty bottle, but a banana peel... yuk!
Ro all	It is the responsibility of the people.
Ro3	In the end, it is the responsibility of school.
Ro4	If students see the cleaners clearing up litter, they will leave it behind more easily.
W3	When I was on secondary school, the cleaners walked around during the day, so we thought 'they will clean up the mess'.

Sub question 4a: The cleaners' task is to clean, not to clear away waste of others. What is your opinion about this statement?

F2	It is the task of the cleaner to clean. But the definition of a clean building for me, is that it is tidy as well. Therefore I think that clearing away waste belongs to the cleaners' task too.
G3	You tend to think it is the cleaners' task, but if you think logically, you should clean up yourself.
Ro2	If it concerns litter, then it is the cleaners' task.

Ro3	No, clearing away litter is actually an improper task. The cleaners are hired to clean.
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Interview question 5: How do you affect towards litter? For example: do you take it for granted, do you even care, does it affect you in a negative way (e.g. irritation, distress).

D1	Some behave just like animals, it is appalling.
D2	It is a matter of the wrong mentality.
D6	The lack of respect of some students amazes me and irritates me.
D6	I would not expect this to happen on a university. It is behaviour of an eleven old child.
D6	If you are able to carry a soda can to school, you can throw it in the bin just as well. I do not understand why this is such a big effort for some students.
D2	I am beyond the point of irritation. I do not want to make a fuzz about everything, so I ignore it reluctantly.
F4	I think students look upon it as both a duty and a burden.
F2	It depends of the person. Some do not care and others are disturbed by it.
F3	I would not clear away the trash of others.
F	If I am looking for a place to sit, I choose a clean place.
G2	I am not really aware of it.
G3	When I want to sit down and someone else left bread crumbs behind, I find it dirty, yuk! But when these are my own bread crumbs, I don't mind.
G all	Feeling irritated.
M2	If someone left a half-eaten sandwich behind, I don't want to sit there. It is disgusting.
M1	It depends what kind of litter it is. If I leave a small piece of paper or a small empty sandwich bag behind, I think it's not so bad. But leaving a half-eaten sandwich behind is disgusting.
Ri3	It is annoying, especially bread crumbs left behind by someone else.
Ri2	It is taken for granted, because it is impossible to keep such a large building 100% clean. I think most of the students are not disturbed by it, but then again, it is pretty clean here.
Ri4	Personally, for me it depends how much it is, what it is and where it is.
Ro all	I don't want to sit on a couch which looks dirty.
Ro1	Cigarette ends lying on the ground or a cup of coffee fallen down and no one bothered to clean it up... these kind of things really annoy me.

Interview question 6: How true is, according to you, the assumption that students litter more than adults? If you think so, why?

D5, 6	I assume the current generation litters more than the older generation when they were our age.
D6	I think they used to have more respect for the lecturers.
D2	I do not agree. I think it is a problem of all times.
D3	The problem increased because all food and drinks are packed as well. People used to take their own sandwiches, now we can buy packed food everywhere.
F1	True. People older than 30 have their own household, so they are used of taking the responsibility to clean up. If you still live at your parents, perhaps they do it for you.
F	Young people are lazy and do not care about the rest.
G4	I am sure young people litter more. I think the older generation is more interested in sustainability as we are.

G2	It is a difference between generations.
G4	If you see people making a mess in the train, or painting graffiti, it is always young people.
G5	I think your parents should teach you.
G3	My parents taught me to clean after myself, but if I care less, I won't teach my children...
G5	Perhaps we are interested in other things.
G4	Yes, like laptops, smartphones, sports...
G3	My colleagues at work told me that previously, they had to clean themselves. Now, our manager hired cleaners to do it.
G all	People get lazy because everything is facilitated nowadays.
M2	Students litter more.
M3	Students are easy going and less mature.
Ri2, 5	Students litter more, because previously, young people had to behave to stricter rules. Their upbringing was more severe than ours.
Ri5	Older people have different norms and values as we have.
Ro3	The older generation was raised more severely.
Ro4	The younger generation is more cheeky...
Ro2	...and more anti-social.
Ro1	... and more egoistic. I have seen a documentary about it. (everyone is grinning)
Ro1	Another difference is that the older generation uses to take their sandwiches from home in a box. We don't, we are used to buy our food and drinks in the nearby supermarkets. We all earn money so we can afford it. And the food we buy is wrapped in a lot of packing materials, so this leads to extra litter as well.

Interview question 7: How true is, according to you, the assumption that students litter because they are more sensitive for social norming?

D5	If, in a certain group, people are not used to clear away their garbage, it will not be considered cool when someone does. They will not say anything about it, however, it is not cool. So, if you are a member of that group, the norm prescribes to not drop your garbage in the bin.
D1	I don't think students will address each other when they litter. The current mentality prescribes not to interfere with each other too much.
D3	People will tend to follow the others.
D4	If we work together in our team and I would stand up to throw my waste away, I would take yours as well. However, if we would stand up together and you would all leave your water bottles behind, perhaps I would leave my water bottle behind as well.
D3	On Kingsday you notice everyone throwing his waste on the ground, so I do too, even if it feels weird.
D6	But this is because there are not enough waste bins.
D1	Or they are full and if you want to put something in it... yuk!
F2	They are very sensitive. If someone else does or doesn't clean up, the others will follow.
G4	Very sensitive. If you are part of a group and you are have a divergent opinion, you will almost automatically change it into the opinion of the majority. So if everyone would clean up, it would be the norm.
G2	But I noticed that, after we have worked together and we stand up to leave and one person forgets his waste, others will pick it up to throw it away.
G5	At the Mac Donald everyone cleans up his waste. It is simply 'not done' to litter, because it is always so busy. After you leave, someone else takes your place immediately and it is

	embarrassing if they see you didn't clean up. At school it is different. It is not that busy, there is always place to sit.
Ri2	I think this is often the case.
Ri1	A group is like a flock of sheep.
Ro2	If someone of my groups cleans up, so will I.
Ro4	I think the social norm is stronger among younger people, pupils who are still at secondary school. I think we are old enough 'to do our own thing', to follow our own feelings.
Ro1	I agree, but on the other hand, if someone likes a nice bikini on Instagram, immediately there are 8000 followers. We are very suggestible, our generation.
Ro4	If you see someone else throwing his waste away, it reminds you to do the same.
Ro1	If we work in a team and someone starts to clean up, so will I.

Appendix IV: Protocol for Experimental Interventions

In this protocol the design for performing several experiments is described.

Purpose

The purpose of the experimental experiments at HUA is to gather evidence about the extent of effectiveness of several persuasive interventions, which are based on behavioural mechanisms. The experiments aim to influence HUA students into less littering behaviour.

Materials

The major items needed to carry out the experiments are observation lists, pencils, adhesive footprints, a poster-maker, posters, sandwich plates, adhesive tape, stickers and materials to construct the gamification objects.

Methods

The experiments will start in September 2014, lasting until June 2015. Beforehand eight sections of the building are appointed, based on information from the CC. The selected sections are those where they experienced most litter: class rooms, open workplaces at 2nd, 4th and ground floor, lecture halls A2.02 and C2.38, the smoking area at the entrance and the so called 'Monkey Rock', a hang-out place for students.

First, baseline measurements in all sections will be performed by counting the number of litter left behind inside on floors and furniture and outside at the main entrance. This will be done during three months, from September – December 2014. The measurements will be done twice a week, except from weekends and holidays, after 4.30 p.m. A structured observation list will be provided.

After the interventions are made, the measurements carry on to investigate the changes in the situation before and after. The ground floor section is appointed as 'blank control section'. No interventions will be done there. Students will not be informed about the experiments, so changes have to be implemented during the evening hours.

Observation List

Date		
Time		
Area	BGC / 2C / 4C / Apenrots / Main Entrance / A2.02 / C2.38	
Wastebin Status	Number	Please circle the right answer
	1	empty / half full / full
	2	empty / half full / full
	3	empty / half full / full
	4	empty / half full / full
	5	empty / half full / full
Please tally the number of waste left behind in this public area.		
F&B related waste		
Study related waste (paper)		
Cigarette ends		
Various		

Appendix V: Pictures of Experimental Interventions

Landscaping by applying visual cues in the form of trails of red and green footprints (nudges)



Picture 16: Red footprints on the 2nd floor.



Picture 17: Greens footsteps on the 4th floor.

Gamification object Puiken Peuken Long



Picture 18: Puiken Peuken Long



Picture 19: Poster with gaming rules

Gamification object Chute



Picture 20: Chute, seen from the top.



Picture 21: Chute, seen from below.

Message tactics: Reminder after lectures



Picture 22: Gentle reminder.

Posters



Picture 23: Social Proof



Picture 24: Prompting



Picture 25: Implementation Intention



Picture 26: Norm activating



Picture 27: Norm activating



Picture 28: Social proof

Appendix VI: Maps of Experimental Areas

The marked pink areas are the experimental sections.

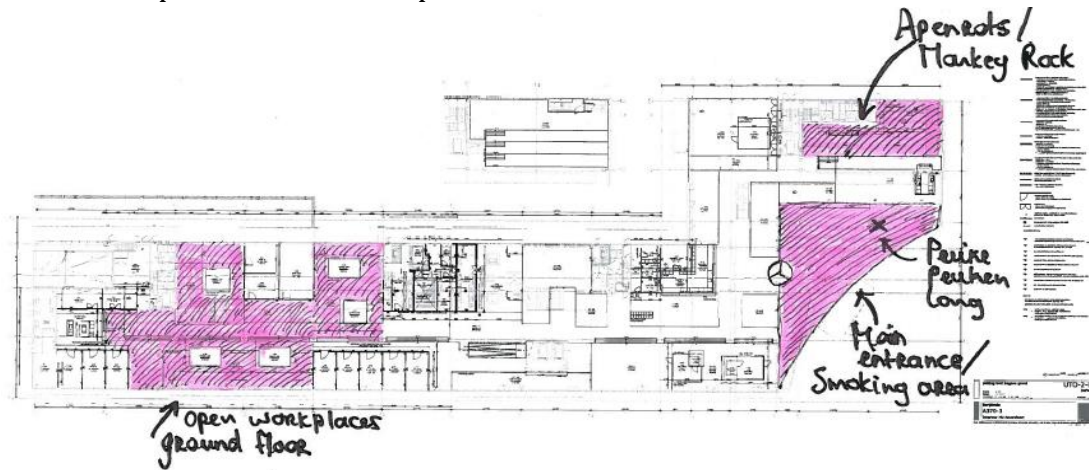


Figure X:

Picture 29: Ground floor area: open workplaces, main entrance and Monkey Rock.

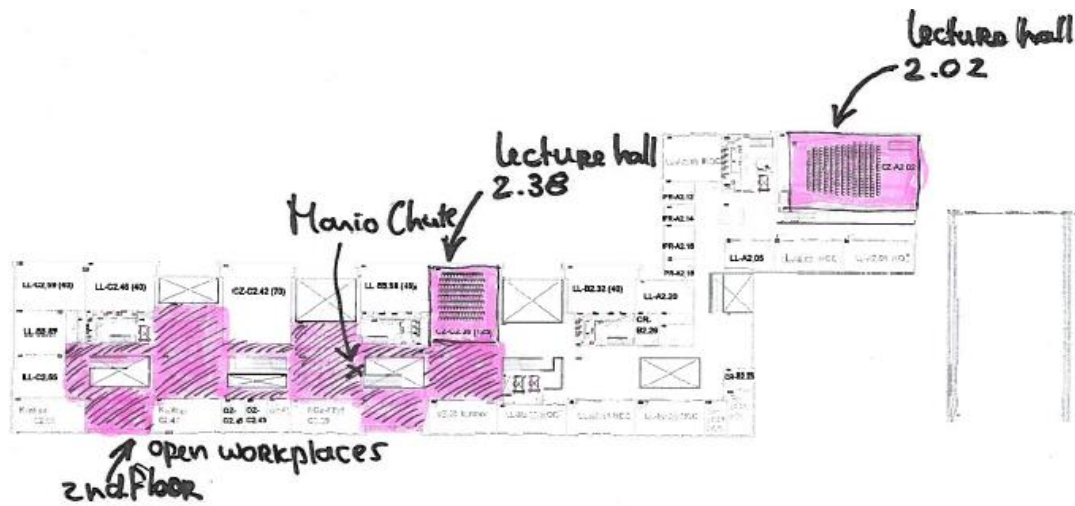
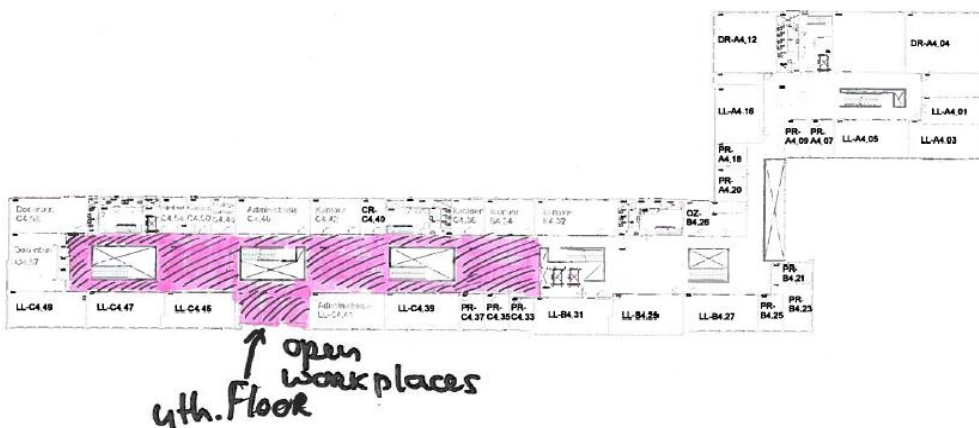


Figure X:

Picture 30: 2nd floor: open workplaces, lecture hall A2.02 and lecture hall 2.38.



Picture 31: 4th floor: open workplaces.