CAN AND SHOULD WE REDUCE THE PAPER USE AT THE WAGENINGEN CAMPUS?

--An exploration for sustainability

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Disclaimer

Executive summary

Recently, Wageningen University and Research (WUR) has won the Sustainable prize for the most sustainable university for the second year on a row. Sustainability is the core idea within the Campus but the current situation still needs to be improved. In fact, students and employees in WUR print plenty of study materials, although electronic versions are published on the WUR Eduweb. This situation causes environmental problems and wastes money. Therefore, the objective of this project is to help the Green Office Wageningen to design persuasive strategies of reducing paper reading and promoting digital reading.

Within 8 weeks, we implemented the whole project step by step. Firstly, we reviewed literatures about environmental impact on paper and digital reading. Based on the LCA and other case studies it can be concluded that digital version is more sustainable. Secondly, we selected the social science (psychology and consumer behaviour) theories about what factors influence individual's behaviour. In short, the Attitudes, PCB, Norm, Self-identity, Anticipated pride or guilt and some other indicators are expected to have a relative important impact on behaviour. Thirdly, based on these different indicators we designed a questionnaire, to know what factor is the most influential on people's attitudes. From the results it was clear Attitudes and Perceived Control Behaviour (PCB) have the most important effect on changing reading-behaviour. Lastly, based on results of the questionnaire and successful examples from other organisations, we designed a persuasive campaign within Wageningen Campus. Our campaign includes long-term strategies that focus on building a sustainable culture of Wageningen University, and short-term strategies that focus on promoting sustainable awareness in students and teachers of Wageningen University.

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1.Introduction to the report

1.1 Background

In the world as a whole, the amount of paper consumption increased by 400 percent during the past 4 decades (Martin, 2011). This high demand of paper results in many environmental problems. Deforestation is one of them. Around one third of the total amount of logged trees, with the total number of 4 billion, is consumed by the pulp and paper industry (Martin, 2011). This industry also leads to serious pollution. More than 250 toxic compounds have been found in the wastewater discharged from those factories (Ali and Sreekrishnan, 2001). Many domains are affected by this pollution, including soil, air, water and health of human and animals. In addition, pollution caused by printing cannot be neglected. Apart from the toxic substances involved in the ink, cleansing ink from presses also need several harmful solvents. Both volatilization of these solvents and discharge from cleansing water can cause pollution in air, water and soil (Bhaskarwar and Cussler, 1997).

Due to these serious environmental problems caused by paper use and printing, Green Office Wageningen wants to reduce the amount of paper used at the Campus, especially in printing. One obvious alternative is switching to digital reading devices. Although reading through digital devices also has some environmental impacts, such as those generated from energy consumption, use of rare metals and plastics and waste treatment of these devices, it is assumed that the digital reading in general is more sustainable compared with reading from paper. In this paper, we are going to explore the environmental impacts of both reading behaviours and make a comparison to support our assumption.

In terms of consumer behaviour, the theory of perceived behaviour (Ajzen, 1991) has been widely used in sustainable consumption, such as: organic consumption, public transportation consumption, recycling etc. (Aertsens et al., 2009; Bamberg and Moser, 2006; Smith and etc., 2007; Sparks and Shepherd, 1992). The theory indicates that positive attitudes, subjective norm and perceived behaviour control can predict an individual's intention of behaviour. Moreover, when consumers make decision to do one thing, they always try to avoid punishments and to seek rewards. According to this model, decision-making is guided by a rational evaluation of behavioural consequences (Bamberg and Moser, 2006). However, in terms of persuading consumers to show more sustainable behaviour while reading, the TPB has not been used in this domain. Besides, different persons have different attitudes and behaviours in different situations, thereby various indicators influence people's behaviour. Therefore, in the context of sustainable reading behaviour, to know which factors influence

behaviours of people is important and necessary.

1.2 Organisation: Green office Wageningen

As one of the main stakeholder in this case, Green Office Wageningen is the organization built to coordinate the activities within the Wageningen campus in a more sustainable way and act as a platform for sustainability oriented development. Because the students in WUR with a very eco-friendly thinking contribute to it, they have a very high level of interest about this project. For instance, there was a research which was finished by Koen Kallenberg from Green Office, Wageningen. This study is about whether it is more sustainable to use a book, tablet or laptop for reading (Kallenberg, 2014). Besides, as an official organization belonging to WUR, their influence is relatively high and direct within the University. Green Office acts as a knowledge platform to increase the sustainability of Wageningen University. Furthermore, Green Office performs various projects and organises events, such as weekly Student Cooking Events, in order to increase environmental awareness on the campus. The concept of Green Office was developed and implemented at the University of Maastricht in 2010 firstly. In 2012, Green Office Wageningen followed.

1.3 Focus group: Students

Although there are four stakeholder according to our project (for a full stakeholder analysis, see Annex 4), the students group was chosen as the main target for us to do the research. Firstly, they are the most accessible group we can contact with when we did the survey. Secondly, the reading behaviours of this group is most likely to be changed. Because they have relative low power in the university, plenty of factors can influence them, for example policies, organizations or their teachers in WUR. Besides, students here are still involved in the process of education, which means they have more space for improvement. They can be trained to behave more environmentally friendly before they graduate. As students of WUR, being more sustainable is an important experience in their study lives, at least we assume that. Last but not the least, because the time limited of the project, we cannot focus on all stakeholders during the research. For instance, staff in Wageningen UR is also a group with high relevance.

1.4 Goals and Research questions

Our goal is that in the long term, there is a more sustainable reading behaviour in Wageningen campus. Then, it will match more with the identification of Wageningen UR. In a short term, our purpose is to reduce paper use in Wageningen campus. Strategies will be developed in our project report.

In this paper, we focus on possibilities to guide people reading in a sustainable way. To do so, we will answer the following sub questions:

- What are environmental impacts of both paper and digital materials use and which option is more sustainable for Wageningen Campus?
- By using Theory of Perceived Behaviour, what results can be derived about current attitudes and behaviours of people towards reading materials?
- Based on the results of Theory of Perceived Behaviour and additional literature, what strategies can we use to stimulate people reading in a sustainable way?

This report is made for Green Office Wageningen and handles strategies to reduce paper use at Wageningen Campus. Firstly, our outcomes and recommendations are given. Also, a table is given to show in a quick overview which strategy is based on which theoretical background. After this table, a short summary is given of each theoretical part, following by a discussion and conclusion. For more detailed theoretical information, we refer to the Annex.

2.Outcomes and recommendation

2.1 Communication Strategies

1. Some tips or alarm nearby the printer and bookshop in WUR: Because the administration nearby the “source ” of the behaviour happened place can change the awareness more efficient. So some tips or alarms about environmental impact or reduce paper using (print in double pages) can influence the people’s awareness more normal.

2. Something like Eco-label on the back of the paper reader: It should point out how many environmental resource it consumed by product this book. Just like the alarm on the box of the cigarette, not try to stop their behaviour, but at least remind them the cost and result about it.

3. Some free gifts (materials must be environmental friendly) for the students depends on the time and situation (gift in AID for the new students, Fans for cooler during summer): Make some tips about the sustainable way of materials using and reading. Because students will use these gifts frequently, every time they use them, they will see educational tips.

4. Negotiation game in the AID group: Different students can act as different representative for different countries. During the game they are pushed, to persuade other countries reducing the paper-using amount to reach a goal for the whole world. So everyone should really focus on finding the way for paper using reduction by several methods, within limited time.

5. Make a tracing system for purchases at the WUR-shop: Students need to bring their students card to buy books. They will be informed that the purchase behaviour will be recorded to make people be more aware of their behaviour and to more precisely predict sales. The complicated process will avoid them to buy paper reader very often, the record will let them notice it need to make serious decision to buy the book, and the record can be used for other statistic researches.

6. Involve the AID-board and AID-mentors in stimulating sustainable behaviour, to be more specific, digital reading: An interesting game in AID, new students can be divided into several groups and each group is responsible for design a strategy that helps campus to reduce paper. At the end of the game, one team can be selected as the best welcomed strategy. The strategies that new students create in the game give green office some creative ideas; also the game itself is a process of promotion for new students. As Wageningen University is known for its 'green' identity, new students can be influenced to 'be a 'real' WUR-student' and show more sustainable behaviour. This suggestion can also be combined with point 4, negotiation games in the AID group.

7. An award for Best 'Green' Teacher: As there is already an award for Best Teacher, **something** similar could be organised for the teacher who shows the most sustainable behaviour. The criteria for this competition can be based on the percentage of readers (or other study material) that is provided digitally, but other factors could also be included. Changing behaviour of teachers can be an important factor, since the availability of digital study material can be an important barrier for student behaviour.

8. A competition for the most sustainable study: If individual printing behaviour can be recorded, it should also be feasible to record this per study programme. The students of the study that has the lowest average amount of prints per student could receive a small reward. This competition might be especially interesting to students from environmental studies.

9. Change the wallpaper of computer desktops on the campus: In doing this, a text could be provided to thank the user for using digital devices, and to remind them of the impacts of printing. Also, a picture of desired behaviour could be included.

10. Green contract: Sending email to students to tell them that we have activities that concern sustainability, if students think sustainability is important issue, they can click link to sign a green contract to express that they are caring sustainable issue. As another option, students could directly go to hall of Forum building to sign their name (however, to use paper for this would be less desirable). Afterwards, they can get some sustainable small gifts.

11. A tracing system for printing: Students' cards are connected with printers. This system could be used to record how much print papers that one student use within one month/period/year. Then Wageningen Campus can select the students who print the least paper, they can get some rewards. For example: they can get discount cards for eating lunch in canteen for one week or get some other bonus.

12. Give lectures to promote digital reading skills: a large number of people who do not study with digital materials are mainly impeded by the lack of digital reading skills. Those people can benefit from lectures that provide skills and knowledge of digital reading, so that they will tend to study with digital devices rather than paper materials. Because one of advantages of digital materials is easy to share with others, the use of file-sharing programmes, such as Dropbox, can be also introduced in these lectures. Furthermore, these lectures can be open to every student but mainly focus on the first-year Bachelor students, because we suppose that they have relatively open mind and they will stay at Wageningen Campus for a relatively long time. Thus, guiding their digital reading behaviour becomes easier and leads to a bigger influence for the Campus. These lectures can be introduced step by step, probably provided as a MOS at first, to extend it to a compulsory course.

13. Transparent drawers of printers: just like some transparent containers of paper, drawers of printers can be also transparent. Thus, people can clearly see that with their using of paper, the amount of paper in drawers are decreasing. For sending a more sustainable message to people towards paper-saving, the shape of transparent area could be a tree or another figure that reminds of the environment.

2.2 Linkage to theories

The strategies we rank from easy to change to more difficult to change. It is formed, based

on the combination of TPB theory, model results and successful examples. The details and explanations are in our Annex 1.

Table 1: Linkage of strategies to principles and successful examples

Strategies	Principles	Successful examples
1. Tips or alarm nearby the printer and bookshop in WUR	**Context to influence attitudes**: People automatically react to their environment (Dolan et al., 2012), so changing contexts also can be part of changing attitudes.	WWF provides some posters to let people think about the environment before printing.
2. An award for Best 'Green' Teacher	**Incentives to influence attitudes and norms of people**: Incentives means that the persuader promotes desired behaviour by rewarding other people. Rewarding include presents, financial incentives, tokens, etc. (Agarwal, 2010).	
3. A competition for the most sustainable study	**Entertainment Education** to influence attitudes and norms of people.	
4. Green contract	**Consistency to influence people's attitudes, emotion and self-identity**: People strive for consistency between their cognition, attitudes, behaviour and such. Consistency causes people to feel comfortable; inconsistency causes people to feel uncomfortable (Hadas and Boaz, 2007).	Bank of America has made it their mission to become more sustainable (being paperless as much as possible).

5. Tracing system	**Incentives to influence attitudes of people.**	Bank of America has gained its success by having an employee that is responsible for overlooking the paper using process as a full-time job. Loyola University Maryland introduced a 'Student Allocated Printing' system.
6. Giving lectures to promote digital reading skills	**Context to influence perceived of control behaviour.**	'Alameda County Offices' and 'Nike' both made efforts to educate all their staffs by arranging environmental leaders/trainers in all of their departments.
7. Discount of digital reading tool (Tablet, E-reader, etc.)	**Incentives and context to influence perceived control behaviour.**	Framingham State College required all their students to have a laptop for use during class.
8. Eco-label on the back of the paper reader	**Context to influence environmental awareness of people.**	WWF provides a tool on their website to check for environmental impact of the production of several types of paper.
9. Transparent drawer of printers to remind people of the impact to the environment	**Context to influence environmental awareness.**	WWF provides some posters to let people think about the environment before printing.
10. Negotiation game in the AID group	**Entertainment Education**: to influence attitudes and environmental awareness: Designing and implementing a message to both entertain and educate	

	(in order to increase audience members knowledge about an educational issue), creates favourable attitudes, shifts in social norms and changes behaviour (Singhal and Roders, 2004). Pro-social messages are embedded into popular entertainment media content, either intentionally or not (Moyer, 2008). In the same fashion, interesting games should be held, when people are having fun, they will also learn about useful knowledge.	
11. Free gifts	**Reciprocity to influence norm**: Reciprocity means that norm obligates people to repay others for what they get from others. This norm has the strongest influence in people's culture (Grouldner, 1960).	
12. Changing the wallpaper of computer desktops on the campus	**Consensus**: People are social creatures, so they are more influenced by their surrounding environment. People look at what others do, they based on the norm to do things (Rapert, 2002).	WWF provides some posters to let people think about the environment before printing.

3.Theory to support strategies

3.1 Summary of Task 1: Environmental comparison (literature review)

In this case, we will analyse and compare environmental impacts of different reading behaviours with study purpose (See Annex 1 Task 1). The two main reading behaviours are reading from digital devices and reading from paper, and the study materials concern course books, course materials and any other types of literatures for studying and researching. Environmental impacts generate from almost every phase of their complete life time, so that of both reading behaviours will be compared based on the assessment of their whole life-cycles (LCA). As a result, we found that digital versions of study materials are more preferable and sustainable when each digital device is used to read a large amount of information. When these devices can be used more frequently, digital version of study materials also results in fewer environmental impacts than the paper version based on impact categories. In Wageningen Campus, because most of computers and laptops are actively used during most of time of a day and mainly for study purposes, we assume in this case, each digital device can be used to read a sufficient amount of information during its life time. Thus, in the case of Wageningen Campus, digital reading is more environmentally friendly.

3.2 Summary of Task 2: Factors that influence individual behaviour (literature review)

This part is a summary about theoretical factors that influence individual's behaviour towards sustainability. Based on literature review, there are 6 academic terminologies that have been used in sustainable reading: attitude, norm, perceived control behaviour, self-identity, environmental awareness and emotions. More detailed information is included in Annex 1 Task 2.

Attitude

Attitude is that people evaluate one object (person, place, issue) either positively or negatively. People have attitudes towards anything and individual behaviour can be predicted by attitude (Perloff, 2010). People processes new information based on that they already thought or felt (Sherif and Hovland, 1961). Therefore, in the process of persuasion, changing the attitude of people, which means changing their thoughts, is the most basic and important step before changing their behaviour.

Theory of Planned Behaviour

Ajzen (1991) put forwards the theory of planned behaviour. This theory indicates that positive attitudes, subjective norm and Perceived Control Behaviour can predict individual's intention of behaviour. Theoretically, attitude means people's evaluation about whether a certain action is good or not; subjective norm means that "one person's perception of the social pressures put on him to perform or not perform the behaviour in question (Ajzen, 1991)"; perception of behaviour control means that people subjectively estimates the difficulty to perform particular behaviour. Furthermore, the performed behaviour is directly determined by behavioural intention. Generally, the theory has been found to be an important model of attitude-behaviour consistency to predict behaviour of individual (Sheppard et al., 1988; Sheppard, Hartwick, and Warshaw, 2007). In practice, the Theory of Planned Behaviour has been widely used in area of sustainable consumption (Sparks and Shepherd, 1992; Saba and Messina, 2003; Tarkiainen and Sundqvist, 2005; Chen, 2007; Gracia and de Magistris, 2007; Thøgersen, 2007a; Dean et al., 2008).

Self-identity

Generally, the definition of self-identity is about everything in the mind when people think about themselves, as a reference to guide thoughts and behaviours of people
(Kaplan, et al., 2000; Stets, et al, 2000; Oyserman, 2009).

Anticipated pride and guilt

When people evaluate a situation that whether they succeed or failure to follow their own personal or social standards, their emotions are evoked (Tracy and Robins, 2004a). People have a wide range of emotions including shame, hubris, embarrassment, to mention only a few. Specifically, pride and guilt seem to be the most important emotions in the context of sustainable consumption (Onwezen et al., 2013). Pride is a positive and pleasant feeling that is associated with sense of achievement concern self (Rodriguez Mosquera, Manstead, and Fischer, 2000). In order to reach and maintain the positive feeling, individuals are encouraged to do pro-social behaviour. While guilt is a negative feeling that includes feelings of being tense, remorseful, and worried (Ferguson, Stegge, and Dambuis, 1991). People actively wish to eliminate and avoid mismatch of social norm, so guilt can promote sustainable behaviours by removing aversive feelings (Burnett and Lunsford, 1994).

3.3 Summary of Task 3: Multi-Criteria Analysis

To get a more credible and comprehensive base to generate the strategies, the Multi-Criteria Analysis (MCA) was used during this project. It is the method to collect the scientific assessment (for example social, ecological, financial, cultural, technical, psychological) as the

criteria, in the same time, invite different groups of expert to give weight to each criteria, based on their opinions (from the view of both scientific knowledge and personal experience) which one is more dependent. In our cases, the scientific assessment was given based on the result of the model (questionnaire analysis); the group members acted as the experts from different background (Social Science, Environmental Science, Biology). From the result of our project, it can be concluded that all indicators, which are used as the theoretical support of the building strategies, were divided into 3 groups. The group of Attitude, Perceived Control Behaviour, will be used as the main base to make the communication strategies. Because they have both positive scientific assessment (supposed can have positive effort for changing human behaviour, based on results of model) and relative high weight of expert voting. The group of Identity, will just be used as the option because it kept the negative scientific assessment (supposed can have negative effort for changing human behaviour, based on results of model). The group of Subjective Norm, Emotion & Environmental awareness, Barriers for Digital using, will also be used as the main base to make the communication strategies, for the reason they kept relative high weight from the experts voting. But they did not get significant scientific assessment based on the model results, so additional theoretical support need to be found, to make the strategies (built based on these indicators) more credible and acceptable. More detailed information about the MCA is given in Annex 1 Task 3.

3.4 Summary of Task 4: Data analysis to support theory

Based on factors influencing people behaviours, we conclude that six variables (attitudes, norm, perceived control behaviour (PCB), environmental awareness, self-identity and emotions) may have different extent of influences on students' intention of using more digital reading material. After the data analysis that is based on the questionnaire, attitudes, PCB and environmental awareness showed to contribute to increase students' intention of using more digital versions of study material, while the norm, self-identity and emotions have no influences shown in our data results. The details of data analysis can be found in Annex 1 Task 4, which includes the full data analysis.

Specifically, among attitudes, using digital devices that are comfortable to eyes and using digital study material as their habit are important factors. Involving the PCB, a course of training digital reading for students and a discount price for purchasing digital devices from WUR for students are important factors. In addition, an awareness of environmental friendly behaviour by using digital devices is also important. As a result, the importance of the entire five factors can be ordered by:

- A course of training digital readings for students;
- A discount price of purchasing digital devices from WUR for students;

- Using digital devices that are comfortable to eyes;
- Using digital devices as their habit;
- An awareness of environmental friendly by using digital devices for students.

A further discussion is to distinguish the difference between bachelor students and master students. The conclusion is that bachelor students have the high potential to use more digital devices in the near future, whit a stunning 164% expected increase in sustainable reading behaviour by summing the five factors of a course of training digital readings for students, a discount price of purchasing digital devices from WUR for students, using digitals that are comfortable to eyes, using digitals as their habit, and identity. However, if master students do not attend a course about digital reading, they will have higher probabilities to stick to using paper versions. Also, the response showed some differences between females and males. However, these differences were not strong enough to base a strategy on.

3.5 Summary of Task 5: Successful examples

Recently, more and more businesses, universities and colleges and other organisations are aware of the impacts of using paper, and some of them have made efforts to reduce their paper use. Thus, some useful examples are available from changes that others made and proved to be successful. A summary is given here, for more detailed information we refer to Annex 1 Task 5. In the Annex, specific examples are given as well as on what the university could change in order to implement the lesson that could be learned from this.

First of all, it is important to include the top level in the company or organisation in making the change to being more sustainable. If this level is being sustainable, it is more likely that others will follow. In doing so, it is also possible to save money because less paper is being used. An alternative for paper that is likely to first come to mind is using digital material, also when it comes to communication with clients or other contacts. By sending digital versions by email or making documents available online, paper can be saved that otherwise would be likely to be discarded after a short while or that would take a lot of paper in distributing the paper version. Also, by forecasting sales more accurately the number of prints that needs to be made can be reduced. This would most likely be relevant for selling study material to students. If digital versions are made more available, they could also be used more easily in class. Since becoming more sustainable is a long-term process, it is also very important to have a ‘sustainability team’ that keeps motivating and educating all people that are influenced by the sustainability change. Moreover, individuals need to be reminded of their own printing behaviour, preferably close to the source. This can for instance be done by

pop-ups or by using posters near printers that remind of the impacts of printing. By keeping track of individual printing behaviour, a warning can be given when individuals exceed a certain limit of prints, and increasing the efforts that have to be made to print can also reduce the number of prints. Finally, by using more eco-friendly paper and setting margins and defaults of printers to a more sustainable setting, savings can be made in both paper and money.

4.Discussion

Looking back on this project, there are some remarks left to be made. During this project, we as a group also experienced more consciously what the practical consequences are of choosing either for digital or for paper (reading) material. While we all were very motivated to actively choose for the sustainable option, sometimes paper is just easier to work with. For instance, when a large number of articles have to be read from the screen, this can be very uncomfortable for the eyes. Therefore, it was sometimes decided to select useful articles digitally, and to print them after close selection. None of the group members was in the possession of a tablet. Although most of the group members had a laptop, only few of them decided to take it with them during meetings and group work. During meetings for this project, a lot of times a whiteboard was used. Along with paper, it has the disadvantage that it is not accessible at any place and time, however it also doesn't use energy or paper resources during its use.

Being sustainable is a very important topic for Wageningen University and currently, this University is also leading in sustainability among Dutch Universities. This year, Wageningen University again won first place on the SustainaBul, which is a price for the most sustainable university ('Studenten voor Morgen', 2014). Thus, at the one hand it is very important to keep a leading position in sustainability, at the other hand the opportunities to further improve sustainability are relatively limited.

Due to the limited time and expertise, it is impossible for us to carry out a LCA (Life Cycle Assessment) research by ourselves. For comparing environmental impacts of digital reading with that of paper-using and printing, we did a literature research and applied results of others' studies. Because there is few research about environmental impacts of general digital reading, we merely used the results of the comparison of reading digital version of news and books and from traditional paper. However, several uncertainties exist. Firstly, in this case our focus is on study purpose within the Campus, so the quality of paper used by study materials, notebooks and printing is higher than that of newspaper. Thus, we assume that producing this high-quality paper may have more environmental impacts than producing newsprint

paper. Secondly, resulting from major impacts of digital reading generate from phases of devices production and use, we assume that if the lifetime of digital devices can be extended, the environmental impacts caused by device production will be reduced. Furthermore, we assume that nowadays, most people have their own digital devices anyway, and the use of these devices for study purpose only takes up a certain proportion of the intention of buying these devices and heavily depends on people. Thus, it is uncertain that how large proportion of impacts generated from device production phase is contributed by digital reading. Hence, we assume that the environmental impacts caused by digital reading are fewer than that caused by production of digital device. Thirdly, it is already known that environmental impacts of paper mainly generate from paper production phase, whereas that of digital reading mainly generate from both device production and use phases. Therefore, we assume that with the total studying and reading time spent on the same study material increasing, the impacts caused by paper will remain unchanged but that caused by using digital devices will increase.

One has to take into account that using a digital device is also to some extend harmful to the environment. Especially during its production, the impact is large. Thus, if a student would consider buying a new digital device to only use it for study purposes, this could actually result in a less sustainable act then sticking to traditional methods. Green Office Maastricht has conducted a small research to see in which situation it is more sustainable to stick to traditional methods. This is especially the case for students who do not print much (Green Office Maastricht, 2014). However, this research does not take into account availability and usage of digital course material, such as readers and study books. Also, the environmental impact of a device largely depends on the brand and type of device that is used, which makes it harder to prove whether digital is always the more sustainable option.

Sometimes, there are also barriers for showing more sustainable behaviour. In some cases, these barriers could be overcome, for instance by providing more options for digital learning. However, if health issues such as RSI are the main barrier, it is virtually impossible to remove the barrier. Therefore, it would not be desirable to completely banish the use of paper, even if this would lead to the most sustainable outcome. Thus, a paperless university might not be the ideal outcome.

When looking at the model and the MCA output, Emotion and Environmental awareness, Barriers and Subjective norm are not significant. According to our results, focussing on Identity would even lead to a negative impact on the environment. However, from theory it can be learned that these factors can in fact have a large impact on behaviour. We therefore do not advice to completely ignore these things in communicating more sustainable reading behaviour. Furthermore, our questionnaire was produced in a limited time and also the

number of respondents was limited. Some important indicators were scored with only a low number of questions, which can make the results less accurate. In a larger research, some conclusions from the questionnaire might still slightly change. Another main limitation of our questionnaire is the student group is not so "random", for the reason more than half of the students on the contact list no one is from social sciences nor from animal sciences.

In our research, the staff of WUR is not considered as the user in our research, but actually they consume huge amount of paper per year, not only in providing course material, but also because a lot of digital handed in assignments for students are still printed by them. So in the further research it is better to take their behaviour into account as well. Furthermore, Green office and Library also are the stakeholder of our research, but we did not 'include' them as much into this project as we would like. This is partly explained by the fact that communication simply takes time, and time was a limited factor in this project. However, maybe it will be better in the future to let them be considered in the project more, for example in the educational function or making a poster.

Considering the strategy based on our model recommendations, females have more potential to change their behaviour, however males are easier to be impacted to use more digital reading options. Additionally, We should focus on bachelor students who have the high potential to use more digital materials in future. Besides, it is easier to make a course to improve sustainability compulsory for bachelor students, since master students only have to take a limited amount of courses as part of their study programme. As a last suggestion, Green Office could provide new bachelor students an overview of costs if they would choose either solely digital or paper. This would be a plan for the far future however, because currently it is not possible to only use digital study material during the whole study.

5.Conclusion

Based on our literature research, we found that digital versions of study materials are more preferable and sustainable when each digital device is used to read a large amount of information. When these devices can be used more frequently, digital version of study materials also results in fewer environmental impacts than paper version based on impact categories. In Wageningen Campus, because most of computers and laptops are actively used during most of time of a day and mainly for study purposes, we assume in this case, each digital device can be used to read a sufficient amount of information during its life time. Thus, in the case of Wageningen Campus, digital reading is more environmentally friendly and it seems necessary to promote digital reading by students and employees. In this project, we mainly focus on students' behaviour. A table of strategies is given at the beginning of this

report.

For the individual behaviour part, sustainable reading behaviour is a social dilemma, which contains pro-self choice and pro-social choice. In terms of two dimensions of sustainable reading behaviour, two dimensions of values are proposed across different cultures, nationals, and persons (Schwartz 1994, Schwartz, et al. 2001, Schwartz, et al. 2004). The first dimension is related to social acceptance or conformity, which includes altruistic and biospheric values while the second dimension is related to pursuit personal interests, which contains egoistic value. Therefore, firstly we use theory of planned behaviour to analyse reading behaviours of Wageningen students. Theory of planned behaviour indicates that individual attitudes, subjective norm and perceived control behaviour have positive influence on behaviour that mediated by behavioural intention. Besides, theories such as social norm, self-identity, environmental awareness and anticipated emotions have been included to predict behaviour in our case.

Our model supports these theories are relevant and influential in our project. The results show that generally, there are three attitude variables towards papers (papers are comfortable to eyes, papers are efficient to read, papers are easy to make notes) that are not significant, which means that the attitude impacts of respondents who prefer using papers can be ignored by our analysis. While the two attitudes variables towards digital devices (digital versions are comfortable to eyes, using digital versions is my habit) are significant, which is consistent with our expectation that the positive attitude towards using digital devices stimulates the positive intention of respondents who use more digital devices in the future. In addition, there are two Perceived Control Behaviour (PCB) variables that also report positive significant impacts on intention, which are ‘a course about digital reading that will stimulate me to use more digital versions’ and ‘a discount of purchasing digital devices from WUR that stimulates me to use more digital versions’. Therefore, after a course training of digital reading and getting a digital device for a cheaper price, the respondents may increase their intention of using more digital devices in the future. Lastly, environmental awareness becomes significant, so if our respondents have the awareness of using digital devices more environmental friendly than using papers, they may increase their intention as well.

At the same time, we reviewed some successful examples. Firstly, from business examples, it shows that improving sustainability by reducing paper use is more likely to be successful if the top levels are also involved. Secondly, education is an important factor in promoting sustainable behaviour. The people involved do not only have to be motivated to change their behaviour, they should also know how they could do so. Additionally, changing behaviour in order to make it more sustainable is not just a short-term project, but also a long-term

process. Thirdly, reminding people about the impact of their behaviour can help to reduce the number of individual prints. Fourthly, by setting printers to a more sustainable default, paper can be saved without the need for large behavioural changes.

Therefore, we base our knowledge on literature research and results of the questionnaire, MCA and model to deign our creative strategies. However, it is difficult to change people's behaviour, especially their habits. So long-term and short-term strategies are important. For long-term strategies, we focus on changing reading habits of bachelor students, as they will stay at Wageningen University for a longer time. Thanks to the sustainable atmosphere of Wageninegn University, it will be easier to build a sustainable culture. On the other hands, short-term strategies can promote more sustainable information to students (and employees), letting them have positive attitudes that have potential influence on behaviour towards sustainable reading.

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Annex

Annex 1 Theory to support strategies

Task 1: Comparison of environmental impacts of digital reading and reading on paper for Wageningen campus, the Netherlands

In this case, we will analyse and compare environmental impacts of different reading behaviours with study purpose. The two main reading behaviours are reading from digital devices and reading from paper, and the study materials concern course books, course materials and any other types of literatures for studying and researching. It is hard to tell which reading behaviour is more environmentally friendly, so environmental impacts of both reading behaviours will be compared based on the assessment of their whole life-cycles (LCA). Due to the limited time and expertise, all information of this chapter is derived from results of others researches.

1.1 Life-cycles of digital reading and reading on paper

The method of LCA can be used to clarify environmental impacts generated from all stages of the whole life cycle of a product, which means from “cradle to grave” (Baumann and Tillman, 2004). By analysing environmental impacts of both reading behaviours throughout their life-cycles, a relatively complete comparison can be exhibited. Flow charts concerning life cycle of study material in both paper version and digital version are shown below (Figure 1 and 2) (Moberg et al., 2010). As for the figure about the paper version, it clearly indicates that production stages include extraction of raw material from forests, production of pulp, paper and printing material, information editing, printing process, using phase and waste management. With regard to the digital version, stages such as production of electronic devices, editorial work, information transmission from internet, information reading with devices and waste management are covered. Among these stages, editorial work of study material in both versions is seen as the same. Besides, due to a lack of data, the magnitude of environmental impacts originated from transportation and waste management of both still remains uncertain, though recycling of paper and components of devices can also bring positive effects.

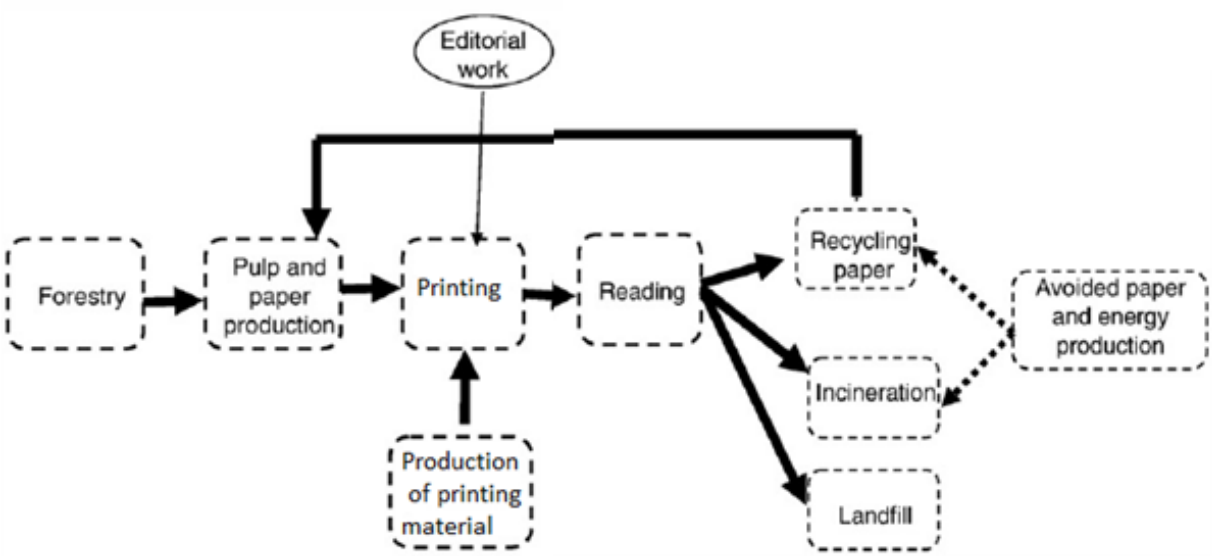


Figure 1: Different stages of study material in paper version in its life cycle (Moberg et al., 2010)

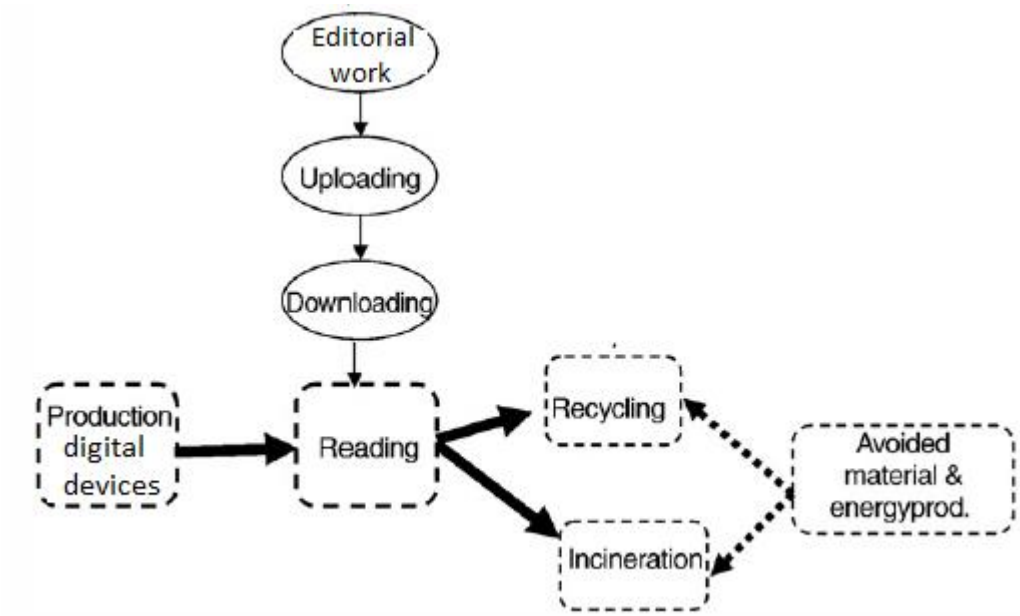


Figure 2: Different stages of study material in digital version in its life cycle (Moberg et al., 2010)

1.2 Comparison of environmental impacts based on two cases

Based on the LCA, a comparison of environmental impacts of both reading behaviours will be given. An assessment method, named environmental scarcity, is applied in this comparison, and the magnitude of environmental impacts is described as 'Ecopoints' (Reichart, 2002). All figures shown in this comparison are relative values. Additionally, this method mainly focuses on energy use and the related emissions to air, water and soil, resulting from these

are also the main emphases of LCA. In LCA, eco-toxicity is often neglected and more attention needs to be put on it (Finnveden, 2000).

From the research carried out by Reichart (2002), it is obvious that with different amount of study material, results of the comparison can be opposite. In the case of only reading a small amount of information or from rather limited pages (See Figure 3), reading on paper is more sustainable compared to reading through digital devices. Credit means there is a possibility that the environmental situation could be improved by paper recycling. Nevertheless, in the case of reading quite a large amount of study material (See Figure 4), reading on paper results in much more adverse environmental impacts. This difference is mostly the result from the increased need of printed paper if one reads large amounts of information from paper, and the pulp and paper industry is highly polluting. In our case regarding the Wageningen Campus, most of study material possesses quite a large amount of information and a large number of pages are needed. Therefore, our case has more similarities to the situation expressed in Figure 4, which means digital reading is more preferable. Furthermore, from both Figures 3 and 4, we can clearly see that major contributors to environmental impacts of digital reading are production of digital devices and the use of these devices and its related infrastructure. Whereas, for reading materials in the paper version, environmental impacts are mostly generated from the production phase.

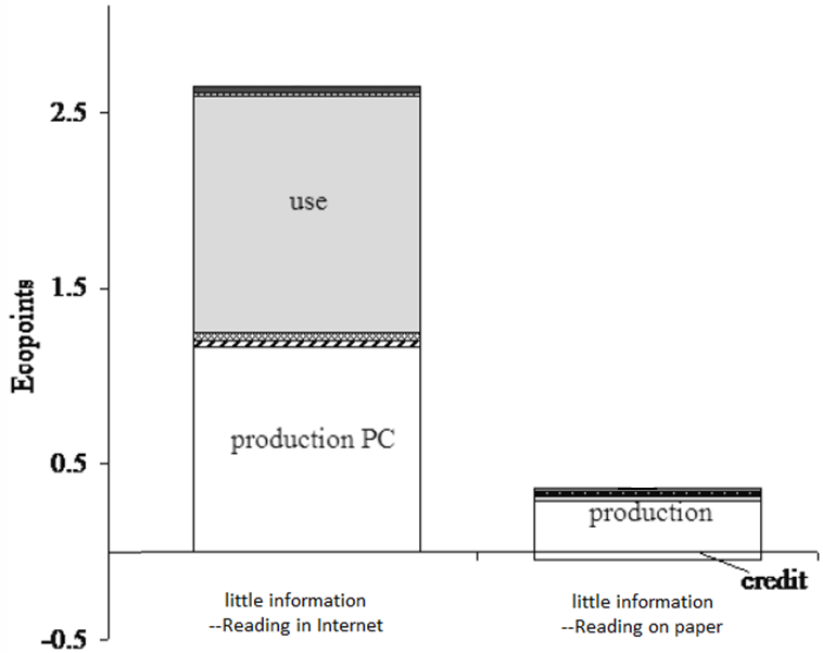


Figure 3: Environmental impacts of digital reading and reading on paper, in the case of reading a small amount of information (Reichart, 2002).

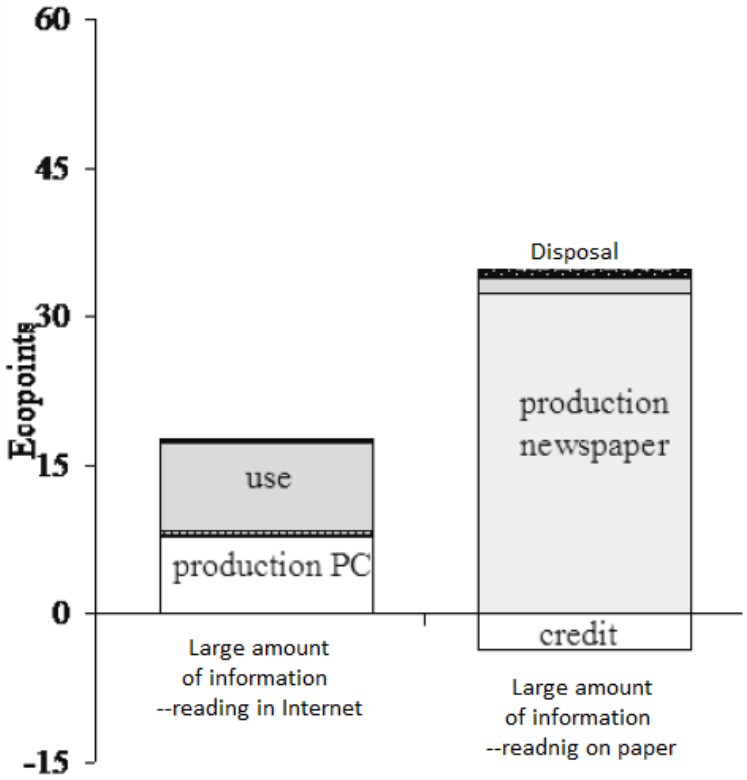


Figure 4: Environmental impacts of digital reading and reading on paper, in the case of reading a large amount of information (Reichart, 2002).

1.3 Environmental impacts of digital reading

For digital reading in general, because most of environmental impacts are generated from phases of production and use, an illustration of impacts will be provided based on these two phases. During the production processes of digital devices, various harmful impacts are caused by manufacturing of components of these devices, such as releases of volatile organic compounds, toxic solvents and solutions, acids, metals and solid wastes, to mention only a few (Berkhout and Hertin, 2004). For instance, computer production can lead to many impacts with respect to waste generation, climate change, and energy consumption (Matthews, 2001). An amount of greenhouse gases with 130kg CO_2 equivalent can be released from the manufacturing of each computer, and meanwhile, it can also lead to a generation of waste with 30kg (Berkhout and Hertin, 2004). Up to 98 percent of material used to produce computers becomes waste, and merely the remaining 2 percent turn out to be part of the computer (Hilty and Ruddy, 2000).

Furthermore, during the use phase of digital devices, both these devices and the related infrastructure consume energy. From Figure 5, the infrastructure enabling digital reading

takes the predominant position of energy consumption during the use phase, with more than 80 %. At the same time, the electricity consumed by digital devices cannot be ignored. 1 kW h per working day is the average amount of electricity consumed by a normal computer in a medium size (Zurkirch and Reichart, 2000). In our case of the Wageningen Campus, it is assumed that most of digital devices allocated at the Campus are mainly for study use, and they stay in either active or standby mode during the whole day. Thus, the energy consumption of them can be quite large. However, if the energy used at the Campus is generated in a greener way, or the devices (such as laptop and iPad) demanding less energy can be used frequently, the amount of energy consumed during the use phase can be smaller. Still, according to the following pie chart, these can only make the percentage of energy consumption contributed by digital devices shrink; the amount of energy consumed by infrastructure still remains considerable.

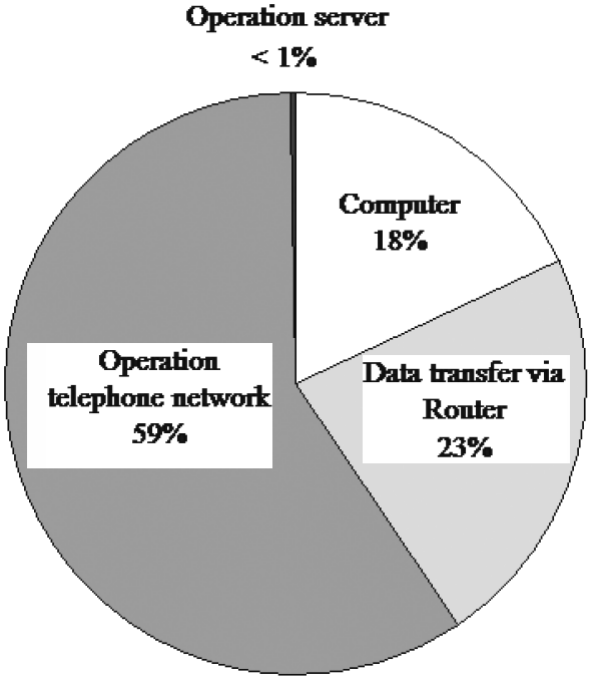


Figure 5: Proportional contribution to environmental impacts or energy consumption during the use phase of digital reading (Reichart, 2002)

1.4 Environmental impacts of reading on paper

For the paper version of study material, environmental impacts generated from the production phase mainly consist of that from the pulp and paper industry and printing. Because production of pulp and paper needs large amount of biomass, deforestation is one of the bigger problems. Around one third of the total amount of logged trees, with the number of 4 billion in the world per year, is consumed by the pulp and paper industry (Martin, 2011). Though this industry gives a high contribution to the economy of many

countries worldwide (Nemerow and Dasgupta, 1991), it also leads to serious depletion of resources and pollution. More than 250 toxic compounds have been found in the wastewater discharged from those factories (Ali and Sreekrishnan, 2001). The untreated effluents from these factories have a high toxicity to the environment, which contain mainly chemical oxygen demand (COD), biochemical oxygen demand (BOD), suspended solids (SS) and a variety of acids (Pokhrel and Viraraghavan, 2004). Those pollutants are generated from a series of stages of papermaking, such as wood preparation, from digester house, pulp washing, pulp bleaching, and paper making (Pokhrel and Viraraghavan, 2004). These stages generally need a considerable amount of water with twenty thousand to sixty thousand gallons/ton of produced paper (Nemerow and Dasgupta, 1991). This causes not only a high discharge of harmful effluents but also a severe waste of water. However, it is well known that in many OECD countries recycled paper is used to produce new paper, in some countries up to 80% recycled paper. This reduces the resources and water use.

In addition, pollution caused by the pulp and paper industry has impacts on soil, air, water and health of humans and animals. For instance, the discharged effluents can cause a significant change in chemical composition in cultivated soil (Howe and Wagner, 1999). Through wet and dry deposition, emissions of sulphur dioxide (SO_2) and nitrogen oxides (NOx) can lead to acidification of soils (Dias et al., 2004). Furthermore, effluents can raise the concentration of toxic compounds in waters, simulating the generation of sludge and foam, changing the colour and thermal exchange of water and destroying the beautiful scenery (Pokhrel and Viraraghavan, 2004). The presence of toxic compounds in water also has adverse impacts on aquatic organisms, such as plankton and various fish species. They can irreversibly alter the composition of the ecosystems (King et al., 1999). Moreover, human health can be also influenced by the exposure of toxic effluents from the pulp and paper industry, in relation to discomfort feeling of eyes, diseases of the digestive tract, and headaches (Mandal, 1996). Additionally, when talking about printing, the pollution from ink itself cannot be neglected. Apart from the toxic substances in the ink involved itself, cleansing ink from presses also need several harmful solvents. Both volatilization of these solvents and discharge from cleansing water can cause pollutions in air, water and soil (Bhaskarwar and Cussler, 1997). Hence, it is without a doubt that reducing the paper use and printing can improve the environment to a large degree.

1.5 Comparison of environmental performance of paper version and digital version

There is a research (Moberg, Borggren and Finnveden, 2011) focusing on the comparison of

environmental impacts of different versions of book. This research is based on an assumption that 48 books (17,000 pages) can be read from a digital devices during its life time. The result of this research is translated into a bar chart shown as Figure 6. Impact categories and their units are expressed in Table 2.

Table 2: Impact categories and their units (Borggren, Moberg and Finnveden, 2011)

Impact category	Unit	Meaning
Energy	MJ eq	Cumulative energy demand
GWP	kg CO_2 eq	Global warming potential
ADP	kg Sb eq	Abiotic depletion
AP	kg SO_2 eq	Acidification potential
EP	kg PO_4 eq	Eutrophication potential
ODP	kg CFC-11 eq	Ozone depletion potential
HTP	kg 1,4-DB eq	Human toxicity potential
FAEP	kg 1,4-DB eq	Freshwater aquatic ecotoxicity potential
MAEP	kg 1,4-DB eq	Marine aquatic ecotoxicity potential
TEP	kg 1,4-DB eq	Terrestrial ecotoxicity potential
POCP	kg C2H4	Photochemical ozone creation potential

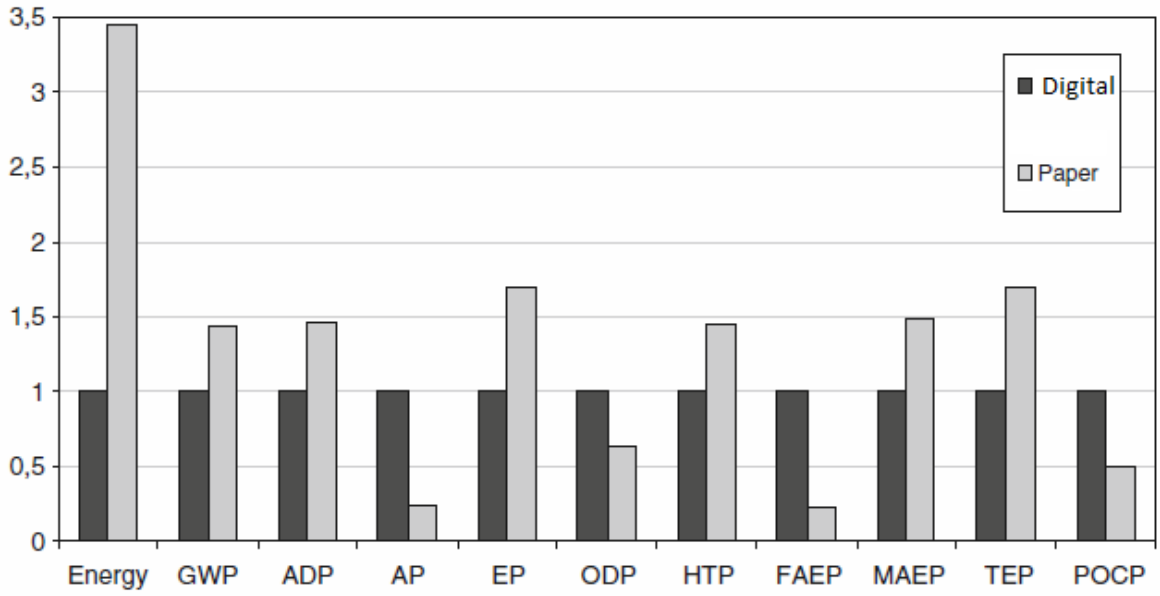


Figure 6: Comparison of digital version and paper version based on environmental impact categories (Moberg, Borggren and Finnveden, 2011)

From Figure 6, it is obvious that except for the performance in several items, such as acidification, photochemical ozone creation, ozone depletion and freshwater aquatic ecotoxicity, study materials in digital version have fewer environmental impacts than that in paper version. Nevertheless, this result is based on the assumption that 48 books (17,000 pages) can be read from a digital device during its life time. In the case that the number of books read from one digital device is less than 30, the paper version is preferred (Moberg, Borggren and Finnveden, 2011). This also confirms the results shown in former sections, which means the digital version is more sustainable when a device can be used to read a large amount of information during its life time. Furthermore, one thing needs to be noted from Figure 6 is that the energy consumption of paper version is very high, which is mainly because the energy consumed in bookstores are also included. In our case of Wageningen Campus, because bookstores are not taken into account, this extremely high energy consumption can be avoided, but it is assumed that the energy consumption of the paper version is still larger than that of digital version.

To sum up, digital versions of study materials are more preferable and sustainable when each digital device is used to read a large amount of information. When these devices can be used more frequently, digital version of study materials also results in fewer environmental impacts than the paper version based on impact categories. In Wageningen Campus, because most of computers and laptops are actively used during most of time of a day and mainly for study purposes, we assume in this case, each digital device can be used to read a sufficient amount of information during its life time. Thus, in the case of Wageningen

Campus, digital reading is more environmentally friendly.

Task 2: Factors that influence individual behaviour (literature review)

This part explains different factors that influence individual behaviour. In the work of Ajzen (1991) Theory of Planned Behaviour is indicated, which means that attitudes, norm and perceived control behaviour have positive influence on behavioural intention. Besides, many other important factors are proposed to predict behavioural intention: self-identity (Oyserman, 2009), emotion (Onwezen et al., 2013) in the sustainable context. The explanation of them are illustrated below.

Theories of Planned Behaviour

Ajzen (Ajzen, 1991) put forwards the theory of planned behaviour, which is the extension of the theory of reasoned action. The theory indicates that positive attitudes, subjective norm and perceived behaviour control can predict individual's intention of behaviour. Theoretically, attitude means that people's evaluation for that if certain action is good or bad, subjective norm means that "one person's perception of the social pressures put on him to perform or not perform the behaviour in question" (Ajzen, 1991), and the last one is perception of behaviour control, which means that people subjectively estimate the difficulty to perform particular behaviour. More importantly, the model assumes that people rationally consider the costs and benefits of one action to decide whether or not to do it. Furthermore, the real behaviour is directly determined by behavioural intention. Generally, the theory has been found to be an important model of attitude-behaviour consistency to predict behaviour of individual (Sheppard et al., 1988; Sheppard, Hartwick, and Warshaw, 2007). In practice, the theory of planned behaviour has been widely used in area of sustainable consumption (Sparks and Shepherd, 1992; Saba and Messina, 2003; Tarkiainen and Sundqvist, 2005; Chen, 2007; Gracia and de Magistris, 2007; Thøgersen, 2007a; Dean et al., 2008).

Norm

The terminology of norm means that behaviours of people are influenced by surround environment （Biel, et al., 2007). Using paper or digital to read is a social dilemma that contains pro-social and pro-self choices for students. When they choose paper to read as the reasons of healthiness or habits, they choose pro-self choice while when they choose digital

to read as the environmental reason, they choose pro-social choice. Norm directs people to make pro-social decision through restrict immediate egoistic benefits in the social dilemma. Therefore, people's norms are stimulated when they realize and believe that their own choices or behaviours would affect other people. The salient norms let people to have a strong sense of moral obligation to protect other's interest. Therefore, consumers prefer sustainable reading to paper reading; they would like to choose cooperative behaviour, which is congruent with their norm (Biel, et al. 2007, De Cremer, et al. 2002, Simpson, et al. 2008). As a result, norm influence behaviour.

Self-identity

Generally, the definition that self-concept is about everything in the mind when people think about themselves and at the same time as reference for to guide thoughts and behaviours of people is accepted widely (Kaplan, et al. 2000, Sirgy 1982, Stets, et al. 2000). Identity-based behaviour focuses on the motivational pull towards identity-congruent actions and identity-congruent cognitive procedures. It focuses on the concept that people utilize their identities in order to plan for action and/or process information. Therefore, we use it to discuss behaviour related identities. Specifically, identity-based motivation states that motivation is higher for identity-congruent action compared to identity-incongruent actions.

Anticipated pride and guilt

When people evaluate a situation that if they success or fail to follow their own personal or social standards, their emotions are evoked (Tracy and Robins, 2004a), which means that emotions not only focus on personal standards, but also about social standards (Tracy and Robins, 2004a; Beer and Keltner, 2004; Tangney, Stuewig and Mashek, 2007). People have wide range of emotions including shame, hubris, embarrassment etc. Specifically, pride and guilt seem to be the most important emotions in the context of sustainable consumption (Onwezen et al., 2013).

Pride

Pride is a positive and pleasant feeling that is associated with sense of achievement concerning oneself (Rodriguez Mosquera, Manstead, and Fischer, 2000). Pride can be considered a desired end state that individuals strive to reach and maintain. When people get the desired achievements that are in line with personal and social standards, pride is stimulated (Exline and Lobel, 2001; Tracy and Robins, 2004b; Williams and Desteno, 2008). Consequently, in order to reach and maintain the positive feeling, individuals are encouraged

to do pro-social behaviour.

Guilt

Guilt is a negative feeling that includes feelings of being tense, remorseful, and worried (Ferguson, Stegge, and Dambuis, 1991). When an individual feels personally responsible for violating a personal, social, or moral standard, guilt arises (Berndsen and Manstead, 2007; Kugler and Jones, 1992; Tangney, Miller, Flicker and Barlow, 1996). As guilt is influenced largely by interpersonal context, guilt is closely related to social norms, such that guilt results from a perceived mismatch between social norms and one's own behaviour (Bamberg, Hunecke, and Blobaum, 2007; Baumeister, 1998). People actively wish to eliminate and avoid mismatch of social norm, so guilt affects sustainable behaviour by removing the aversive feelings (Burnett and Lunsford, 1994).

Task 3: Multiple Criteria Analysis

MCA was chosen as the tool because firstly, different criteria with different scale can be use to assess the indicator in the same time, you do not need to transform them into same unit. In the same time, the problem criteria is difficult to measure can be solved. Secondly, it can give the idea of different indicator with relative importance for the project, which can be a good evidence to support decision making.

3.1 Principle

"Multi-Criteria Analysis (MCA) is a decision-making tool developed for complex problems. In a situation where multiple criteria are involved confusion can arise if a logical, well-structured decision-making process is not followed"('CIFOR', 1999). For several specific criteria and indicators (social, ecological, financial, cultural, technical, psychological), multidisciplinary groups will give a score and weight of them. With the results of total score, list of preference options and ranked options, some indicators turn to be evaluative, and the rest of all can be also appraised in specific way. This tool usually to deal with environmental problems like energy using and climate change. In this case, we created a table for different targets, to collect the opinions of direction for communication strategies design. To get more integrated idea, all group members from different backgrounds will attend into the weighting tasks as the experts, in that time the standard of each expert will be made by themselves in their mind, based on their scientific knowledge and personal experience. The indicators were chosen based on the questionnaire and estimation model.

Table 3: Example of MCA table

		Weight						
	Coefficient	Chen	Lotte	Yu	Sally	Cao	Average	Final
Attitude								
Subjective Norm								
Perceived Control Behaviour								
Identity								
Emotion & Environmental awareness								
Barriers for Digital using								
		100%	100%	100%	100%	100%		

From the MCA table above, there are 6 different indicators can be found, which can point out the direction for the communication strategies building. The meaning of each indicators have already been mentioned in the previous part. The indicators will firstly be scored with the coefficient based on the results of the estimation model. It can support half of the assessment for each indicators, and the results are relative objective, because it only based on the data collecting from the questionnaires. Besides, each experts will give their weight for the different indicators, which in total counts up to 100%. The percentages for each indicator, given by different area experts, can illustrate the each member dependent about which indicator is important. Percentages should be set up based on the background knowledge and experiences of the experts, which were considered more integrated. Finally, the total score for each indicator will be calculated by coefficient times the weight, to give a combined overview for the expected performance of each indicator. These total scores will be ordered from top to bottom, as the main reference for communication strategies building (Higher score will be more focused on).

3.2 Results

Here are the results of MCA based on model's output and member's opinion.

Table 4: MCA table of the indicators based on the questionnaire.

		Weight						
	Coefficient	Chen	Lotte	Yu	Sally	Cao	Average	Final
Attitude	0.32	30%	20%	10%	20%	20%	20%	0.064
Subjective Norm	Not significant	5%	10%	10%	15%	10%	10%	X
Perceived Control Behaviour	1.08	5%	10%	10%	20%	25%	14%	0.1512

Identity	-0.14	20%	15%	20%	20%	25%	20%	-0.028
Emotion & Environmental awareness	Not significant	20%	20%	10%	15%	15%	16%	X
Barriers for Digital using	Not significant	25%	25%	50%	10%	15%	25%	X
		100%	100%	100%	100%	100%	100%	

First of all, from the item of the coefficient(for more information can be found in the part of model analysis), it can be found that there are three different kind of results there: positive number, negative number and not significant. The meaning of these results are already mentioned partly in the previous part. In short, the positive number means this indicator will have positive effort if the communication strategies is built based on that; the negative number means the strategies built based on this indicator will have negative effluence for changing students reading behaviours; the not significant means there is no evidence that can support whether these indicators will have positive or negative effect for influencing the students behaviours. These three kind of results will be used again for classification of the communication strategies generation. This way of measurement was generated by our group, in the further research some test can be made for the credibility of this way.

Secondly, five member results about how many weights should be given for each indicators listed after the coefficient. It can be concluded that people from different background with different experience will have different opinion about weighting. Even the two members(Chen and Cao) from same programme (Environmental System Analysis).

After that, the average weights of each indicator, which calculated based on the five member opinion can be found that the Barriers for Digital using was considered as the most important standard(although not significant based on questionnaire analysis) for the communication strategies building, with average 25%. Next, the attitude and identity(although also not significant based on questionnaire analysis) were thought as same relative higher level comparing with the rest of the indicators, with both average 20%. The last indicator which the members were thinking is the Subjective Norm, with only average 10%.

Because there were three indicators without a significant Coefficient based on the model, only three indicators got the final score. The Perceived Control Behaviour had the highest score, which means based on the result of both model analysis and personal experience, this indicator should be considered mostly for the strategies making. After that, although the indicator Attitude did not have a high Coefficient, but with higher weight given by the members, this indicator is the second important reference for strategies. Because the negative Coefficient, the Identity will not be considered so much as the standard of the strategies generation, because the result of the strategies was predicted be negative.

However, because the limited function of the model analysis, also the uncertainty of the results from the questionnaires, there were still three indicators (Subjective Norm, Emotion & Environmental awareness, Barriers for Digital using) without Coefficient, it is not wise to abandon them, also not integrated and comprehensive for us to build the strategies only based on the result of the model. These indicators were also considered as the reference for strategies building, with weights given by the member (especially the Barriers for Digital using, with highest weight of all indicator). So these three indicators will still be considered as the reference to make the strategies, but more theoretical support should be found to prove the availability of these indicators. The more information of theory and final strategies came up by the members can be found in the chapter of the strategy.

Task 4: Data analysis to support theory

4.1 Sample description

4.1.1 Sample

The participation sample of the research, to collect current situation of the students reading preference in WUR, would be consisting randomly selection of the students in WUR, from different nationalities, study programme and educational level. We will use simple random sampling method to find the participants. We selected the samples in different rounds by different methods.

Firstly, after we finished the first version of questionnaire, each member selected 5 to 10 friends of them to do the pre-test round. The way of selection was mixed directivity(mixed gender, nationality, etc.).
This way of sampling has several strengths:

- Easy to control
- Get the response immediately
- Can be random
- Feedback from the questionnaire can be used to improve the questionnaire in next round

After we collected all the answers from the first round, it shown us the results were available for the model operation, no serious mistakes need to adjusted, and the students can understand the questions, answering efficiently.

In the next round, we divided the sampling work with two methods. Firstly, we posted the questionnaire on the public website of WUR, for example the students plaza mainly consisted of students in WUR or public website for Wageningen students apartments. To make it more clear for the students, we wrote down brief description with introduction and aim of the questionnaire and the specific group of the desired interview.

Secondly, we asked the Library department of WUR for a list of students. All the students followed information literacy courses, but it has to be taken into account that it is not complete in the sense that no students from social sciences nor from animal sciences were on the list. The total number of the students are 910. We randomly selected 500 of these students to send the questionnaire, with measurement for privacy protection. The whole process of implementation the questionnaire continued for more than a week.

Before the deadline of the sampling work, there were 137 finished and uploaded the questionnaire. There were more than 126 results we had got, which means firstly the number of the responders matched the requirement of our model(the model designed by our member to analyse the statistics data from the questionnaire and factors can influence the reading behaviours, for more detailed information of the model can be found at following part of report). However, some results need to be selected for deleting because they were not filled completely, which left 122 responses for further analysis. The output of the model will be relative significant; secondly, because the number of the responders were close to the minimum, it means the output of the data analysis will be accurate and creditable enough.

4.1.2 Definitions, description and expected impacts of data

[Table 5]

Table 5 presents the descriptive statistics of variables, which is used in our regression model. Every variable in our questionnaire has been measured by 4-scale, for example, ‘strongly disagree’, ‘disagree’, ‘agree’, and ‘strongly agree’. Therefore, the maximum value for a variable is 4 while the minimum is 1, and we show it as the mean value in table 5. The expected sign indicates that the corresponded variable has a positive, negative or no impact to the intention of students who prefer using digitals. We categorize the variables into the dependent variable, attitude variables, the norm variable, perceived control behaviour variables and independent variables.

Intention

Intention measures the extent of the students who will prefer using more digital devices for reading in the future. The higher score the respondents filled in, the higher intention of using digitals for reading the respondents had. Because the behaviour is hard to be predicted, we use the variable of intention as an indicator to estimate the possible changes of respondents' behaviours.

Attitude variables

Attitude is measured by individual's behavioural beliefs and evaluations of these behavioural beliefs. The behavioural beliefs, covering a wide range of attributes regard to why people choose paper/digital reading, were measured by asking respondents to rate their agreement. We use direct and indirect methods in our questionnaire to measure the attitudes of respondents towards reading by paper and digital versions. For the direct method, we use the question of ' the extent of students preferring paper and digital respectively', which means that two sub-questions have been included in it. The higher score on papers indicates that the corresponding respondent prefers using papers as his or her primary reading behaviours, so it causes a negative impact to the intention of using more digitals, and vice versa.

For the indirect method, we use seven characteristic variables of papers and digitals respectively, which could affect the selected reading behaviours of students. They are comfortable to eyes, easy to take, habit, efficient to read and easy to get, easy to make notes and environmental friendly. These characteristic variables are selected by our brainstorming. In addition, we expect that the higher scores on papers indicate that the corresponding respondent prefers using papers as his or her primary reading behaviours, so it causes a negative impact to the intention of using more digital devices, and vice versa.

Norm

Subjective norm can support the information how the student build their subjective standard for paper and digital devices use. It includes the question that 'the teachers suggest me to use more digital versions of course.'

We use the direct method to measure the respondents' norm, which leads by a question of 'teachers who suggest using more digital course materials.' We expect that the norm has a positive impact on intention of students who prefer using more digitals.

Perceived Control Behaviour

Perceived Control Behaviour is used to test the factors that can influence the students preservation of their reading behaviour. It includes the question about the skill of digital devices using, skill courses impact and discount of digital devices purchase.

We use the indirect method to estimate the PCB of respondents, which leads by 4 sub-questions, namely 'skills to search enough digital lecture materials or literature', 'a course about digital reading that will stimulate me to use more digital versions', 'a discount of purchasing digital devices from WUR that stimulates me to use more digital versions', and 'thinking it is easy to get digital course materials'. We expect that the higher score on the sub-questions, the higher intention of respondents could have, and then change their reading behaviours to more use of digital devices.

Independent variables

We have seven independent variables in our regression model, which are age, gender, and education level, identity, pride, guilt, and environmental impacts. We expect that age and gender have no impacts on intention, and the higher education level indicates more digital versions searching skills of the respondents, so it leads to a positive intention. However, the other four variables of us expecting all have the ambiguous impacts on the intention, which means it could be either positive or negative, depending on the different understandings of respondents to the four variables.

Table 5: descriptive statistics

Variable	Mean	S.D	Expected sign
Dependent variable			
Intention	2.54	0.88	n.a.
Attitude variables			
The extent of students preferring on paper	3.57	0.59	-
The extent of students preferring on digital	2.32	0.85	+
Comfortable for eyes concerning paper	3.62	0.55	-
Comfortable for eyes concerning digital	1.75	0.67	+
Easy to take by paper	2.77	0.84	-
Easy to take by digital	2.90	0.84	+
Habit concerning paper	2.94	0.65	-
Habit concerning digital	2.30	0.66	+
Efficient to read by paper	3.14	0.67	-
Efficient to read by digital	2.41	0.70	+
Easy to get by paper	2.44	0.75	-

Easy to get by digital	3.12	0.76	+
Easy to make notes concerning paper	3.63	0.59	-
Easy to make notes concerning digital	1.98	0.79	+
Environmental friendly of paper	1.83	0.72	-
Environmental friendly of digital	3.30	0.63	+
Norm			
Teachers who suggest using more digital course materials	2.14	0.68	+
Perceived control behaviours variables			
Skills to search enough digital lecture materials or literature	3.01	0.66	+
A course about digital reading that will stimulate me to use more digital versions	2.49	0.85	+
A discount of purchasing digital devices from WUR that stimulates me to use more digital versions	2.86	0.85	+
Thinking it is easy to get digital lecture materials	3.01	0.70	+
Independent variables			
Age	23.10	3.14	n.a
Gender	1.64	0.49	n.a
Education Level	1.63	0.56	+
Identity	2.99	0.79	+/-
Pride	2.84	0.70	+/-
Guilt	2.65	0.92	+/-
Environmental impacts	3.355	0.51	+/-

Source: online questionnaire

n.a. = not applicable

4.2 Analysis of results

4.2.1 Model explanations

To examine the separate and the combined impacts of attitudes, norm and Perceived Control Behaviour on the intention of students using digital devices, we test 3 groups of the model. The first group tests attitude variables that are significant on impacting students who prefer paper. The second group tests attitude variables that are significant on impacting students who prefer digital devices. The third group combines the selected attitudes variables that are both significant from group 1 and group 2, and then examines the impacts of attitudes, norm, PCB and other independent variables on the intention of students who prefer using digital devices.

We expect model 1-2 to be significant, and then get the selected attitude variables. Specifically, the characteristic variables of the attitude towards traditional papers and digitals versions are included in our questionnaire. They are Q10 and Q12, which listed seven different sub-variables, namely comfortable with your eyes, easy to make notes and easy to take, environmental friendly, habit, efficient to read and easy to get respectively. It is in order to capture the specific attitudes of students on using traditional papers and digital versions. In addition, Q8 is also an attitude variable that measures the extent of students who prefer papers or digitals directly. Moreover, in Q27 we listed four sub-variables that can reflect PCB, which are that enough skills on searching digitals materials, a course about digital reading that will stimulate me to use more digitals, a discount of purchasing digital devices from WUR and thinking easily to get digital lecture materials. Lastly, Q23 measures the Norm variable, which is that ' my teachers suggest me to use digital versions of course materials more than paper versions'.

The regression model is specified as:

$$Att\_paper_i = a_1 + \sum a_{2j} M_{ji} + u_{1i}$$

(1)

$$Att\_digital_i = b_1 + \sum b_{2j} N_{ji} + u_{2i}$$

(2)

$$I_i^R = c_0 + \sum c_{1j} ATT_{ji} + c_2 NORM_i + \sum c_{3j} PCB_{ji} + \sum c_{4j} X_{ji} + u_{3i} \qquad (3)$$

Att_paper_i= Attitude towards using paper for respondent i.

$Att\_digital_i$= Attitude towards using digitals for respondent i.

M_{ji}= A set of characteristic variables of using papers for respondent i

N_{ji}= A set of characteristic variables of using digitals for respondent i

I_i^R= Values of reading intention for respondent i.

ATT_i = Selected characteristic variables of attitudes from M_{ji} and $N_{ji}$for respondent i.

$NORM_i$ = Teachers who suggest using more digital course materials for respondent i.

PCB_i = Variables of perception on the extent to access digital course materials by respondent i.

X_{ji} = A set of control variables for respondent i.

u_{1i} = Error term with standard properties.

u_{2i} = Error term with standard properties.

u_{3i} = Error term with standard properties.

We use the OLS method in all three groups of models to estimate the factors.

4.2.2 Estimation results

[Table 6]

The table 6 reports the results of model 1 and model 2, which finding that comfortable for eyes (traditional papers and digital versions), easy to make notes (paper), habit (digital) are significant in attitudes towards using traditional papers and digital versions respectively. However, the other independent variables are not significant. Consequently, we select the four significant attitude variables in the next step regression.

[Table 7]

Table 7 reports that the all three attitude variables towards papers are not significant, which means that the attitude impacts of respondents who prefer using papers can be ignored by our analysis. The two attitudes variables towards digital devices are significant, which is consistent with our expectation that the positive attitude towards using digital devices stimulates the positive intention of respondents who use more digital devices in the future. In addition, there are two PCB variables that also report positive significant impacts on intention, which are 'a course about digital reading that will stimulate me to use more digital versions' and 'a discount of purchasing digital devices from WUR that stimulates me to use more digital versions'. Therefore, after a course training of digital reading and getting a cheaper price of digital devices, the respondents may increase their intention of using more digital devices in the future. Lastly, environmental impacts become significant, so if our

respondents have the awareness of using digital devices more environmental friendly than using papers, they may increase their intention as well.

[Table 8]

Table 8 reports that by the summing of all significant variables in model 3, it may create 137% increase on intention if the respondents increase all their significant attitude, PCB and environmental impact variables by one scale. Consequently, in order to increase the intention of respondents (students), we should focus on finding the communication strategies based on these significant variables in model 3.

[Table 9] [Table 10] [Table 11]

For a further analysis, we distinguish the difference impacts between female and male, bachelor students and master students. Table 9 reports the difference between male and female. We can find that only environmental impact is positively significant for male, while there are three variables positively influencing female, which are comfortable to eyes (digital), habit (digital) and a course about digital reading. Finally, by combination the results of table 10 and table 11, we conclude that females have more potential to change (total 100% increase) but male are easier impacted (only environmental impact) to use more digital devices.

[Table 12] [Table 13] [Table 14]

Table 12 reports the difference between bachelor students and master students. We can find that there are four positive variables impacting bachelor students who use more digital devices in the future, which are comfortable to eyes (digital), habit (digital), a training course of digital reading and a discount price of purchasing digital devices from WUR. However, there is one positive variable and one negative variable that both impact master students who use more digital versions in the future, which are a course and easy to make notes (paper). Finally, by combination the results of table 13 and table 14, we conclude that bachelor students have the high potential (total 164% increase) to use more digital devices in the future. Besides, if master students do not attend a course about digital reading, they will have higher probabilities to stick using papers (the sum of two variables that equal to 0 is rejected).

Table 6: Regression results of model 1 and model 2

Variable	Attitudes towards papers		Attitudes towards digitals	
	Model 1		Model 2	
	Coefficient	Z-value	Coefficient	Z-value
Attitude variables				
Comfortable for eyes	0.39***	4.78	0.22*	1.87

Easy to make notes	0.42***	5.18	0.14	1.47
Easy to take	-0.07	-1.30	0.09	1.18
Environmental friendly	0.2	0.31	0.03	0.39
Habit	0.04	0.56	0.44***	3.88
Efficient to read	0.13*	1.83	0.15	1.19
Easy to get	0.04	0.55	-0.03	-0.28
Independent variables				
Gender	0.11	1.17	-0.17	-1.20
Education level	-0.04	-0.54	0.05	0.40
Environment	-0.09	-0.84	0.05	0.47
Identity	-0.06	-0.90	0.05	0.29
Pride	0.05	0.60	0.05	0.42
Guilt	-0.02	-0.42	0.09	1.12
Observations	113		113	
Mean VIF[a]	1.19		1.22	
F test	0.00***		0.00***	
R-square	0.47		0.41	

Note: *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively. Standard errors are robust to heteroskedasticity. Thus, all variables are reliable.

[a] Mean ViF tests the degree of multi-collinearity among the independent variables.

Table 7: Regression results of model 3

Variable	Intention of using more digitals	
	Model 3	
	Coefficient	Z-value
Attitude variables		
Comfortable for eyes (paper)	0.02	0.18
Easy to make notes (paper)	-0.18	-1.60
Efficient to read (Paper)	-0.08	-0.75
Comfortable for eyes (digital)	0.28***	2.61
Habit (digital)	0.28***	2.64
Norm Variable		
Norm	0.09	0.90
PCB variables		
Skills to search enough digital lecture materials or literature	-0.01	-0.02
A course about digital reading that will stimulate me to use more digital versions	0.33***	3.54
A discount of purchasing digital devices from WUR that stimulates me to use more digital versions	0.21***	2.44
Thinking it is easy to get digital course materials	0.08	0.65
Independent variables		

Gender	0.02	0.13
Education level	0.05	0.44
Identity	0.02	0.19
Environment impact	0.27*	1.75
Pride	-0.06	-0.51
Guilt	-0.55	-0.69
Observations	113	
Mean VIF[a]	1.45	
F test	0.00***	
R-square	0.51	

Note: *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively. Standard errors are robust to heteroskedasticity. Thus, all variables are reliable.

[a] Mean VIF tests the degree of multi-collinearity among the independent variables.

Table 8: Linear combination

Null hypothesis: Comfortable for eyes (digitals) + Habit (digitals)+ A course + A discount + Environment = 0		
Variable	Coefficient	Z-value
Intention of using more digital devices	1.37***	6.62

Table 9: Regression results of model 3 for comparing gender difference

Variable	Intention of using more digitals (male)		Intention of using more digitals (female)	
	Model 3		Model 3	
	Coefficient	Z-value	Coefficient	Z-value
Attitude variables				
Comfortable for eyes (paper)	-0.03	-0.13	0.09	0.54
Easy to make notes (paper)	-0.25	-1.11	-0.05	-0.32
Efficient to read (Paper)	0.07	0.43	-0.14	-1.06
Comfortable for eyes (digital)	0.1	0.59	0.39**	2.55
Habit (digital)	0.13	0.62	0.26**	1.93
Norm Variable				
Norm	-0.05	-0.29	0.12	0.95
PCB variables				
Skills to search enough digital lecture materials or literature	-0.01	-0.07	0.02	0.17
A course about digital reading that will stimulate me to use more digital versions	0.21	1.13	0.36***	2.83

A discount of purchasing digital devices from WUR that stimulates me to use more digital versions	0.22	1.24	0.17	1.44
Thinking it is easy to get digital course materials	-0.02	-0.12	0.10	0.64
Independent variables				
Education level	0.40	1.20	-0.01	-0.05
Identity	0.20	1.00	0.06	0.39
Environment impact	0.63**	2.30	0.02	0.10
Pride	-0.40	-1.62	0.07	0.49
Guilt	-0.11	-0.73	0.01	0.07
Observations	113		113	
Mean VIF[a]	2.06		1.53	
F test	0.01***		0.00***	
R-square	0.69		0.50	

Note: *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively. Standard errors are robust to heteroskedasticity. Thus, all variables are reliable.

[a] Mean VIF tests the degree of multi-collinearity among the independent variables.

Table 10: Linear combination of model 3 for female

Null hypothesis: Comfortable for eyes (digital) + Habit (digital)+ A course		
Variable	Coefficient	Z-value
Intention of using more digital	1.00***	4.84

Table 11: A comparison between male and female by summing the significant coefficients Variable	Male	Female
Coefficient	0.63	1.00

Table 12: Regression results of model 3 for comparing different of education levels

Variable	Intention of using more digitals (Bachelor)		Intention of using more digitals (Master)	
	Model 3		Model 3	
	Coefficient	Z-value	Coefficient	Z-value
Attitude variables				
Comfortable for eyes (paper)	0.03	0.18	-0.10	-0.50
Easy to make notes (paper)	-0.13	-1.01	-0.37**	-2.02
Efficient to read (paper)	-0.13	-0.79	0.03	0.19

Comfortable for eyes (digital)	0.41***	2.89	0.13	0.87
Habit (digital)	0.47***	3.63	0.17	1.03
Norm Variable				
Norm	0.13	0.97	0.12	0.75
PCB variables				
Skills to search enough digital lecture materials or literature	-0.16	-1.14	0.15	0.82
A course about digital reading that will stimulate me to use more digital versions	0.23*	1.81	0.44**	2.97
A discount of purchasing digital devices from WUR that stimulates me to use more digital versions	0.25**	2.30	0.20	1.59
Thinking it is easy to get digital lecture materials	-0.17	-1.02	0.11	0.63
Independent variables				
Gender	0.13	0.67	0.16	0.75
Identity	0.28*	1.72	0.05	0.37
Environment impact	0.12	0.57	0.18	0.75
Pride	-0.17	-1.31	0.16	0.76
Guilt	-0.09	-0.96	-0.09	-0.74
Observations	113		113	
Mean VIF[a]	2.22		1.55	
F test	0.00***		0.00*	
R-square	0.74		0.51	

Note: *, **, *** indicate statistical significance at the 10%, 5% and 1% level respectively. Standard errors are robust to heterroskedasticity. Thus, all variables are reliable.

[a] Mean VIF tests the degree of multi-collinearity among the independent variables.

Table 13: Linear combination of model 3 for bachelor students

Null hypothesis: Comfortable for eyes (digital) + Habit (digital)+ A course+ A discount + Identity =0		
Variable	Coefficient	Z-value
Intention of using more digitals	1.64***	5.82

Table 14: Linear combination of model 3 for master students

Null hypothesis: Easy to make notes (papers)+ A course =0		
Variable	Coefficient	Z-value
Intention of using more digital devices	0.07	0.35

Task 5: Successful examples

There are several available examples of companies and other universities that successfully went (almost) paperless or at least reduced their use of paper by a remarkable percentage. These examples are important to look at, since they show what changes are useful and in which steps the biggest achievements can be reached. Also, some NGOs (Non-Governmental Organisations) that concern about sustainability provide some useful tips to reduce the use of paper, as the impact of (unnecessary) paper use on the environment is becoming more clear.

5.1 Big changes

One of the most important factors in increasing sustainability, is to influence the top of the organisation. Since the top of the organisation is involved in making decisions that will influence the behaviour of all levels below, influencing top levels is essential to achieve a noticeable change. If the opportunity to change is not created for the levels below, these people could be limited in their change in behaviour, even if they are willing to change. Bank of America incorporated their paper-saving vision in their policy already in the early 1990's and as a result of that major improvements on paper saving have been made, even in the years in which this topic was relatively new (Sarantis, 2002). In doing so, they saved millions of dollars (European Environmental Paper Network, 2014). Another successful example is the Co-operative Group. Their senior managers encouraged their staff to make efficient use of digital technology and to get rid of paper in their work area. As a result, the paper use of the organisation was reduced with an astonishing 71% (European Environmental Paper Network, 2014). Thus, in order to make paper reduction successful, there lies an important role for Green Office, to make sure the top-management of the university is willing to change paper use. As the University is known for its concern about sustainability, this should be feasible. To increase the likelihood that the top of the organisation is willing to change, the case could be supported by numerous examples is which reducing paper use did not only save paper, but also money. Large sums of money can be saved by the limitation of unnecessary waste of paper. Implementation of this knowledge can also happen on levels below, but will most likely only be effective if these people have to pay for printing, as is the case for Bachelor- and Master-students during most of their study on the university.

When it comes to alternatives of paper, the most obvious alternative is using digital material, also for communication. In most companies, sending letters is an important way to keep contact with clients. By sending a digital version instead, a lot of paper can be saved, that otherwise would very likely be discarded after a short time span. As a successful example,

FERN made their Annual Report available online, which reduced the print run by 95%. Besides, they asked recipients of the monthly news bulletin whether they would prefer a digital version. Currently 8 copies are still sent by post, whereas 1200 copies are sent by email (European Environmental Paper Network, 2014). A good example within the university is 'Wageningen World', a magazine that covers some recent topics in research. Recently, there was a letter sent along with the magazine, to ask people if they would prefer a digital version. Thereby the number of paper versions was reduced. An example of what still could be improved within the University, is the percentage of course material that is provided digitally. When it is not possible to reduce the number of paper versions that are distributed, redesigning can also be an option. By redesigning publications, paper can be saved because printing can be done more efficiently. Efficient use of paper means less printing pages and thereby less use of paper and less blanc space per paper. For instance, Bank of America reduced paper use by 565 tons in the year they started redesigning their forms alone. Moreover, Alameda County offices saved $27,000 and 5,500 pounds (approximately 2500 kg) of paper by reformatting their secured property tax form (Sarantis, 2002). Some opportunities to increase the efficiency of paper use could include printed course material, or the magazine 'Recourse'. Of course, the biggest improvements can be achieved in printed material that is widely distributed.

Another good example to reduce the use of paper, is to forecast sales more accurately. For example, IPC Media reduced the number of unsold magazines by 30 million copies between 2006 and 2008 this way. As another example, The Penguin Group reduced its number of books that remained unsold by cooperating with retailers and delivering smaller quantities more often (European Environmental Paper Network, 2014). The most relevant way to implement this in a strategy for Wageningen University, might be in the sales of the 'WUR-shop'. It would be interesting to keep track of which courses also provide digital materials, and see if this has significant impacts on the sales of course materials compared to courses that don't provide digital material. Since part of the course material is directly printed within the university, any possible reductions in printing could be done relatively easily. Also, some course material could then only be reprinted after this proved necessary.

Framingham State College was one of the first Colleges to put the concept of being paperless to the test. Already in 2002, they made the change to use of laptops in class, being the first public college in New England. This meant students had to bring their own laptop, and having a laptop was a requirement for new students as well. In 2004, about 80% of the courses was given online. Laptops made it easier to communicate with teachers, as students and teachers found it was less intimidating to ask questions via email. Besides, these emails could also be sent after working hours. The use of digital devices also helps to make sure lecture materials are always up to date and students use the latest version. Furthermore, the

use of these devices makes it easier to put theory into practice. It made students more independent, but at the same time provided them a way to discuss topics on a message board. However, a drawback of this digital use, and especially the access to internet, is that students are also more easily distracted by their email or surfing the web (Schworm, 2004).

Possibly one of the most important aspects in improving sustainability, is to have a 'sustainability team'. Bank of America had a Green Team in place already before the start of their paper reduction campaign (Sarantis, 2002). As behavioural change is not a short-term project, but a long-term process, it is important to continuously stimulate positive changes and look for new alternatives of current situations. For instance, Bank of America has gained its success by having an employee that is responsible for overlooking the paper using process as a full-time job (European Environmental Paper Network, 2014). As Green Office serves this role within Wageningen University, their continuous stimulation in sustainability can be of vital importance to reduce paper use on the Campus. In some cases, people are already motivated to make their behaviour more sustainable, but still need education on how to do it. Again, education is the key. Alameda County Offices realised that it would be very difficult to reach all employees with just a small advisory team, thus they used a train-the trainers approach. From each department, people were selected to take responsibility for paper reduction at their own department. These people that were selected were trained firstly, and returned to their department afterwards to show a video about impacts of paper, that was compulsory to watch for all employees. Furthermore, all employees received guidelines to reduce paper use. In a similar way, Nike arranged environmental leadership in all of their departments. (Sarantis, 2002) In spring 2014, Maastricht University launched a course about sustainability that is available for students from all faculties, this might also stimulate sustainable behaviour of students (Maastricht University Green Office, 2014).

5.2 Individual changes

Next to general changes, the printing behaviour of individuals also needs to be changed in order to achieve maximum improvement in sustainability. Besides adapting to the changes within the business, personal changes can also be made. When considering individual printing behaviour, one of the most successful ways to change this probably is to let people think before they print. A way to do this is by giving a pop-up to ask if printing is necessary as soon as a printing order has been given (ShrinkPaper website, 2014). Also, reminding people close to the sources, the printers, that there are alternatives for printing. For example, WWF provides some posters to let people think about the environment before printing. One example of the available posters is given in Figure 7.

Figure 7: One of the posters that is made available by WWF. This and other posters can be downloaded on http://wwf.panda.org/how_you_can_help/live_green/fsc/save_paper/

5.3 Small changes, big impacts

Finally, there are also some strategies that require an effort to change at first, but can be efficient changes in the long term.

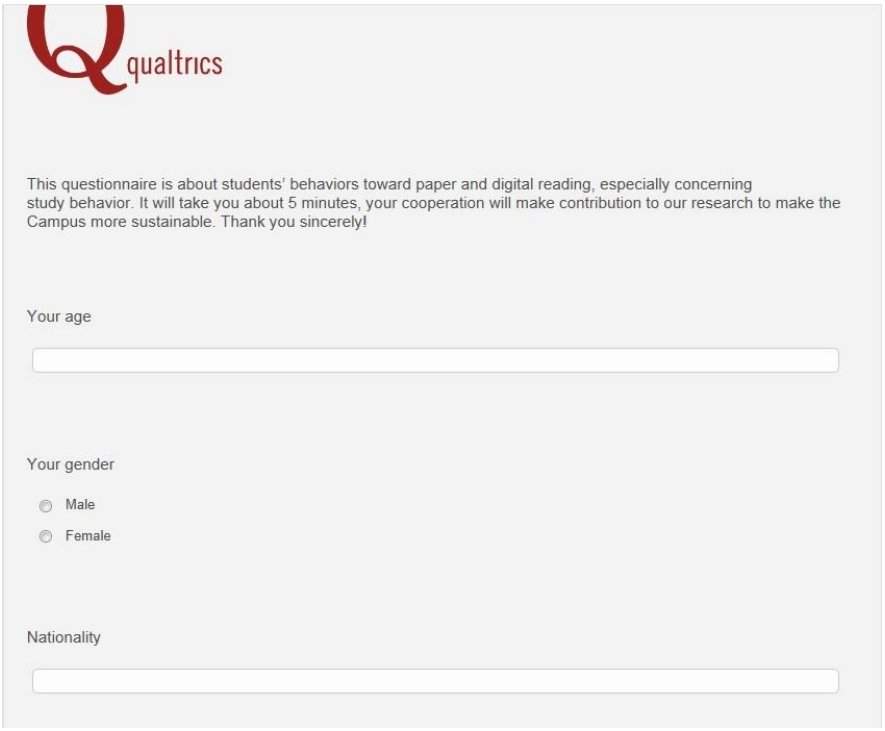
By using lightweight paper instead of thick paper, huge savings can be achieved in paper weight. This requires a change in the purchase of paper, but needs little attention after this step is taken. After Bank of America switched to lightweight paper, they did not only make savings in the weight of paper ($500,000 every year), but also reduced their paper storage, handling, transportation and labour costs (European Environmental Paper Network, 2014). Additionally, paper that is produced in a more responsible way helps to reduce the impact. WWF provides an online database on the impact of several paper types, and gives ranks based on forest-, climate- and water-performance to provide a quick overview which type is least harmful to the environment. Performance can easily be tested on their website, 'CheckYourPaper'.

Furthermore, the default setting of printers can be changed to print more efficiently. Printers on Wageningen University are already able to print double-sided. Also, until recently, the default setting was to print double-sided. Recently, a new printing system was introduced. The default settings are still set to printing double sided, although it is not clear whether it remembers personal preferences (Eggers, Marta. pers.comm., June 12, 2014). Research

could be done about the current settings of printers, and if it is needed, they could be changed to a more sustainable setting. To take it even one step further, a new default setting could be introduced in which A4-pages are printed as a A5-page, which will result in 4 printed pages per paper if combined with double-sided printing. Moreover, setting print margins wider allows to print more per page, which will count up in the long term. Finally, sharing less printers with more people also evoked a direct saving of costs, as less printers needed to keep up to date, although this is not directly linked to saving paper. However, if printing costs more effort (more time to find a printer, this can indirectly reduce printing behaviour. At Maastricht University, all printers will be replaced this year by more energy-efficient printers with standardized settings that enhance more efficient printing. Besides, the distribution of printers will be optimized, with a reduction of 30% in the number of printers as a result (Bamberger, Doris. pers.comm., June 18, 2014).

What also proved a useful strategy for reduction of prints, is to introduce a print swipe card system, that is linked to individual accounts. In 2009, Loyola University Maryland introduced a 'Student Allocated Printing' system. Every student is allowed to make a limited amount of free prints. After the limit is reached, students have to pay if they want to print more. This program has made significant reductions in the amount of prints made by students (Loyola website, 2011). As Wageningen University has already linked their print system to individual cards, here lies a possible opportunity to expand this system.

Annex 2 Questionnaire



This questionnaire is about students' behaviors toward paper and digital reading, especially concerning study behavior. It will take you about 5 minutes, your cooperation will make contribution to our research to make the Campus more sustainable. Thank you sincerely!

Your age

Your gender

- Male
- Female

Nationality

What level do you study at the moment?

- Bachelor
- Master
- PHD
- Other

Major

How long do you spend on reading course materials per day on average?

- 0-1 hour
- 1-2 hours
- 2-4 hours
- more than 4 hours.

To what extent do you prefer paper or digital reading for the studying purpose (think of readers, study books, reading materials, notebooks, etc.)?

	Strongly dislike	Dislike	Like	Strongly like
Paper reading				
Digital reading				

The following items are about extent of your agreement for the statements between paper using and digital using. There will be four-point rating scale ranging from 1 (Strongly disagree with the option on the left side) to 4 (Strongly agree with the option on the right side).

Concern characteristics of paper reading

	Strongly disagree	Disagree	Agree	Strongly agree
Comfortable with your eyes				
Easy to make notes				
Easy to take				
Environmentally friendly				
Habit				
Efficient to read				
Easy to get				

Are there any other characteristics of paper reading? (Please name it/them)

Concern characteristics of digital reading

	Strongly disagree	Disagree	Agree	Strongly agree
Comfortable with your eyes				
Easy to make notes				
Easy to take				
Environmentally friendly				
Habit				
Efficient to read				
Easy to get				
Enough Computers in Wageningen Campus				
Easy to check new words				

Are there any other characteristics of digital reading? (Please name it/them)

Are there any other barriers that influence you to read on digital devices? (Please name it/them)

- Because there are not enough digital devices available at the Campus.
- Because lack of needed digital literacy skills.
- Others (Please name it in the next question)

Are there any other barriers that influence you to read on digital devices? (Please name it/them)

To what extent do you agree the following statements for yourself

The slogan of Wageningen University is about "quality of life", so as Wageningen student, I should do sustainable behavior

Strongly disagree | Disagree | Agree | Strongly agree

It is important to me to do good for others.

Strongly disagree | Disagree | Agree | Strongly agree

It is good for me to do good for environment, other species and other generations.

Strongly disagree | Disagree | Agree | Strongly agree

If I were to use environmentally friendly reading material, I would feel proud/worthy/exceptionally good.

Strongly disagree | Disagree | Agree | Strongly agree

If I were to use environmentally unfriendly reading material, I would feel guilty/feel remorseful/have a bad conscience.

Strongly disagree | Disagree | Agree | Strongly agree | Strongly Agree

My teachers suggest me to use digital versions of course material more than paper versions.

Strongly disagree | Disagree | Agree | Strongly Agree

To what extent do you agree the following statements?

	Strongly disagree	Disagree	Agree	Strongly agree
I think I have ability to search enough digital lecture materials or literature.				
I think that a course about digital reading will stimulate me to use more digital versions.				
I am willing to buy a digital device (laptop, E-reader, etc.) for reading if the university would give a discount for these devices.				
I think it is easy to get digital lecture materials.				
I am going to use digital reading for study purposes more in the near future.				

Do you have any suggestion(s) to reduce the paper use at the Campus?

Would you be willing to participate in a meeting to make the paper use of the Campus more sustainable? If so, please fill in your email address (your email address will not be linked to your answers of the questionnaire, for privacy)

Annex 3 Estimated &Realised budget

Code	Expenditures in €	Estimation	Realisation
1	office equipment	20	0
2	copy and print costs	20	3
3	telephone costs	5	0
4	traveling expenses[1]	0	0
5	other costs	20	13
	overhead costs[2]	50	50
	Total Expenditures	115	66

Here follows a short explanation of the expenses that are made:

Copy and print costs: €3
As our project involves reducing printing, most of the literature review was done digitally. However, because of discomfort for the eyes, a small part of the articles were still printed

Other costs: €13
We did not buy a present for the respondents of our questionnaire (at we had planned at first) as this proved unnecessary. We did however spend €13 to buy a small present for the persons that spent a lot of time helping us in developing and improving our product.

Categories that are not mentioned above had a realisation of 0€, as it proved unnecessary to spend costs on them.

Annex 4 Stakeholder analysis

The stakeholder analysis is shown in a matrix (See Figure 8). All relevant stakeholders are discussed below.

Green office

As one of the main stakeholder in this case, Green office is the organization built to coordinate the activities within the Wageningen campus in a more sustainable way. Because the students in WUR with a very eco-friendly thinking contribute it, they have a very high level of interest about this project. For instance, there was a research which was finished by Koen Kallenberg from Green Office Wageningen, which is about whether it is more sustainable to use a book, tablet or laptop for reading (Kallenberg, 2014). Besides, as an official organization belonging to WUR, its influence is relatively high compared to some other stakeholder.

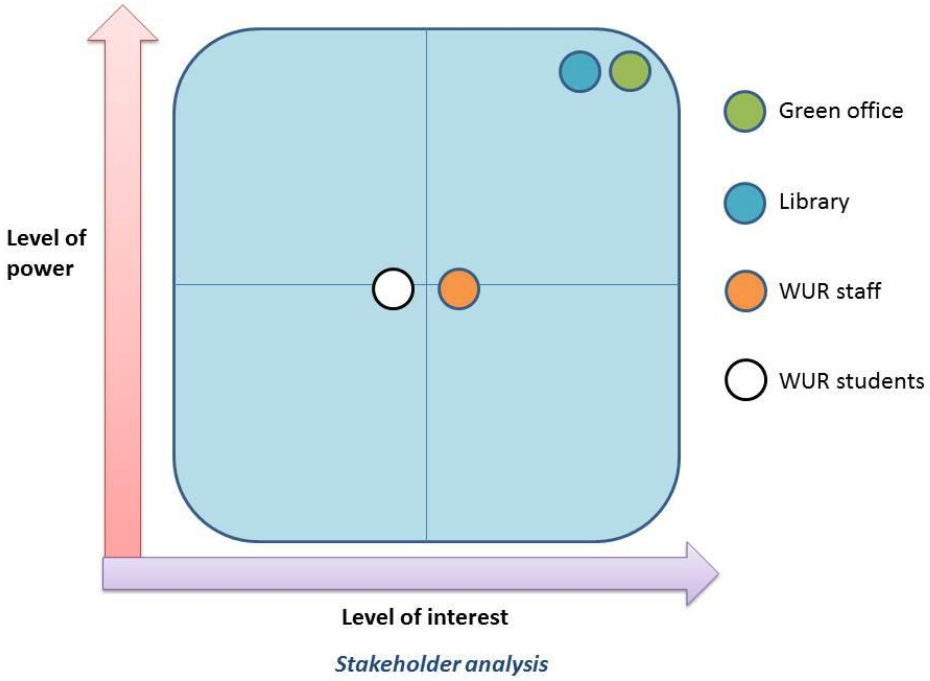


Figure 8: Stakeholder Matrix of the Wageningen Campus paper using case

Library

Library of WUR is also one of the main stakeholders in this project. First of all, it is an important consumer of paper at the campus. Secondly, it is also the department to take charge of reading materials, not only the paper version, but also the digital books. Last but not the least, it can also monitor the reading behaviour within the area of library, which means it can have the educational function to the people who are reading either digitally or on paper. For these reasons, it can be concluded that the library has a high influence in this case. At the same time, they concern not only the students reading behaviour in the library, but also saving part of their work by enhancing the accessibility of article that currently are not available for students. Thus, they have high interest in this project.

WUR staff

The WUR staff, to be more specific the teachers in WUR are also important stakeholders in this case. They are one of the main consumer of the paper using within the campus, including the most relevant aspect-supporting teaching materials to the students. They can decide whether a course needs to have reading material. What's more, they can decide to support the printing version or supporting the digital version, and besides, asking students to print out the reading materials or not. So they have a medium influence of the power and interest in this project.

WUR students

The whole of students in WUR may be the biggest group of paper users, during learning, group work, recreation and exam. To more focus on the reading behaviour aspect, the decision how to get and use the reading materials made by the students can influence the amount of paper use in the campus. Hence, their power is medium. If the accessibility of digital materials is improved, students can have more options. Possibly, they will change their behaviour to make it more sustainable, although saving money might be a more important reason for them then sustainability. Thus, their interest level will be medium. In our project, students are set as our main target group.