The potential of end users to improve the sustainability performance of the built environment

A research about the mind-set of end users in the Netherlands regarding the sustainability performance of their buildings

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I declare that this research and thesis is my own work. Where other sources have been used, they have been referenced and acknowledged.

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Synopsis

Purpose: The purpose of this research is to identify the segments of end users of buildings which have the largest potential in terms of improvement of the sustainability performance of the built environment in the Netherlands.

Design/Methodology/Approach: This research provides more knowledge about end users of buildings in the Netherlands. To investigate the market of end users in the Netherlands, a segmentation of end users is provided based on the mind-set of end users towards the sustainability performance of their buildings. This segmentation results from conducted quantitative research in the form of a questionnaire. The different segments are investigated and the segments with the largest potential are identified.

Findings: Four segments are determined which are most promising to reach in order to improve the sustainability performance of the built environment, being segment 1 (willing, costs, active), segment 2 (willing, costs, passive), segment 7 (willing, strategic, active) and segment 8 (willing, strategic, passive). Together these segments have a potential to (further) improve the sustainability performance of 24.158.965 m^2 of buildings in the Netherlands.

Originality/Value: A request from the field is to conduct more empirical research about the requirements of end users regarding their buildings. A segmentation of users is preferable in order for policy makers and owners to gain insight into the specific requirements of different types of end users. FMN, DGBC and CFP have the desire to specifically investigate the mind-set of end users regarding the sustainability performance of their buildings and they want to gain insight into the constraints that end users face when considering implementing sustainability practices in their existing buildings, in order to reach them with solutions that foster improvement of the sustainability performance.

Keywords: Sustainability, sustainable buildings, end users, real estate in the Netherlands, existing buildings, need for sustainability, built environment, sustainability performance of buildings.

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Preface

This master thesis has been designed for the purpose of the master Facility- and Real Estate Management at the University of Greenwich and the Saxion University of Applied Sciences Deventer. After receiving my Bachelor in Facility Management in 2012, I realized that I wanted to learn more about the field of real estate and especially regarding the theme sustainability in real estate. The master Facility- and Real Estate Management offered this possibility and was therefore the perfect fit for me in order to further develop myself. From the beginning of the master I started thinking about my topic for this thesis. I wanted to investigate what the constraints are regarding improvement of the sustainability performance of existing buildings in the Netherlands. Moreover, I wanted to investigate how the sustainability performance of the built environment in the Netherlands could be improved. However, I found it quite difficult to find the right scope for my research. Luckily, I got in contact with Corporate Facility Partners. They wanted to investigate how end users can be reached in order to improve the sustainability performance of the built environment in the Netherlands. Again, a perfect fit for me. I had the privilege to work with Bram Adema, who has a lot of knowledge and experience regarding the theme of sustainability in real estate. I am grateful to him for his support, input and care. Moreover, the research was conducted in cooperation with Facility Management Nederland (FMN) and the Dutch Green Building Council (DGBC). I want to thank Yvette Watson (FMN) for her hard work in providing a network for the questionnaire and her help with my research. Furthermore, I want to thank DGBC for their cooperation with this research. Finally, I would like to thank Adrienn Eros, my thesis supervisor. She helped me to complete this thesis and I am grateful for all her suggestions and help during this research.

Management Summary

The built environment in the Netherlands currently exists of mostly unsustainable buildings. Even though the majority of the newly developed buildings in the Netherlands are sustainable, the share of newly developed buildings compared to the current supply is very small. Therefore, the real opportunities for a sustainable built environment are present within existing buildings.
The most important group that can influence the sustainability performance of existing buildings are end users. They determine the demand for sustainable buildings and have to be willing to be housed in an existing building with an improved sustainability performance while paying a possible premium. However, according to the field, not enough parties know how to reach these end users or know what their preferences are. Therefore, this research has been conducted in order to investigate the mind-set of end users regarding the sustainability performance of their buildings. By preparing a segmentation, the segments with the largest potential to improve the sustainability performance of the built environment are identified, alongside with the constraints that these segments face.

The results show in general that the most important requirements regarding the buildings for end users are the location of the building, the cost of exploitation and the accessibility by public transport. Sustainability is not considered as a main requirement by the majority of the end users. However, 73% consider the sustainability performance of their buildings to be important. The importance of sustainability is confirmed through the use of sustainability assessment tools by 57,5% of the end users. Furthermore, end users already pay attention to multiple sustainability themes, with the most important being energy, health, management and waste.
The goal when investing in sustainability practices is mostly cost savings, followed by improvement of health and productivity of employees, and improvement of the organisational image. Also, 80% of de end users is willing to invest in sustainability practices, with payback periods varying between three and over 10 years. Finally, the most prominent constraints that the end users face are an inadequate investment budget, lack of a clear action plan, not enough insight in the possibilities to improve the sustainability performance among decision makers, insufficient time available and not enough support from the board.

Next, the results discovered eight segments of end users, which are based on three axes: (1) willing to invest vs. not or barely willing to invest, (2) investment goal: cost savings vs. strategic value, (3) actively searching for information vs. not actively looking for information.
Four segments are promising to reach, being segment 1 (willing, costs, active), segment 2 (willing, costs, passive), segment 7 (willing, strategic, active) and segment 8 (willing, strategic, passive). Together these segments have a potential to (further) improve the sustainability performance of 24.158.965 m^2 of buildings in the Netherlands.
The most important people to reach in these segments are identified, alongside with the sectors which are most promising to reach. All organisational sizes (based on the amount of employees) are represented in these segments, which shows that the willingness to invest is not confined to certain organisational sizes. The four segments already pay a lot of attention to several sustainability themes. Therefore, the biggest opportunities to (further) improve the sustainability performance of these buildings are present within sustainability practices regarding water, transport and land use and ecology. The segments which are actively searching for information regarding sustainability practices can be reached through fairs and conferences, papers and magazines, and websites. The segments which are not actively searching for information, have to be reached through other channels. Finally, the most prominent constraints in these segments are an inadequate investment budget, not enough insight in the possibilities to improve the sustainability performance among decision makers, lack of a clear plan of action and insufficient time available. Therefore, in order to target these segments, solutions for these constraints have to be provided and consequently, appropriate marketing strategies can be developed.

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1. Introduction

In this chapter the background and problem statement of this research will be described. Furthermore, the research question that this thesis will address is described alongside with the hypotheses. In addition, this chapter will show the contribution to the field, the scope of this research, the constraints of this research and the reading guide.

1.1 Background of the subject and problem statement

The way the world used the global natural resources in the past has now led to the situation in which our environment is polluted, the natural resources are depleted, climate change is occurring and global warming is one of the most important challenges of our time. More than any other human undertaking, the built environment has a tremendous impact on our ecosystem (Kibert, 2004). Studies show that buildings and constructions are responsible for 40% energy, 20% water and 40% CO_2, of the world's resources (Building and Construction Authority, 2010). Luckily, the built environment has the largest potential to significantly reduce their greenhouse gas emissions as compared to any other major emitting sector (Robichaud and Anantatmula, 2010). This is mostly due to the high energy use in buildings. With the use of the right sustainability practices and technologies, a significant amount of both energy and economic savings can be accomplished (Building and Construction Authority, 2010). The awareness of the potential of sustainable buildings to positively influence the environment is growing and has now reached the governments, corporate world and industries. As a result, governments increasingly adopt sustainable building standards and regulations, and provide incentives for the implementation of sustainability practices. Moreover, every year more projects seek environmental certification, which indicates that the demand for sustainable buildings also increases in the corporate world and other industries (Robichaud and Anantatmula, 2010). Also in the Netherlands the attention for sustainable buildings is growing. Especially regarding new constructions sustainable building has become a normal factor and the new buildings that are being developed are mostly sustainable (Bak, 2011). Unfortunately, the current supply greatly outnumbers the amount of new constructions. For example, when looking at offices in the Netherlands, every year only 500.000 till 800.000 m^2 is newly developed (Hulshoff, 2009), compared to a current supply of 49.384.000 m^2 in 2013 (DTZ Zadelhoff, 2014).
Considering that the supply of sustainable buildings in the Netherlands is currently limited, the biggest opportunities to increase the sustainability performance of the built environment are present within existing buildings. Unfortunately, improvement in the sustainability performance of existing buildings is still in its innovation phase. There are a couple of frontrunners that improved the sustainability performance of their existing buildings, but the majority of these buildings are still unsustainable (Hulshoff, 2009).

Owners and end users can influence the sustainability performance of the built environment. End users are the most important factor in the implementation of sustainability practices in existing building, considering they determine the demand for sustainable housing. By demanding sustainable buildings, it acts as a big trigger for investors and owners to look different at their real estate (AgentschapNL, 2010). Moreover, 85% of the energy consumed during the building's lifecycle occurs during the use of the building. Even if sustainability practices are implemented in the building, sustainable management is imperative for a significant improvement of the sustainability performance (Bak, 2011). Therefore, end users of existing buildings play a key role in the process of creating a sustainable built environment (Hulshoff, 2009). However, according to CoreNet and Facility Management Nederland (2013) not enough parties know how to reach these end users or know what their preference is. Corporate Facility Partners (CFP) and the Dutch Green Building Council (DGBC) agree with this statement and they want to discover what the mind-set of end users is regarding the sustainability performance of their building. Moreover, they want to discover the

constraints that end users face when considering the implementation of sustainability practices in their buildings. The thesis aims to provide answers to these questions. By providing insight in the market of end users, it is possible to find solutions for the problems that prevent improvement of the sustainability performance and reach these end users with specific marketing strategies.

1.2 Research question and hypotheses

As mentioned in paragraph 1.1, the built environment in the Netherlands still consists of a lot of unsustainable buildings. End users can play a big role in the improvement of the sustainability performance of the built environment. Therefore, the mind-set of end users regarding the sustainability performance of their buildings has to be investigated. Moreover, this research is conducted to gain insight into the constraints that end users face when considering implementing sustainability practices in their existing buildings. This research identifies the segments that are most promising to reach and thus enabling the field to develop specific marketing strategies in order to reach these segments. The main question (MQ) that this thesis will address is:

MQ: Which segments of end users are the most promising to reach in order to improve the sustainability performance of the built environment in the Netherlands?

1.3 Research model

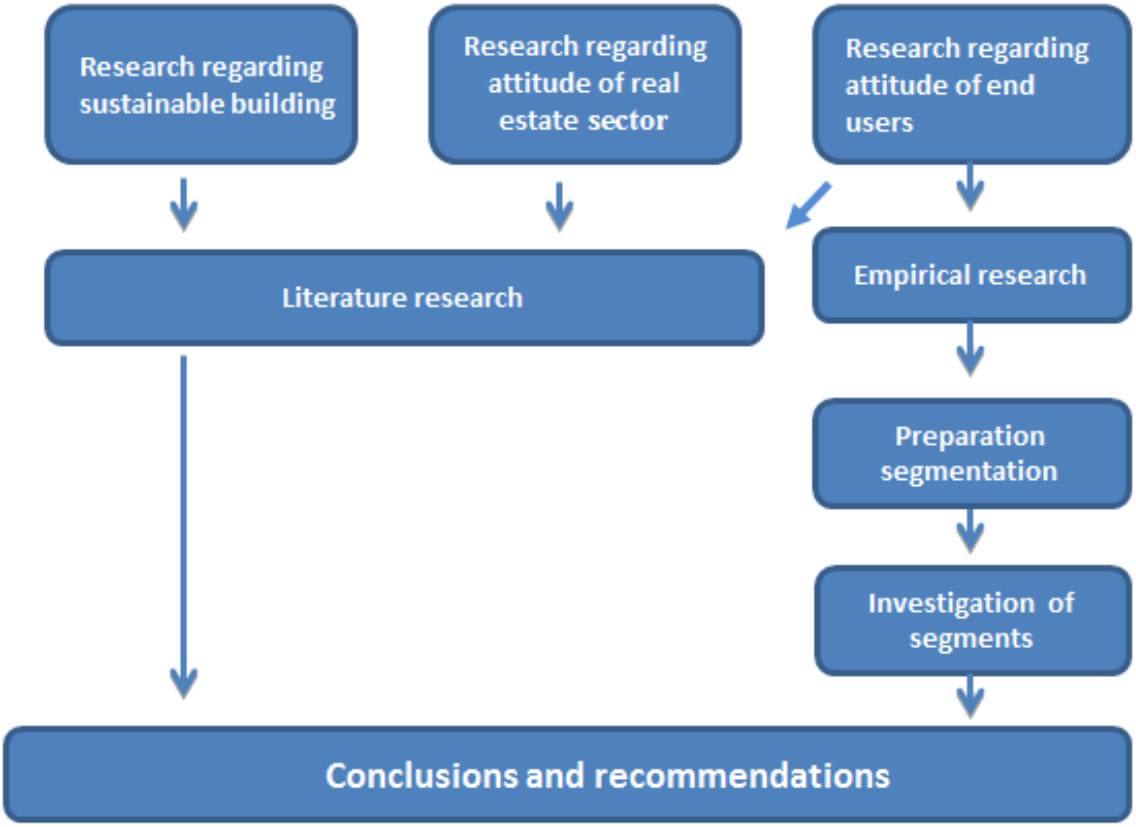


Figure 1. Research model (Source: author, 2014)

1.4 Contribution of the research to the field

Field of Real Estate- and Facility Management
A request from the field (CoreNet and FMN, 2013) is to conduct more empirical research about the requirements of end users regarding their buildings (in general, based on different criteria). According to the field a segmentation of users is preferable in order for policy makers and owners to gain insight into the specific requirements of different types of end users. In addition, FMN, DGBC and CFP have the desire to specifically investigate the mind-set and requirements of end users regarding the sustainability performance of their buildings. They also want to gain insight into the constraints that end users face when considering implementing sustainability practices in their existing buildings, in order to reach them with solutions that foster improvement of the sustainability performance.
This research will contribute to the field by providing insight into the mind-set of end users in the Netherlands regarding the sustainability performance of their buildings. Moreover, it will provide more knowledge about the requirements of end users regarding their buildings, especially in relation to the sustainability performance. In order to investigate the market of end users in the Netherlands, a segmentation of end users will be provided based on the mind-set towards the sustainability performance of their buildings. In the different segments the receptiveness towards sustainability practices will be further examined with a focus on the most important sustainability practices for these segments and the constraints end users face when considering implementing sustainability practices in their existing buildings. By assessing the requirements and constraints of end users in different segments, the segments that are most worth pursuing can be identified. Consequently, specific marketing strategies can be developed in order to reach these segments.

Scientific
This research will contribute to the knowledge about sustainable buildings in the Netherlands. The mind-set of end users regarding the sustainability performance of their buildings is a relatively new subject in scientific literature. By conducting a questionnaire among 331 respondents, more empirical research and evidence will be added to the scientific field and more depth regarding this subject will be provided. Considering that this research is exploratory, it will also provide a basis for further research. This research is not meant to be generalized for the total population of end users in the Netherlands, however it does show a type of segmentation that can be applied in a more elaborate research concerning the mind-set of end users regarding sustainable buildings.

1.5 Scope of the research

This research will focus on end users in the Netherlands. Other parties that have an influence on the sustainability performance of the built environment in the Netherlands are described and their positions regarding sustainability practices have been examined in the literature research. However, these parties are excluded from the empirical research.
Moreover, this research will only focus on end users who are housed in commercial buildings.
This research will only assess the sustainability performance of the buildings occupied by end users. The sustainability performance of the organisation as a whole is excluded from this research, so other Corporate Social Responsibility (CSR) activities are not considered.
Finally, this research is conducted in order to prepare a segmentation based on the mind-set towards the sustainability performance. For this research the segmentation is based on the purchasing behaviour of end users regarding sustainability practices.

1.6 Constraints and limitations of the research

This research is conducted with care and with the use of valid resources. However, there are a number of limitations that should be described.
First, the focus in this research lies on end users. In this research it is assumed that end users of existing buildings play a key role in the process of creating a sustainable built environment. However, it is possible that other parties in the real estate sector can also significantly contribute to a sustainable built environment.
Second, this research mainly focuses on the segments with the largest potential. However, other segments can be interesting to reach as well. The segments are divided based on the mind-set regarding the sustainability performance of their building and their purchasing behaviour regarding sustainability practices. The use of other criteria could lead to another division of segments.
Third, the questionnaire. It is a possible risk that respondents are not honest and provide socially desirable answers due to growing public awareness regarding sustainability practices.
Finally, the time constraints for this research. The duration of this research is just four months, which means that the researcher is not able to reach the preferable depth.

1.7 Reading guide

In chapter 2 the conducted literature research has been described. This chapter is divided in the impact of the built environment, sustainability and sustainable building, sustainability assessment tools, advantages of sustainable building, current and future state of sustainable building, sustainable building in the Netherlands, the importance of the end users and the demands and constraints among end users.
Furthermore, in chapter 3 the methodology to conduct this research has been depicted. This chapter is divided in the objective of this research, the research questions and hypotheses, research strategy, research design, data collection, sampling technique, data analysis and the reliability and validity of this research.
In chapter 4 the results of the empirical research has been described, which has been divided in the general results and the results per segment. Finally, the accuracy of the hypotheses has been calculated. Then, in chapter 5 the conclusions of this research has been described. Finally, in chapter 6 the suggestions for further research have been depicted.

2. Literature research

In this chapter the impact of the built environment will be described, as well as the concepts of sustainability and sustainable building. In addition, sustainability assessment tools are presented, followed by the current and future state of sustainable building. Furthermore, sustainable building in the Netherlands will be investigated, as well as the importance of end users. Finally, the demands and constraints among end users are described. The literature research aims to provide a foundation for the design of the measurement tool for the field research, but not to determine hypotheses, since the research is exploratory.

2.1 Impact of buildings on the environment

Today we live in an environment that is heavily affected by our activities. UNEP (2000) states that humans use natural resources in a faster rate than it can be replenished. Humans also produce more waste products (such as the emissions of carbon dioxide) than our atmosphere can absorb. According to the IPCC (2014a) there is now no doubt that that human-induced climate change occurs. The world's climate changes and will continue at rates that has been unknown in recent human history (Adger, et al., 2003). More than any other human undertaking, the built environment has a direct, extensive impact on our ecosystem (Kibert, 2004). Research of the United Nations Environment Programme (2009) showed that buildings are responsible for one third of the global greenhouse gas (GHG) emissions in the world and responsible for over 40% of the total energy use. According to Levine et al. (2007) the deflagration of energy resulting from fossil fuels in buildings produced an estimated 3 Gt [1] carbon dioxide (CO_2) in 2004, compared to 8.6 Gt CO_2 by all energy users. Especially worrying is the growing rate of emissions resulting from the built environment, mostly through the use of energy. Between 1970 and 2010 the GHG emissions have more than doubled and reached 9.18 Gt CO_2 in 2010 (IPCC, 2014b). Looking at the current growth in new constructions and the existing unsustainable stock of buildings around the world, it becomes clear that if the current situation does not change, GHG emissions resulting from buildings will again be doubled in the following 20 years (Levine et al., 2007). In order to diminish the worst case scenarios of climate change, GHG emissions have to be reduced by at least 25% within 11 years and reduced by 50% within forty years (UNEP, 2009). Fortunately, the built environment has the largest potential to significantly reduce their GHG emissions as compared to any other major emitting sector (Robichaud and Anantatmula, 2010). With the use of proven technologies, the energy consumption in buildings can be reduced with an estimated 30% to 80% during the building's lifecycle (UNEP, 2009).

The awareness of the impact that buildings have on the environment seems to grow and consequently research in the design and construction of buildings have focused on how sustainability measures can reverse the impact of climate change (Robichaud and Anantatmula, 2010). Multiple researches have shown that sustainable building practices can considerably reduce the energy consumption and GHG emissions resulting from the built environment. For example, the research of Kats (2003) among 60 LEED rated commercial buildings showed that on average sustainable buildings use 25% to 30% less energy as compared to conventional buildings. This is confirmed by the research of Watson (2009) which shows that LEED-certified commercial buildings use 25% less energy during the operational period of a building than comparable buildings. Between the period of 2009 and 2020 these energy savings will result in 78 million tons of emissions avoided. Other studies show that sustainable building practices can reduce a building's energy consumption by 42% (Lockwood, 2006) and even 50% (Robichaud and Anantatmula, 2010).
The awareness of the potential of sustainable buildings to positively influence the environment is growing and has now reached the governments, corporate world and industries. As a result,

[1] GT CO_2 = 1.000.000.000 ton Carbon Dioxide

governments increasingly adopt sustainable building standards and regulations, and provide incentives for the implementation of sustainability practices. Research show that every year more projects seek environmental certification, which indicates that the demand for sustainable buildings is also increasing in the corporate world and industries (Robichaud and Anantatmula, 2010).

2.2 Sustainability

Being sustainable is more than just reducing the CO_2 footprint and saving energy. Sustainability is about "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (The Brundtland Commission, 1987, p.37) This means finding a balance between economic growth, social responsibility and the capacity of natural resources (Dyllick and Hockerts, 2002). A balance between these elements has to be created, because they are intertwined and influence each other (Meadows et al., 1972). The harmonization of these three objectives also refer to the Triple Bottom Line, or the three P's: people, planet and profit, which Elkington (2004) explains as creating financial value for the organisation, while taking care of the employees, stakeholders and society, and doing no harm to the environment.
Sustainability is not a new concept, the quest for a balance in the three P's has been a challenge for over 150 years (Dyllick and Hockerts, 2002). However, in the past decades, sustainability has significantly grown in importance and is considered to be one of the most prevalent challenges in our time (Silvius, 2012). Organisations are being increasingly pressured to shift their focus from solely being responsible for the economic performance towards their shareholders, to being responsible for the sustainability performance of the organisation towards all stakeholders (Visser, 2002 cited in Silvius, 2012). Proactively or reactively, organisations are searching for ways to integrate the concepts of sustainability in their marketing, their communication, their actions and their resources (Silvius, 2012). Not only due to pressure from society, or from a philanthropic standpoint, but also because it has shown multiple advantages and even generates economic value for organisations (Holliday, 2001).

2.3 Sustainable buildings

The increasing attention to sustainability is also visible through the advent of sustainable buildings. In the literature multiple definitions of sustainable buildings are described. According to Lockwood (2006) sustainable buildings are buildings that have less negative environmental impact as compared to conventional buildings. These buildings are environmentally responsible throughout the whole lifecycle of a building, from siting, design, construction, operation to demolition. Kats (2003) adds that they are designed in order to reduce the negative impact on human health and well-being. Furthermore, Robichaud and Anantatmula (2010) state that sustainable buildings can be considered as a philosophy that seeks to: 1. minimize environmental impact, 2. enhance the health, wellbeing and productivity of the users, 3. increase the return on investment to developers and the community, 4. consider the lifecycle of the building during the planning and construction phase. Looking at these three definitions, the definition of Robichaud and Anantatmula (2010) seems to be the most complete. According to this definition, sustainable buildings integrate all three pillars of sustainability during the lifecycle of a building, from siting to demolition.
It is worth noting that the term 'sustainable building' has been used as a synonym of 'green building', 'high performance building', 'sustainable design', 'integrated design' etc. (Robichaud and Anantatmula, 2010; Zuo and Zhao, 2014). For the use of this research the term 'sustainable building' will be used.

2.4 Sustainability assessment tools

Even though there is a consensus regarding attributes that shape sustainable buildings, there is no universally accepted way to compare and qualify these attributes. There are however a number of methods available that assess the sustainability performance of buildings, with the most representative being Leadership in Energy and Environmental Design (LEED, United States) and the BRE Environmental Assessment Method (BREEAM, United Kingdom) , which were both developed in the 1990's (Lee and Burnett, 2008). Other regularly used sustainability assessment tools are Green Star (Australia), Green Mark Scheme (Singapore), Comprehensive Assessment System for Built Environment Efficiency (Japan), Pearl Rating System for Estidama (United Arab Emirates), and Green Building Index (Malaysia). All these tools were developed by the green building council in each region/country. The assessment is conducted by authorized professionals appointed by the green building councils. The World Green Building Council has been created in order to coordinate the various green building councils in the world. Considering the numerous sustainability assessment tools, the two most popular tools will be further described.

LEED

LEED is a third party certification program designed and administered by the U.S. Green Building Council (USGBC). LEED stands for 'Leadership in Energy and Environmental Design' and is designed to set standards and measure the sustainability performance of buildings in construction and operation. LEED focuses on five areas, being sustainable site development, water savings, energy efficiency, selection of materials, and indoor environmental quality (Robichaud and Anantatmula, 2010). To become certified, organisations earn 'points' for environmental interventions in each of the above five mentioned areas. When enough points are accumulated, they get awarded with a certification in a certain level: Certified, Silver, Gold, and Platinum (where platinum is the highest). In 2013 already 50.000 buildings worldwide have been certified or are in the certification process (Roudman, 2013).

BREEAM

BREEAM is an assessment tool for best practice in sustainable building design, construction and operation. BREEAM stands for 'Building Research Establishment Environmental Assessment Method' and is designed by the Centre for Sustainable Construction, part of the Building Research
Establishment Global (BRE Global England). BREEAM rewards organisations with award points or 'credits' if the performance of the building is above regulation. Buildings are assessed through nine areas: energy, management, health and well-being, transport, water consumption and efficiency, materials, waste, pollution, and ecology and land use. The overall accumulated credits are translated into the following scales: pass, good, very good, excellent and outstanding (where outstanding is the highest).

BREEAM is now the mostly used environmental assessment method, with already 200.000 buildings certified and over a million registered for certification in 2011 (BRE Group, 2011). The tool is adapted for every country, in order to stay close to the legislation and building styles of that specific country. At this moment a number of versions exist, being BREEAM-UK, BREEAM-NL, BREEAM-ES, BREEAM-NOR and BREEAM-DE. For countries without their own version, BREEAM International is used (DGBC, 2013).

2.3 Advantages of sustainable building

As mentioned in paragraph 2.2, organisations are integrating the concepts of sustainability not only due to pressures from society, or from a philanthropic standpoint, but also because it has shown to have multiple advantages and can even generate economic value (Holliday, 2001). Sustainable buildings can foster multiple advantages for parties in the real estate sector and end users, ranging from improved health of occupants till economic benefits. These will be discussed on the next pages.

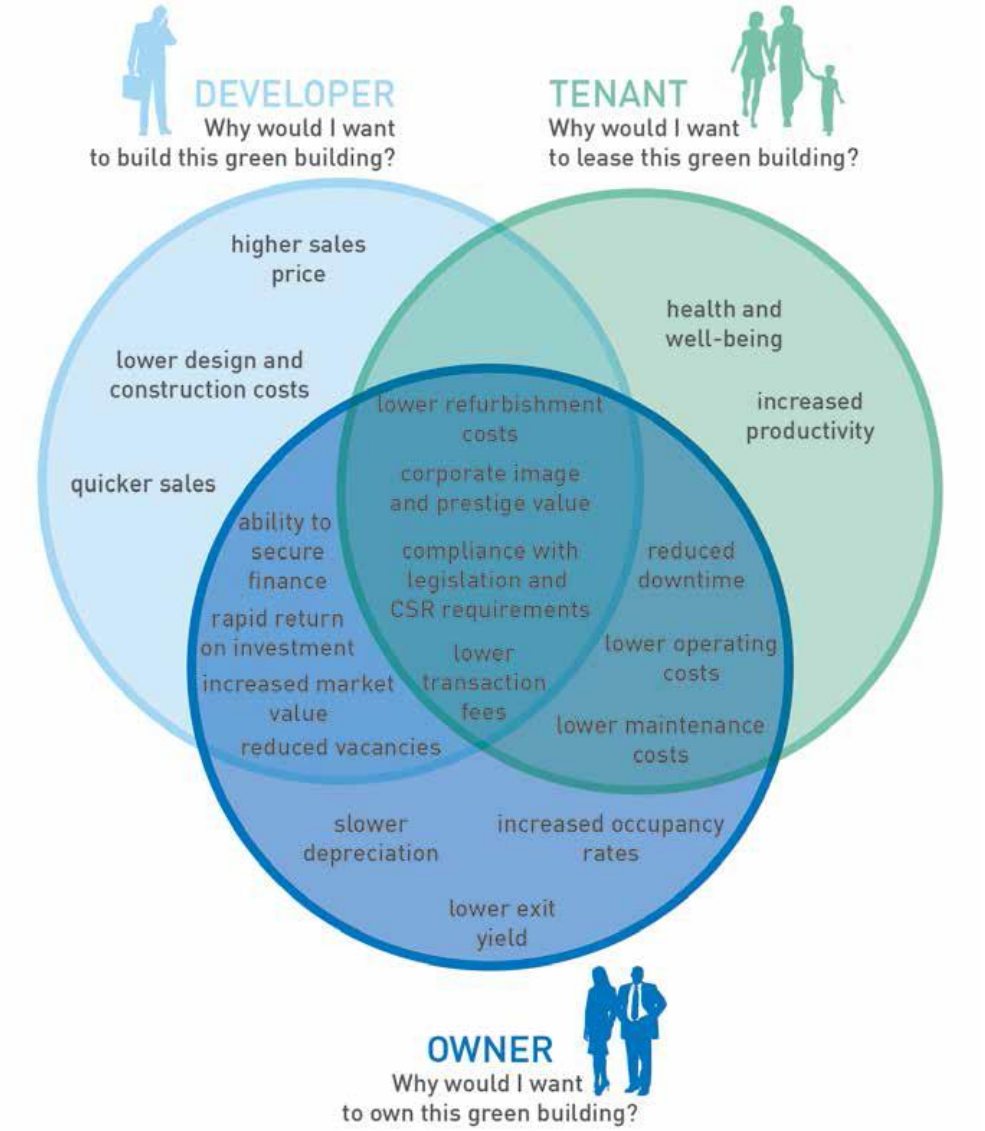


Figure 2. Stakeholder perceptions that affect the value of green buildings (Source: WGBC, 2013a, p.11)

The environmental benefits of sustainable buildings are already firmly supported (Heerwagen, 2000; WGBC, 2013a; Zuo and YuZhao, 2014). However, sustainable buildings also deliver attractive financial and strategic benefits, which will be discussed based on the chronological stage of extraction. First, the benefits that can be accomplished during the design and construction phase will be described. This is followed by the asset value and returns for developers and investors. Finally, the operational benefits relevant for end users and owners will be described.

Design and construction

In the study of the WGBC (2013a) based on different sources of research between 2000 and 2012, it shows that actual design and construction cost premiums are in the range of -0.42 to 12.5%. With the latter percentage being similar to a zero carbon building design. The results of these studies range from a variety of building types and countries, which is depicted in figure 3.

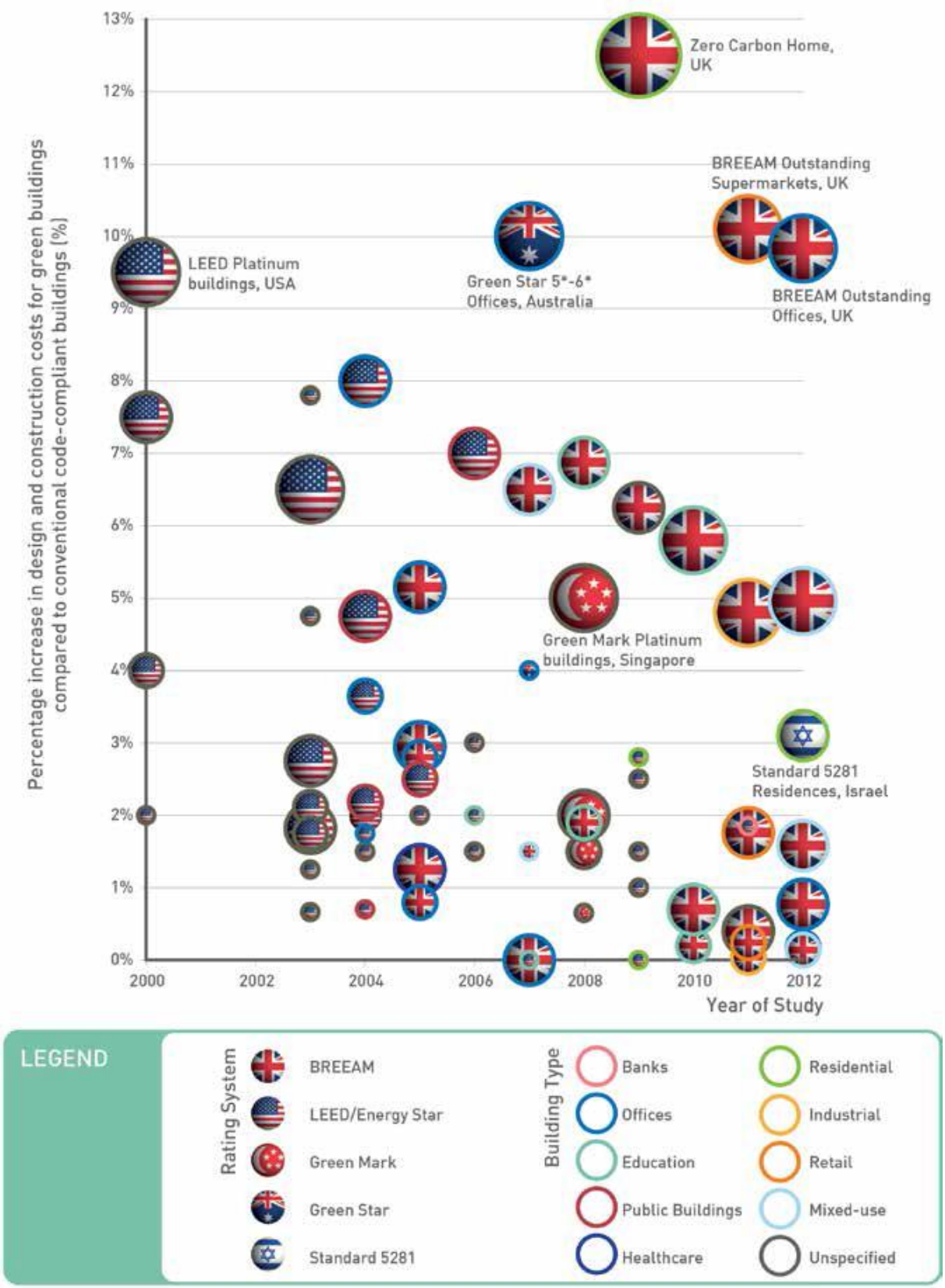


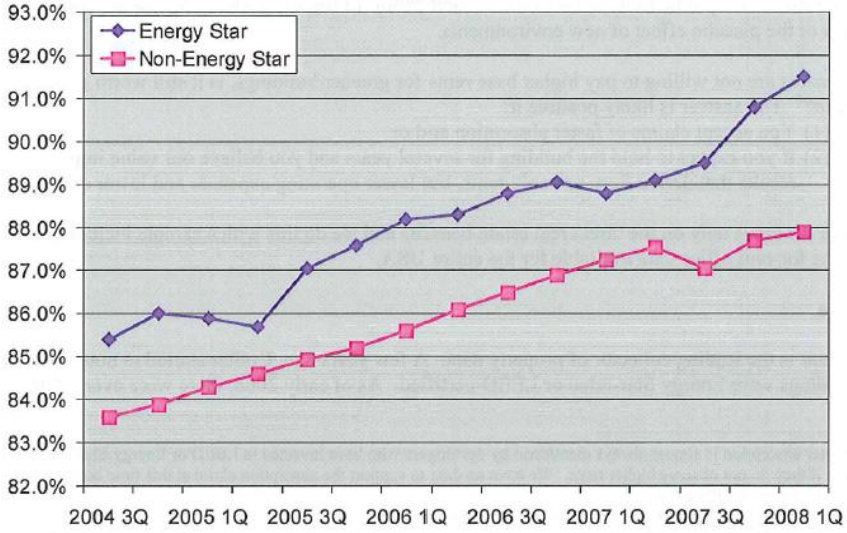
Figure 3. Cost premiums sustainable building (Source, WGBC, 2013a, p. 21)

Increase in cost premiums can be proportional to the increased level of sustainability aspirations and certification. For example, a zero carbon building shows a 12,5% cost premium as compared to a conventional building. However, for the majority of certified buildings, the cost premium mostly ranges from less than 0% to 4%. Multiple studies show that sustainable buildings do not necessarily require higher investments, in fact there are cases where sustainable buildings require less investments (WGBC, 2013a). Higher levels of certification will lead to a higher cost premium. In the research of Kats (2003) among 60 LEED-certified buildings it showed that depending on the level of certification (Certified, Silver, Gold or Platinum), the cost premiums range from 0,66 with LEED-Certified, till 6,5% for LEED-Platinum. On average, higher levels of certification will lead to a 0% to 10% cost premium, while the highest levels of certification ranges from 2% to 12.5% cost premium (WGBC, 2013a).
Even though multiple studies show that sustainable buildings do not necessarily lead to extra cost, many professionals in the construction industry are still under the impression that sustainable buildings increase the design and construction costs (Ambec and Lanoie, 2008; Kats, 2003). Professionals estimated the extra cost for a sustainable building between 10-20% and sometimes even 29%. This could be due to relying on old data, or a lack of awareness that costs are decreasing. Another reason can be that they saw showpiece buildings with additional costly finishes that may not be financially viable. This perception continues to present a challenge for de construction industry (WGBC, 2013a).

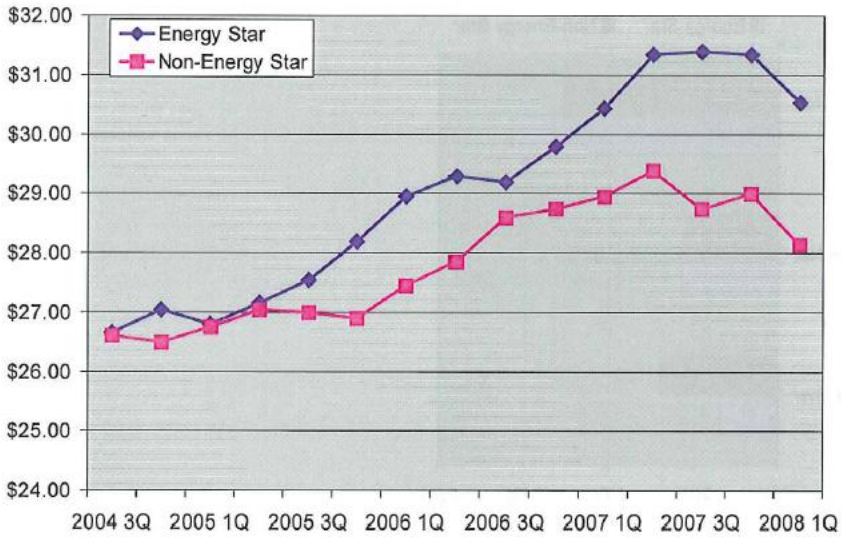
Asset value
Sustainable buildings are inclined to have higher asset values than conventional buildings. This difference in asset value is evidenced by higher selling prices, which are related to a number of benefits being: higher rental/lease rates, lower operating expenses, higher occupancy rates and lower yields (WGBC, 2013a). The research of Miller (2008) among 643 Energy Star- rated buildings and 2000 control buildings shows that buildings which are Energy Star rated enjoy higher occupancy rates, higher rental rates and higher sales prices. These figures are depicted in figure 4. Moreover, in another research of Eichholtz et al. (2009a) 10.000 commercial buildings were investigated, divided into LEED-Certified, Energy Star labelled and control buildings. The research discovered that Energy Star labelled buildings will rent for 3% higher per square foot. Premiums in effective rent are even higher, being 6%. Moreover, selling prices of sustainable buildings are on average 16% higher than compared to the control buildings and the occupancy rate is slightly higher. Research of USGBC (2012) shows other results, in this research the building value of sustainable buildings are 10,9% higher for new constructions and 6,8% higher for existing buildings. In addition, they discovered an increase in the occupancy rate of 6,4% for new constructions and 2,5% for existing buildings.
Conversely, it can also be expected that organisations who fail to improve the sustainability performance of their buildings will not get a 'green' premium, but a 'brown' discount (Miller, 2008).
As a result, the real estate sector is beginning to think about innovative solutions in order to ensure the value of their assets (AgentschapNL, 2010).

Operating expenses
Sustainable buildings cost less to operate and maintain. In the research of Kats (2003), Rashid et al. (2012) and Watson (2009) it showed that sustainable buildings use between 25 - 30% less energy as compared to conventional buildings. There are also examples of reduction in energy use by 42% (Lockwood, 2006) and even 50% (Robichaud and Anantatmula, 2010). In new constructions the energy savings are the highest, but also for renovated existing buildings the energy savings can be substantial. Miert et al. (2012) discovered that in the Netherlands renovated energy efficient buildings use up to 40% less energy as compared to conventional buildings.

Occupancy rates Energy Star- rated building versus control buildings



Direct rental rates Energy Star- rated buildings versus control buildings



Sales prices Energy Star- rated buildings versus control buildings

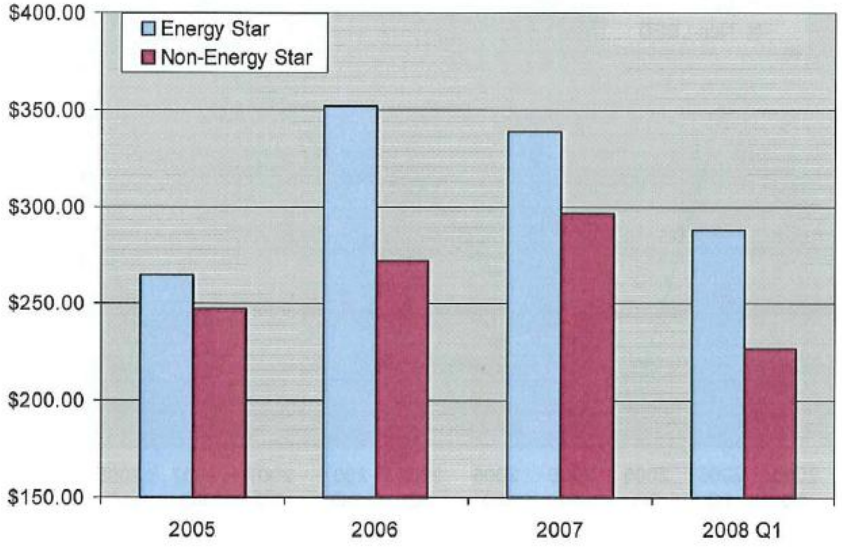


Figure 4. Occupancy rates, rental prices and sales prices (Source, Miller, 2008, p.24 & p.25)

Another main benefit is reduced water consumption. Already in 1996, Gottfried discovered that water conservation and efficiency through sustainable building can lead to a substantial decrease of water usage in buildings. Changes in irrigation systems, water efficient appliances and behavioural awareness can reduce the water consumption by about 30% (Gottfried, 1996). Kats (2010) estimates that the water consumption savings that can be accomplished are 39% over that of a conventional building. Another beneficial part of saving water is that it results in the reduction of GHG emissions, especially CO_2 and a decrease of waste production (Fernanda Rodrigues et al., 2012).
Energy and water savings are the main contributors to the decrease in operating expenses, but there are also other examples, such as up to 13% less maintenance costs due to low-maintenance appliances (Rashid et al, 2012), less insurance claims due to a decrease in accidents from materials below standards, less need for pest control (Gottfried, 1996) and less frequent replacement cycles through cradle-to cradle approach (WGBC, 2013a).
From a life cycle standpoint, savings resulting from an upfront investment in the sustainable design and construction of buildings can exceed any additional investment costs substantially. By a minimal upfront investment of a 2% premium, a building can yield savings over ten times the investment (Kats, 2003). Thus, if for example one billion euro's is invested in sustainable buildings, this will yield a saving of ten billion euros.

Productivity, health and well-being
According to Kats (2003) and WGBC (2013a) the effect of health and productivity expresses itself in the far reaching costs of employees, considering that the cost of labour is considerably higher (85%) than the costs for rent (10%) or energy (1%). Therefore, even small improvements in employees' health and productivity can produce large financial benefits. One of the driving forces behind the advent of sustainable buildings is creating a favourable indoor environmental quality, which promotes health, comfort, productivity and employee satisfaction. Attributes that increase the indoor environmental quality include high levels of natural daylight (Reinhart and Fitz, 2006), artificial lighting that increases lighting quality and decreases computer glare (Hirning et al., 2014; Rashid et al., 2012), increased contact with the natural environment (Brown et al., 2010), advanced ventilation systems that increase air flow and reduce indoor pollutants (Singh et al., 2010; Heerwagen, 2000), thermal comfort and inviting workspaces (Brown et al., 2010).
Sustainable buildings with a favourable indoor environmental quality can contribute to the health and wellbeing of the users, which results in an increased productivity and therefore, a better business result (Ajala, 2012; Heerwagen, 2000; Kats et al., 2003). While more research is needed, based on the existing studies, it can be concluded that a better environmental indoor quality will result in healthier, more productive and more comfortable employees (Singh et al., 2010).
Moreover, sustainable buildings can also have a positive effect on the sense of pride of employees towards the organisation. In 2011, Tim Hortons (fast food chain) conducted an investigation among their own organisation. Sustainability plays an important role in this organisation and the results show that 97% of the employees are proud to work for this organisation (Tim Hortons, 2011).

Image of the organisation
The reputation of an organisation is determined by its solvency, its trustworthiness and its social responsibility. Considering that sustainability is a component of social responsibility, it can thereby contribute to the image of an organisation (Eichholtz et al., 2009b). For example, if an organisation reduces its energy use, they consequently reduce their GHG emissions and therefore the environmental impact. This is being increasingly noticed by the field. Moreover, a sustainable building can contribute to the attraction and retention of outstanding employees and thereby improve the competitive advantage of the organisation.
A sustainable building can also help improve an environmentally unfriendly image. The building can then function as a figurehead (Hartogh, 2011).

2.4 The current and future state of sustainable building

Sustainable building in the real estate sector

The number of sustainable buildings are increasing around the world. Sustainable building is no longer only driven by idealism, it is now seen as a business opportunity through the above stated benefits (Kibert, 2004). Looking at the real estate sector, different research shows that the added value of sustainable building is becoming visible in the real estate sector. Noticeable is that this trend is not confined to specific parts of the world or specific economies (McGraw-Hill Construction, 2013). According to RREEF Research (2008) several factors influence the increased attention for sustainable buildings globally being tenant requirements, government regulations, and demands for socially-responsible investments. These factors are driving a rapid transformation to sustainable buildings and this is visible by the explosion in the numbers of sustainable buildings that are being developed.

In the United states sustainable building is becoming standardized among AEC firms, consultants and owners. In 2012, 40% of the respondents state that they are involved in high levels of sustainability and this number is expected to grow to 53% in 2015 (McGraw-Hill Construction, 2013). Blumberg (2012) confirms the increasing interest for sustainable buildings. The demand for sustainable buildings is increasing very fast and consequently, the real estate sector is more willing to make their buildings more sustainable.

Even though this research shows positive results for the future of sustainable buildings, it has to be recognized that the current state of sustainable buildings in the real estate construction sector is still depressing (Blumberg, 2012). The biggest constraints for sustainable buildings in the real estate sector are still the issue with costs and the potential that sustainable investments are not financially viable. In addition, there is a lack of awareness of the impact of exhausting natural resources (WGBC, 2013a). Fortunately, an upward trend is visible and it appears to be that the real estate sector is becoming increasingly aware of the many advantages of sustainable buildings, especially regarding new constructions. However, the stock of the existing office space in the U.S. greatly outnumbers the new office stock that is being developed each year. Therefore, existing buildings have the largest potential to significantly improve the sustainability performance of the built environment (Blumberg, 2012). For more information regarding the state of sustainable buildings, see appendix 1.

Sustainable building among end users

According to global research among 400 organisations about the mind-set of end users towards sustainable buildings, the year 2007 represented a tipping point in the mind-set of end users towards sustainability. 47% of the global respondents indicated that the sustainability performance of their buildings is a critical issue for them. Moreover, another quarter states that the sustainability performance will become a critical issue within two years (Jones Lang Lasalle, 2007). A more recent research of the WGBC (2013b) shows that in Europe the demand among end users is increasing. The number of non-residential projects certified for BREEAM, LEED and others has tripled between 2011 and the first half of 2013. The demand for certification is the strongest in the offices sector, followed by the industrial sector and the retail sector. According to Deloitte (2014) the demand for sustainable buildings among end users worldwide is also visible through the increasing inclusion of sustainability features in their lease agreements. Research also shows that 70% of the respondents are willing to pay more for a sustainable building. 62% states that they are willing to pay a premium between 1-10% and 8% states that they are willing to pay over a 10% premium for fitting sustainable practices. It seems to be that the market of end users is ready for sustainable buildings. However, the same research also shows that 46% of the respondents feel that sustainable buildings from the supply side are hardly available (Jones Lang Lasalle, 2007).

It appears that there are still constraints present among the real estate sector and end users worldwide for improving the sustainability performance of their buildings. Therefore, a closer look will now be taken at the current state of sustainable building in the Netherlands.

2.5 Sustainable building in the Netherlands

For a long time, sustainable building in the Netherlands revolved around the 'Circle of Blame' (see figure 5), which means that every involved party in the real estate sectors feels the need to improve the sustainability performance of their buildings, but at the same time all parties point at each other to take the first step (Bak, 2011). Around 2008 different parties managed to break the vicious 'Circle of Blame'. According to Hulshoff (2009) the real estate sector in the Netherlands has now moved beyond its innovation phase and recognized sustainability as a normal factor, especially regarding new constructions. This can be explained through the increase in legislation, support of sustainability assessment tools such as BREAAM and GPR Gebouw and recognition of the advantages of sustainable buildings (Smit, 2014). Many of the newly developed buildings are sustainable and considerable progress has been made regarding the sustainability performance and the use of innovative techniques in this area (Bak, 2011). According to the WGBC (2013b) offices pursuing BREEAM-NL now represent about 75% of the new constructions in the Netherlands, which shows the integration of sustainable buildings in new constructions. Unfortunately, also in the Netherlands the share of newly developed buildings compared to the current supply is very small. Considering that only 500.000 to 800.000 m² is newly developed every year (Hulshoff, 2009), compared to a current supply of 49.384.000 m² in 2013 (DTZ Zadelhoff 2014), the real opportunities for a sustainable built environment present themselves among existing buildings (Bak, 2011; Hulshoff, 2009, Smit, 2014). At this moment the built environment mostly consists of unsustainable buildings with yearly emissions of about 8,4 million ton CO_2. The unsustainable supply can partly be explained by the fact that only since 1995 the government started to pressure organisations to increase the energetic quality of their buildings (Bak, 2011). Currently there are a few frontrunners that have integrated sustainability features in their existing buildings, but the majority of these buildings are still unsustainable (Hulshoff, 2009).

Figure 5. The Circle of Blame (Source: Warren-Myers, 2012, p. 119)

Research shows that about 30% of the existing office buildings can become sustainable with relatively simple engineering solutions, adapted technical installations and management measures. Unfortunately, this is currently barely happening because of the presumption that investments are not financially viable through rental income or decreased operating costs (RVO, 2008a).
In order for owners to be willing to invest in improving the sustainability performance of their buildings, they have to be convinced of the advantages that arise from sustainable buildings and users have to demand for it. A good example is shown by the Dutch government. The government uses about 4 million m² office buildings, which are under the responsibility of the

'Rijksvastgoedbedrijf'. The Rijksvastgoedbedrijf is improving the sustainability performance of their buildings for years now and since 2010 they only rent buildings with an Energy label 'C'[2] or higher. Considering that the Rijksvastgoedbedrijf is the largest end user of offices in the Netherlands, this is a big trigger for investors/owners to look different at their real estate (AgentschapNL, 2010). They can no longer afford dismissing the sustainability performance of their building portfolio and are now willing to invest (Bak, 2011). Today the question arises whether other end users of buildings in the Netherlands are willing to follow the example of the government and demand for sustainable buildings. In the next paragraph the importance of reaching the end user will be further explained and the mind-set of end users in the Netherlands regarding sustainable buildings will be examined.

2.6 The importance of the end user

The most important groups that can influence the sustainability performance of existing buildings are owners and end users. The owner is in most cases the investor, but can also be a developer or owner-user (Quispel and Langbroek, 2011). End users come from sectors such as the residential or commercial sector. This research will focus on the commercial sector. Within the commercial sector end users come from diverse organisations, such as the government, the care sector, the educational sector, freelancers, small- and medium enterprises, multinationals etc. (CoreNet and FMN, 2013).
End users are the most important group regarding the implementation of sustainability features, considering they determine the demand for sustainable housing. End users have to be willing to be housed in an existing building with an improved sustainability performance. Moreover, they have to be willing to pay a possible premium for being housed in an existing building with an improved sustainability performance (Quispel and Langbroek, 2011; RVO, 2008a). Another reason for reaching end users is that a total of 85% of the energy consumption of the building's lifecycle occurs during the use of the building (BCA, 2010). In order to significantly reduce the energy use, just implementing sustainability practices is not enough, it also has to be managed in a controlled way to ensure the best possible sustainability performance (Bak, 2011).
Owners are the second most important group, considering that they have to be willing to invest in sustainability practices, otherwise it will not happen.
Both parties will benefit from improvement of the sustainability performance. The advantages arising from improving the sustainability performance of buildings for owners are based on costs decrease, risk and return. The advantages for end users are also based on costs decrease and moreover, an improvement of the health and productivity of employees and image improvement (Quispel and Langbroek, 2011). It can therefore be suggested that improving the sustainability performance of the existing buildings, delivers diverse advantages for both groups. However, between owners and end users the question arises who should be responsible for investments regarding improvement of the sustainability performance of the buildings. This is also called 'the split incentive'. It means that both parties will benefit from the sustainability features, but both do not want to invest if the other one receives the advantages (Bak, 2011). End users can play a huge role in solving the problem of the split incentive. RVO (2008a) discovered that in practise, if the advantages can be made clear to end users, they are willing to be housed in an existing, improved building. This development shows a positive attitude regarding sustainability practices among end users.
Research of Jones Lang LaSalle (2010) among 163 Dutch office users and office user-owners also shows the increasing attention for sustainable buildings. The research discovered that sustainability is an important item when choosing housing possibilities. Moreover, 87% of the owner-users state that they want to be housed in a sustainable building within ten years. Bak (2011) conducted a research regarding the receptiveness of sustainability among office users. It showed that 75% of the respondents consider sustainability to be important and over 50% of the respondents are willing to

[2] In 2008 the government introduced the Energy label, which assesses the energy performance of a building. The energy performance is measured by the characteristics of the building. The different levels vary from A++ till G, with G being the worst (Source: Bak, 2011).

implement sustainability practices in their existing office. However, even though these studies show positive results, sustainability is still not a requirement for housing for a lot of end users. In the next paragraph the housing requirements of the end users will be explored and the constraints for sustainable buildings will be described.

Demands for a building and constraints for sustainable practices among end users
In 2013, CoreNet and FMN conducted a research to discover which criteria end users consider to be important when choosing housing possibilities. The research shows that the location of the building is the most important requirement when choosing a building. Moreover, the accessibility of the building is increasingly important, especially regarding the accessibility by public transport. Another main requirement is a representative and flexible office building. Flexibility has two components, being the flexibility of the rental contracts and the technical flexibility. Also the adaptability of the building towards 'the New Way of Working' is mentioned as an important requirement. Furthermore, the sustainability performance of the building, is increasingly seen as a criteria. When moving to another existing building, end users already expect a certain degree of sustainability in the building. When a building is not sustainable, it can act as a 'disqualifier' (CoreNet and FMN, 2013). In addition, the research shows that 60% of the end users are more willing to search for an existing building instead of a new building. The reason for this positive development is the vacancy of office buildings in the Netherlands. The prices are decreasing fast and owners are more willing to improve the quality of their buildings. Here lies a beautiful chance for sustainability. In a time with a lot of vacancy, end users have a strong position if they demand sustainable buildings.
For end users willing to stay in their existing building, the research of Bak (2011) demonstrates that half of the end users are willing to improve the sustainability performance of their buildings. However, end users experience a number of constraints, which prevent improvement of the sustainability performance. The split incentive has already been mentioned as a constraint. Moreover, a research from Deloitte (2012) among 20 municipalities in the Netherlands shows that there are four main reasons that prevent improvement of the sustainability performance: A complex organisational structure, limited information of the performance of the building, little knowledge about the possibilities to increase the sustainability performance and no translation of the communication about sustainability throughout the organisation. Research of Nuon (2012) among investors and users demonstrates that the most important constrains are: Not enough insight in the costs and benefits of improving the sustainability performance of the building, lack of financial resources, lack of technical knowledge and difficulties with permits and legislation. Hulshoff (2009) adds that the Circle of Blame is also present in existing real estate, which presents another constraint among different end users.

Above mentioned studies have already given an impression of the needs from end users regarding their buildings, the mind-set towards sustainable practices and some of the constraints that they experience when considering implementing sustainability practices. However, the research regarding these subjects is very limited in the Netherlands. CoreNet and FMN (2013) support this statement and call for more research regarding the different types of end users. A suggestion for further research is segmentation of different sectors of end users, in order to determine their needs and preferences. Furthermore, more research is needed in order to discover how to reach these segments of end users. Hulshoff (2009) states that end users play a key role in the improvement of the sustainability performance of existing buildings and this statement is supported by Facility Management Nederland (FMN), Corporate Facility Partners(CFP) and the Dutch Green Building Council (DGBC). This research has been conducted in order to provide more data about the demands of end users and their mind-set towards sustainable buildings. The measurement tool will make use of the factors explained above, and will add some other and open questions to provide field for an explorative research.

2.7 Segmentation

As mentioned earlier, this research is being conducted to gain insight in the market of end users. In order to reach and respond to this market, segmentation will be applied. Segmentation is used to identify the groups most worth pursuing. Moreover, segmentation is used to guide organisations in tailoring their products and service offering to the segments that are receptive for a particular product and that are most likely to purchase them (Yankelovich and Meer, 2006).

Segmentation in Business-to-Business markets consists of two main categories, being macro-segmentation and micro-segmentation. Macro-segmentation mainly focuses on the characteristics of an organisation, such as size, industry, sector, geographic location etc. Micro-segmentation takes it a step further and requires more detailed information about organisations, such as buying decision criteria, the importance of buying, the attitudes towards buying certain products etc. (Hutt and Speh, 2007). Micro-segments are homogenous groups of organisations within the macro-segments and are based on the purchasing behaviour. Micro-variables that can be used in micro-segmentation are:

Organisational capabilities: Used to segment organisations based on the financial, technical and operational capabilities of an organisation. For example, an organisation who is financially weak may be attracted to products that will deliver cost savings, instead of products that require high investments and deliver high quality.

Purchasing policies: Used to segment organisations based on their purchasing policies or practices. For example, the government has a standard purchasing policy, but in the private sector these purchasing policies can vary.

Purchasing criteria: Used to segment organisations based on the purchasing behaviour. For standard products, criteria such as price and payment terms dominate the buying decisions. For non-standard products, performance and application criteria are more dominant.

Personal characteristics: Used to segment organisation based on the personal characteristics of decision makers. These are factors such as the willingness to take risks, education, ages and personal motives (Havaldar, 2005).

For this research the segments will be identified based on the purchasing behaviour of end users. In order to segment the market, different axes are determined (characteristics based on which the market can be segmented). The first axis is derived from the micro-variable *capabilities of the organisation*. In this regard, it will determine the financial capability of organisations to invest in sustainability practices. This axis is called 'the willingness to invest' and is based on the payback period that organisations accept when investing in sustainability practices.

The second axis to be determined is derived from the micro-variable *purchasing criteria*. This will determine the attractiveness of certain products based on price and performance. It is stated that some organisations are more likely to purchase products that are cost efficient, while other organisations are more likely to purchase products who deliver a higher degree of quality and performance (Havaldar, 2005). For this research the axis to be determined is roughly divided in 'cost savings or strategic value' and is based on the goal when investing in sustainability practices.

Another way of segmenting the market is based on the media use of organisations. While this is not the most common way to segment the market, it is based on the assumption that different media sources tend to reach different kinds of organisations/people. It is possible that if different parties only address one kind of media source, a part of the market will be excluded (Thomas, 2007). The third axis to be determined is therefore based on the degree to which organisations are actively searching for information through media. This axis is called 'actively or not actively searching for information' and assesses the ability to reach organisations with specific marketing strategies through media. More information about the segmentation is provided in paragraph 3.7.

Recapitulating, the chosen variables for the segmentation now form the following three axes:

Axis 1: Willing to invest vs. not or barely willing to invest

Axis 2: Investment goal: cost savings vs. strategic value

Axis 3: Actively searching for information vs. not actively looking for information

3. Research methodology

In this chapter the methodology to conduct this research is described. The methodology consists of the objective, the research questions and the hypotheses. In addition, the methodology consist of the research strategy, the data collection technique and the analysis technique of the questionnaire.

3.1 Objective of the research

The objective of this research is to identify the segments of end users of buildings which have the largest potential in terms of improvement of the sustainability performance of the built environment in the Netherlands. This objective will be achieved by gaining insight in the market of end users and discovering the mind-set of end users regarding the sustainability performance of their buildings and the constraints they face. By providing insight in the market of end users, it is possible to find solutions to the problems that prevent improvement of the sustainability performance of existing buildings. Moreover, specific marketing strategies could be prepared in order to reach these end users.
The indirect objective of this research is to contribute to the knowledge regarding end users in order to improve the sustainability performance of the built environment in the Netherlands.

3.2 Research question and sub-questions

The main question (MQ) that this thesis will address is:

MQ: Which segments of end users are the most promising to reach in order to improve the sustainability performance of the built environment in the Netherlands?

In order to answer the main question in more detail, the following sub-questions (SQ) are derived:

1. What are the requirements for end users of buildings in the Netherlands, concerning the sustainability performance of buildings?
    - 1.1. What are the general requirements from end users regarding their buildings?
    - 1.2. How important is the sustainability performance of the building for end users?
    - 1.3. What are the most important features regarding the sustainability performance of the building?
    - 1.4. Which constraints do end users of buildings experience that prevent improvement of the sustainability performance of their buildings?
2. Which segments of end users of buildings exist based on their mind-set towards sustainability practices in the Netherlands?
    - 2.1. What are the most important goals of end users of buildings when implementing sustainability practices in their buildings?
    - 2.2. To what extent are end users of buildings willing to invest in sustainability practices regarding their buildings?
    - 2.3. What is the purchasing behaviour of end users concerning the sustainability performance of their buildings?
        - 2.3.1. To what extent are end users of buildings actively looking for information concerning the improvement of the sustainability performance of their buildings?
        - 2.3.2. Which kind of media do these segments use?
3. What is the potential of the segments (based on the square meters for each segment) regarding the improvement of the sustainability performance of the built environment?

3.3 Hypotheses

Hypotheses are usually characterized by interrelations between variables and are often derived from a substantive theory (Leon-Guerrero and Frankfort-Nachmias, 2011). This research is explorative in nature, as will be explained in the next section. Many of the ideas to be investigated do not have sufficient theoretical background which could be tested. Thus, the hypotheses are basically ideas of the researcher which will be tested based on the data collected.

(H1) Segments which are willing to invest in the improvement of the sustainability performance of their buildings experience on average less constraints than segments which are not willing to invest.

(H2) Certain sectors in which organisations operate are more willing to invest in the improvement of the sustainability performance of their buildings.

(H3) People with certain occupations are more willing to invest in the improvement of the sustainability performance of their buildings.

(H4) People with a certain role in the decision making process regarding improvement of the sustainability performance are more willing to invest in the improvement of the sustainability performance of their buildings.

(H5) Organisations with certain sizes based on the amount of employees are more willing to invest.

3.4 Research strategy

According to Bryman and Bell (2007) a research strategy is a general orientation to the conduct of business research. This research is **explorative**, which is a means to find out what is happening, to seek new insights and assess phenomena in a new light. The exploratory research is used to gain insight in the mind-set of end users regarding the sustainability performance of their buildings and the constraints they face when considering to improve the sustainability performance of their buildings. Considering that research regarding this subject is limited in the Netherlands, an exploratory research is a good approach to clarify the understanding of a problem and to discover the exact nature of the problem (Robson, 2002). In order to answer the research questions, two approaches to perform research can be described, being qualitative and quantitative research. Qualitative research refers to the collection of all non-numeric data or non-quantifiable data and is concerned with finding explanations of social phenomena. Moreover, qualitative research is concerned with questions about the 'why' and the 'how' and tries to gain deeper understanding in a certain phenomenon (Hancock, 2002; Saunders et al., 2009). Quantitative research can be considered as a research strategy that emphasizes quantification in the collection and analysis of data (Bryman and Bell, 2007). It is concerned with questions about 'how much', 'what', 'which' and 'how often' (Hancock, 2002). For this research, quantitative research is chosen. **Quantitative research** is chosen because the researcher wants to obtain information about a large population, which accordingly can be statistically analysed. Moreover, in order to prepare a segmentation of the market of end users, quantitative research is appropriate considering that all data in the different segments have to be exactly the same in order to conduct an appropriate analysis (Baarda, 2007). Finally, quantitative research is chosen for testing the proposed hypotheses (Muijs, 2001).

3.5 Research design

When conducting exploratory research, a number of research designs exist, with the most well-known being experiments, case studies and surveys (Saunders et al., 2009). For this research the research design **survey** is used. The survey is a popular and commonly used design in business and management research and is mostly used to answer 'who', 'what', 'where' and 'how much' questions. Surveys allow the researcher to collect a large amount of data from a large population in an efficient manner and find patterns. Surveys have two approaches, being qualitative or quantitative (Saunders et al., 2009). The qualitative approach is not suitable for this research, considering that interviews or observations have to be conducted. Interviews are not suitable, because it requires interviewing a large population, which is not possible due to the time constraints of this research. Furthermore, observation is not suitable because quantitative data is needed for the preparation of the segmentation. The quantitative approach is also more common, considering that these data are standardized and allow simple comparison. Moreover, the quantitative approach allows the researcher to collect data which quantitatively can be analysed using descriptive statistics (Saunders et al., 2009). Subsequently, this data will be used to develop the segmentation of end users. In addition, this approach allows the researcher to suggest relationships between variables, which are proposed in the hypotheses in paragraph 3.3.

This research is **cross-sectional** in nature, which means that the research studies a certain phenomenon at a certain time. This research is conducted in a period of four months and therefore is not a longitudinal study, which means a study over a longer period of time. (Saunders et al., 2009).

3.6 Data collection

According to Harrell and Bradley (2009) there are a number of data collection methods that can be used when acquiring data. The most well-known data collection methods are interviews, focus groups, questionnaires, observation and secondary data sources(Harrell and Bradley, 2009). For this research the data collection method **questionnaire** is used. A questionnaire is a preferable method to use when conducting research about the mind-set and opinions of people (Baarda, 2007). Considering that this research wants to discover the mind-set of end users towards the sustainability performance of their buildings, it is therefore an appropriate method to use. Moreover, a questionnaire is chosen because it provides the possibility to collect a large amount of data from a large group in a relatively short amount of time. Conducting interviews would also have been a possibility, but collecting the same amount of data as collected through the questionnaire, would take too much time.

The questionnaire is used to discover the mind-set of end users regarding the sustainability performance of their buildings. Moreover, the questionnaire is used to determine segments of end users that have a potential to improve the sustainability performance of the built environment in the Netherlands. In addition, the questionnaire is used to identify the constraints these segments face when considering improvement of the sustainability performance of their buildings.

The questionnaire can be answered either orally or in written form. For this research the questionnaire is completed in written form. This approach is chosen due to the time constraint, considering that oral questionnaires require a larger amount of time. Moreover, this approach allows the respondents to answer the questions anonymously, which will partly overcome the problem of providing socially desired answers. This approach also requires less time from the respondents, which makes the respondents more willing to complete the questionnaire.

The questionnaire is prepared in the online questionnaire tool 'Survey Monkey'. This tool is used, because when sending the questionnaire through mail, the problem of non-response reveals itself. Some respondents will skip questions, or even skip whole pages, whereas the online questionnaire tool does not provide this possibility. Moreover, this tool is used because in order to receive a

desired response, the design and lay-out of the questionnaire has to be perfect (Baarda, 2007). 'Survey Monkey' provides the possibility to design a professional, high quality questionnaire, which is more inviting than just sending a list with questions. Moreover, this tool collects all data and transports this in SPSS. Therefore, the researcher does not have to enter all data in SPSS manually, which saves a lot of time. Finally, this tool is chosen because the questionnaire is send out through multiple channels and this tool provides an online link (link that redirects the respondent to the questionnaire) which can be sent out in any way possible, being on a website, through e-mail or through social media.

3.7 Sampling technique

Sampling is a technique where a sample of the total population is chosen in order to generalise the results of the research. The sampling technique can be divided in two types, being probability and non-probability sampling. For this research non-probability sampling will be used. Non-probability sampling consists of three approaches: quota, snowball and convenience sampling. The researcher uses **non-probability convenience sampling**, which means that respondents are chosen who are available at the time that the researcher is collecting data. This technique is used very often, but the reliability of generalisation is very low, considering everyone who was available at the time had the possibility to fill in the questionnaire and they might not be representative of the whole population (Saunders et al., 2009).
The population of end users is approximately 863.840 in 2010 (CBS, 2010). A sample of 7866 end users was used for this research, which represents a total of 0,91% of the total population. The direct databases used for the questionnaire are the network of CFP (5466) and the network of FMN (2400). The database of CFP consists of former- and actual clients of CFP. Considering that the core business of CFP consists of improving the sustainability performance of commercial buildings for end users in the Netherlands, it is therefore an appropriate database to use. Furthermore, the database of FMN consists of members of FMN. These members are all end users of commercial buildings working in the field of facilities in the Netherlands. Other databases used to send out the questionnaire are different Facility Management alumni networks of universities in the Netherlands. These are alumni from the university of Breda, Rotterdam, The Hague and Utrecht, Saxion university and HAN university. In addition, the questionnaire was send out to different websites, such as the website of DGBC, Platform Duurzame Huisvesting, FMN, ROMagazine and TVVL. The estimated reach of these databases consists of 8200 end users.
The channel used to send the questionnaire to the databases of CFP and FMN is by e-mail, with an accompanying text and an attached link to the questionnaire.
The different alumni networks received a message through LinkedIn with an attached link to the questionnaire. On the mentioned websites a link to the questionnaire was provided with an accompanying text.

The questionnaire was filled out by a total of 331 respondents. It is not possible to determine which databases generated the responses. However, when comparing the completed questionnaires to the time period that the questionnaires were sent out, it can be determined that most respondents originate from the databases of CFP and FMN. Most likely, only a couple of respondents filled out the questionnaire through other channels. Therefore, the response rate of this research will be concluded based on the databases of CFP and FMN.
The databases of CFP and FMN consist of 7866 end users and with 331 filled out questionnaires, the response rate of this research is 4,2%. This is lower than the average response rate resulting from using e-mail, which is 9.3% (Johnson, 2011). One possible explanation for this outcome is the summer period. At the time of sending out the questionnaire, about 7% of the CFP database was on vacation and in the weeks after that, a lot of other people also started their vacation. Another explanation for the low response could be that the questionnaire was sent out almost simultaneously with another research that was conducted among FMN members.

3.7 Data analysis

The gathered data resulting from the questionnaires are analysed using the statistical analysis program SPSS. Two types of analysis are performed, being univariate and bivariate analysis.
Univariate analysis is used to provide insights in the answers concerning one variable and is conducted by frequency distribution, which means that the analyses provides the variables belonging to each of the categories for the variable in question (Bryman and Bell, 2007). The univariate analysis will provide the general results as described in paragraph 4.1 and determine the segments of end users, as described in paragraph 4.2.
Bivariate analysis provides insights in the answers concerning two variables and is used to test the hypotheses. The calculations are performed using the T-test and the Chi-Square test.
Furthermore, cross tabulation has been used. These calculations are described in appendix 5.
All data is summarized and presented in graphics, tables and pie-charts, which are derived from frequency tables. These results will be described in chapter 4.

3.8 Validity

There are two types of validity that can be recognized, being internal and external validity.
Internal validity refers to the ability of the questionnaire to measure what is intended to measure (Saunders et al., 2009). In order to ensure that the researcher proposes questions that are unbiased and clear, a pilot version of the questionnaire was sent out to five respondents. The respondents were asked to provide feedback on the questionnaire when questions were not clear or open for multiple interpretations. Moreover, the pilot questionnaire was used to discover whether the data resulting from the questionnaire would lead to the desired results, being the preparation of the segmentation. Furthermore, all questions that were designed for the questionnaire are derived from literature research and experts in the field (CFP, FMN, DGBC).
External validity refers to the ability to generalize the results of the research for the whole population (Verschuren and Doorewaard, 2010). For this research it is not possible to generalize the results. The reason for this is that the response rate of this research was rather low (4,2%), which resulted in 331 completed questionnaires. This seems like a good basis for analysis, but when preparing the segmentation, the groups are too small to be representative for the whole population. However, this research is not meant to be generalized for the whole population. It is meant to serve as a basis for further, more elaborate research, which will be further discussed in chapter 6.

3.9 Reliability

According to Saunders et al. (2009) there are three ways to test whether research is reliable. These are: test re-test, internal consistency and alternative form.
The test re-test means that the questionnaire is administered twice to the respondents. At this stage, the questionnaire was only administered once. However, this research will likely be conducted again on a larger scale, which allows the possibility to administer the questionnaire again. This will consequently improve the reliability of this research.
Another way to test the reliability of the research is **alternative form**. This means that responses are compared through alternative forms of the same question. When questions are included for this purpose, they are called 'check questions'. The researchers used two check questions in order to discover if the respondents chose the same answer in an alternative question. These are question 4 and 5, which assesses the importance of the sustainability performance of the buildings for end users and question 6 and 11,12,13, which assesses the goal when investing in sustainability practices. These questions have been described in appendix 3. The researcher is aware that check questions increase the length of the questionnaire, therefore only two types of check questions were included.

4. Results

In addition to the literature research, a questionnaire was sent out to 7866 end users in the Netherlands. In this chapter the results deriving from the questionnaire will be described. The data will be divided in the responses received overall, the preparation of the segmentation and the argumentation for the hypotheses.

4.1 General results questionnaire

The respondents

The results show that 39,6% of the questionnaire was completed by facility-or real estate managers. 22,5% of the respondents are directors and 12,8% are general managers. Furthermore, 11% of the respondents are advisors and 6,6% are project managers. Other occupations of the respondents are purchasing managers, financial managers and sustainability managers, with percentages ranging between 0,9% till 4,4%.

63,6% of the directors are decision makers in the implementation of sustainability practices. These results show that the director is the most influential party in the decision making process. Moreover, 18,2% acts as advisor, 7,6% acts as a executer and 7,6% acts as a project manager.

The facility- or real estate managers are mostly project managers (32,6%), or advisors (30,6%). However, they are also an influential party in the decision making process, considering that 21,3% of the facility-or real estate managers have a decisive role in the decision making process. Furthermore, 32,6% acts as an executer.

Another influential party is the general manager, 18,6% of the general managers are decision makers. In addition, general managers are in most cases advisors (36,8%) and project managers (23,7%). 10,5% of the general managers do not have a role in the decision making process.

Furthermore, 60% of the purchasing managers do not have a role and 40% act as advisors. Of the financial managers 50% is project manager and 50% is advisor.

Sustainability managers are mostly advisors (75%), and project managers are obviously in most cases project managers (52,9%) or they acts as advisors (29%).

Finally, advisors are in most cases advisors (75%), but they also act as project managers (10,7%) and executer (3,6%). 10,7 % of the advisors do not have any role in the decision making process in the implementation of sustainability practices.

Together these respondents are responsible for almost 25.200.000 m^2 of buildings. Compared to 600.000.000 m^2 of commercial buildings in the Netherlands, these respondents comprise 4,2% of the total stock of commercial buildings (Sipma, 2014).

The respondents were asked which colleagues play a role in the decision making process. According to the respondents the most influential parties in the decision making process are directors (33,8%) and facility- or real estate managers (29,8%), followed by purchasing managers (15,5%), financial managers (12,8%) and general managers (8%).

The respondents are mostly representing the business services sector, being 41,8%. Moreover, 20,7% is working in the governmental sector, 12,2% in the industrial sector and 11% in the health care sector. Other respondents come from the educational sector, the retail sector and the construction sector. The sizes of these organisations range between less than 250 employees till over 5000 employees.

Criteria for choosing current building

In the questionnaire the respondents were asked what the most important criteria were for choosing the building(s) in which they are currently housed. It was possible for the respondents to provide more than one answer, which resulted in a total of 681 answers. The most important criteria for choosing the buildings is the location of the building. The results show that the location was mentioned 220 times, which results in the highest percentage of answers provided, being 32,3%.

The other most mentioned criteria are the cost of exploitation (14,6%) and the accessibility by public transport (13,8%), which were mentioned 99 and 94 times by the respondents.

Other important criteria for choosing the current building are the image of the building, the sustainability performance of the building and the accessibility by car. The mentioned criteria are presented in figure 6.

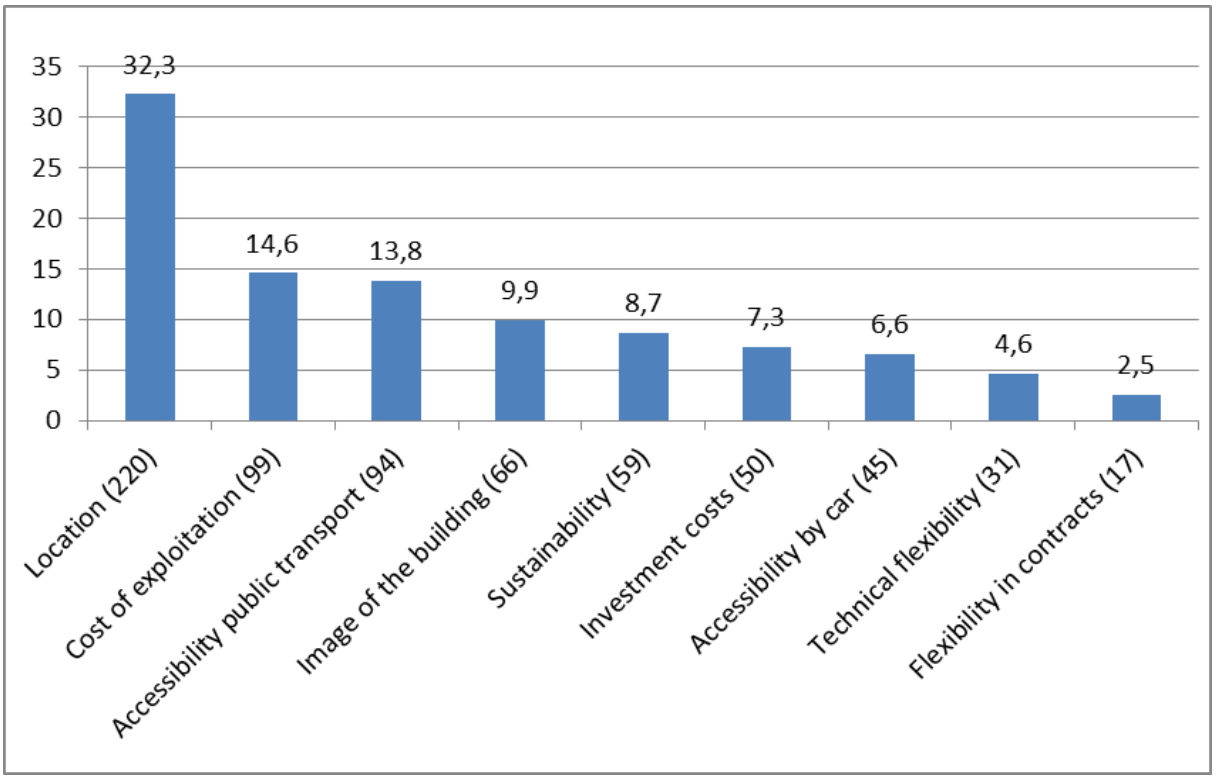


Figure 6. Most important criteria for current buildings (Source: author, 2014)

Importance of sustainability

In the previous questions sustainability was mentioned as a criteria 59 times, resulting in 8,7% of the answers provided. This small percentage could suggest that sustainability is a less important criteria for the respondents when choosing their building. However, when asking if the sustainability performance of their buildings is important, 54,6% of the respondents state that the sustainability performance of their building(s) is important and 18,6% state that it is very important. Furthermore, 20% of the respondents have a neutral opinion regarding this subject, 5,4% state that they do not think that the sustainability performance of their building is important and 1,4% state that the sustainability performance is not important at all. Therefore, it can be concluded that over 73% of the respondents consider the sustainability performance of their building to be important. These results are depicted in figure 7.

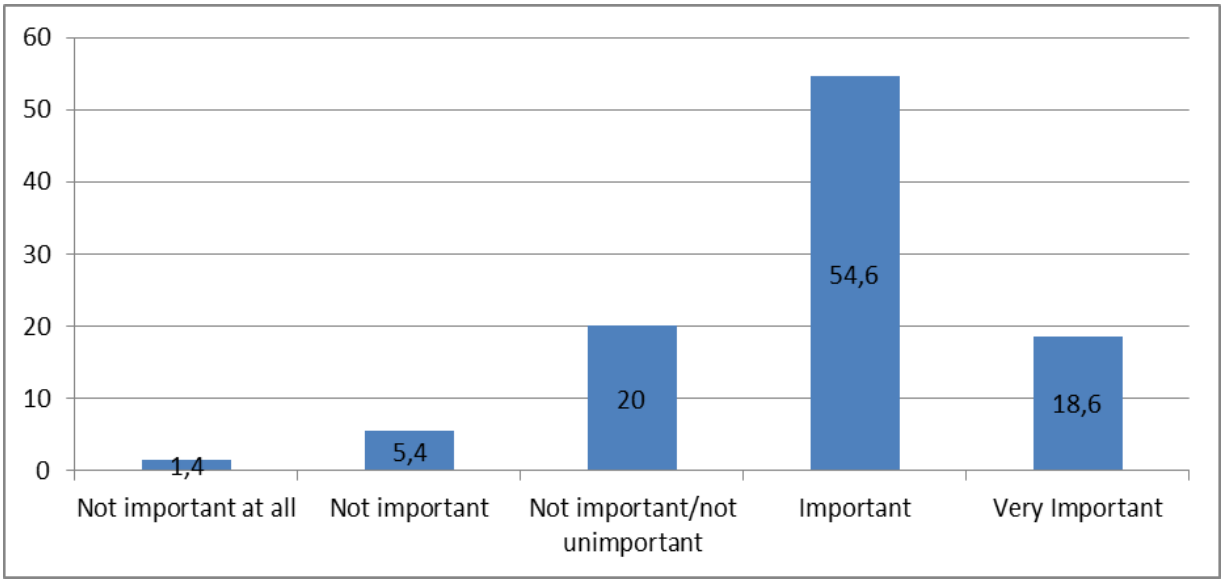


Figure 7. The importance of the sustainability performance in percentages (Source: author, 2014)

Sustainability assessment tools

The importance of the sustainability performance of the buildings is also visible by the number of buildings that are certified through sustainability assessment tools. The results show that over 57,5% of the end users is in the possession of a sustainability certificate for their buildings, with the most popular certifications being the Energy label (28,6%) and BREEAM-NL (16,8%). Other sustainability assessment tools that are used by the respondents are GPR Gebouw, GreenCalc and Greenkey. Furthermore, 42,5% of the respondents state that they do not use any sustainability assessment tool. These figures are presented in figure 8.

It has to be recognized that the Energy Label is obligated when a building is transferred to a new owner or tenant (RVO, 2008b). Even though it is also possible to voluntarily assess the building based on the Energy Label, it cannot be determined based on these results whether the use of the Energy Label was obligatory or voluntarily.

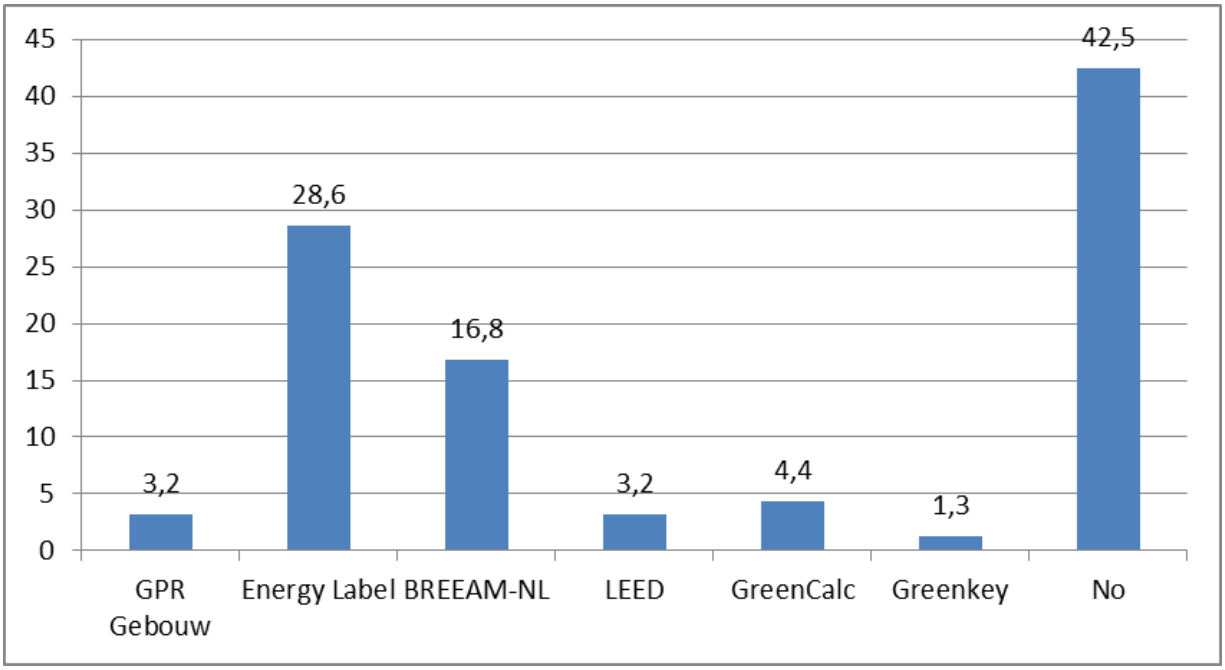


Figure 8. Use of sustainability assessment tools (Source: author, 2014)

Goals when improving the sustainability performance of the buildings

The respondents were asked what the most important goals are when improving the sustainability performance of their buildings. It was possible for the respondents to provide more than one answer, which resulted in a total of 524 answers. The most important goal for improving the sustainability performance of their buildings is cost savings. The results show that cost savings was mentioned 162 times, which results in 30,9% of the answers provided. Other important goals are improvement of health and productivity (27,7%) and image improvement (20,8%), which were mentioned 145 and 109 times by the respondents. Other mentioned goals were innovation (11,1%), improvement of the competiveness (6,3%) and social responsibility (3,2%). These results are depicted in figure 9.

As a follow up question the respondents had to make a choice between sustainability practices that deliver cost savings or sustainability practices that deliver strategic value. In the questionnaire the question was proposed three times, every time with another strategic value. The results show the following division:

1. cost savings (80,2%) or improvement of the competiveness (19,8%)
2. cost savings (57%) or improvement of the image (43%)
3. cost savings (66,8%) or innovation (33,2%)

These results show that cost savings is the most important goal when investing, thereby confirming the results from the previous question.

Axis for segmentation

In addition, above mentioned questions are used for the preparation of the segmentation. As mentioned before in paragraph 2.7 the segmentation is based on three axes: willingness to invest, cost savings or strategic value, and actively searching for information or not. These questions relate to one of the axes, being cost savings or strategic value. The consideration between cost savings or strategic value is calculated by the number of answers provided in a certain category. Therefore, it is stated that if cost savings is mentioned two times or more, the main goal is cost savings. Conversely, if cost savings is mentioned once or not at all, the main goal is strategic value.
More information regarding the segmentation and the three axes will be provided in paragraph 4.2.

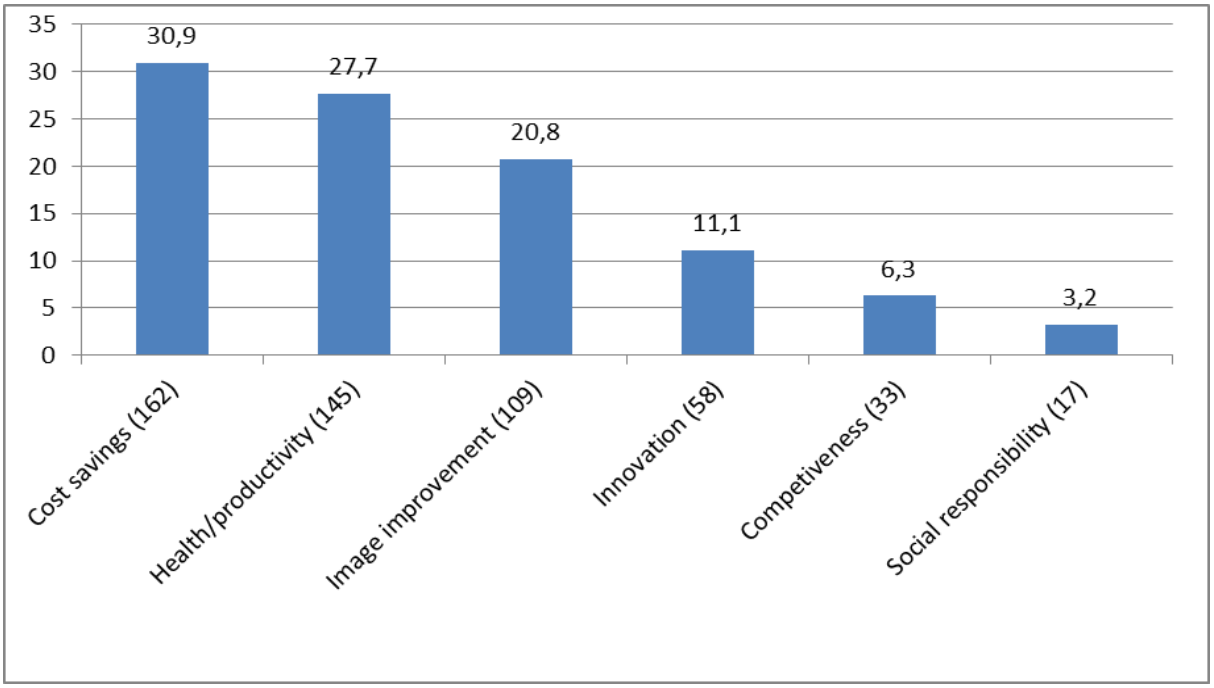


Figure 9. Goals for improving the sustainability performance of building (Source: author, 2014).

4.1.6 Attention to sustainability themes

The following results relate to the question which sustainability themes gain the most attention in organisations. The sustainability themes are based on the assessment tool BREEAM-NL, which divides sustainability practices in nine central themes: energy, health, management, transport, water, materials, waste, land use and ecology, and pollution (BREEAM-NL, 2014).

The results show that the sustainability themes which gain the most attention in organisations are energy, health, management and waste. Energy improvement is the most important theme, with 78,3% of the respondents paying more than average attention to this theme. Also health improvement is an important attention point with 72,1% of the respondents paying more than average attention to this theme. Furthermore, 68,6% of the respondents state that waste is a theme that gains more than average attention and 54,3% pays above average attention to management.

The sustainability themes that gain the fewest attention are the themes water, and land use and ecology. These figures are depicted in table 1.

Sustainability themes	Very few attention	Little attention	Not little/not a lot	A lot of attention	A great deal of attention	Aggregation: More than average attention
Energy	1,4%	5,4%	15%	49,4%	28,9%	**78,3%**
Health	1,8%	5,7%	20,4%	53,2%	18,9%	**72,1%**
Management	2,9%	8,3%	34,5%	47,8%	6,5%	**54,3%**
Transport	4,3%	19,2%	33%	33%	10,5%	**43,5%**
Water	5,8%	21,9%	40,3%	23,4%	8,6%	**32%**
Materials	4,7%	12,9%	31,3%	41,4%	9,7%	**51,1%**
Waste	2,1%	5,7%	23,6%	50%	18,6%	**68,6%**
Land use and ecology	17,4%	27,2%	33,7%	15,9%	5,8%	**21,7%**
Pollution	3,3%	17,4%	32,6%	37,7%	9,1%	**46,8%**

Table 1. Attention to sustainability themes (Source: author, 2014)

4.1.7 Willingness to invest in sustainability themes

As a follow up question, the respondents were asked whether they have invested in certain sustainability themes in 2013. On the one hand this question was asked in order to compare the results between this question and the previous question, and on the other hand to assess the willingness and attractiveness to invest in certain sustainability themes. The results show that the respondents mostly invested in energy, health, waste, transport and management in 2013. Energy is the most popular theme to invest in with almost 80% stating that they have invested in improving the energetic performance of their building. Moreover, the second most frequently mentioned sustainability theme is investing in health, which was mentioned by over 64% of the respondents. Other frequently mentioned sustainability themes were waste (63%), transport (48,7%) and management (47,7%). The willingness and attractiveness to invest in pollution (34,1%), water (34,2%) and land use and ecology (17,4%) is less present.

The high frequencies in the answer possibility 'I do not know' implicates that some of the sustainability themes are not as well-known as others, especially the theme 'land use and ecology' seems to be not as well-known, while 'energy' seems to be best known among the respondents. These figures are depicted in table 2.

Invested in 2013	Yes	No	I do not know
Energy	79,2%	16,2%	4,5%
Health	64,2%	24,2%	11,7%
Management	47,7%	38%	14,3%
Transport	48,7%	39,2%	12,2%
Water	34,2%	53,8%	11,9%
Materials	52,9%	36,1%	11%
Waste	63,1%	30,4%	6,5%
Land use and ecology	17,4%	57,9%	24,7%
Pollution	34,1%	47,9%	18%

Table 2. Investments in sustainability themes in 2013 (Source: author, 2014)

Payback period of investments regarding improvement of the sustainability performance

As presented in table 2, it can be concluded that the respondents are already willing to invest in a number of sustainability themes. In addition to the previous questions, the respondents were asked which payback period their organisation would accept when investing is sustainability practices. Over 80% of the respondents state that the organisation is willing to invest in the improvement of the sustainability performance of their building, with payback periods varying between three and more than ten years.

The most attractive payback period when investing is between three and five years, which is stated by 48,3% of the respondents. Moreover, 13% is willing to invest if the payback period is between six and seven years. The percentage of respondents who is willing to invest with a payback period between eight and nine years is smaller, being 7,6%. Furthermore, 11,3% of the respondents state that they are willing to invest if the payback period is ten years or more. Surprisingly, only 5,5% of the respondents state that they are not willing to invest in sustainability practices. The low amount can be partially explained by the fact of social pressure, which would divert respondents from choosing this answer possibility. However, even with this in mind, it can be concluded that the majority of the respondents is willing to invest in sustainability practices. These results are presented in figure 10.

Axis segmentation

In addition, the payback period is used for the preparation of the segmentation. The segmentation is based on three axes: willingness to invest, cost savings or strategic value, and actively searching for information or not. The question regarding the payback period relates to the one of the axes, being the willingness to invest. The consideration between willing to invest and not or barely willing to invest is calculated by the payback period that respondents are willing to accept. For this purpose, it is stated that if the respondents accept a payback period between three and more than ten years, they are willing to invest. Conversely, if the payback period is less than two years, they are not or barely willing to invest.

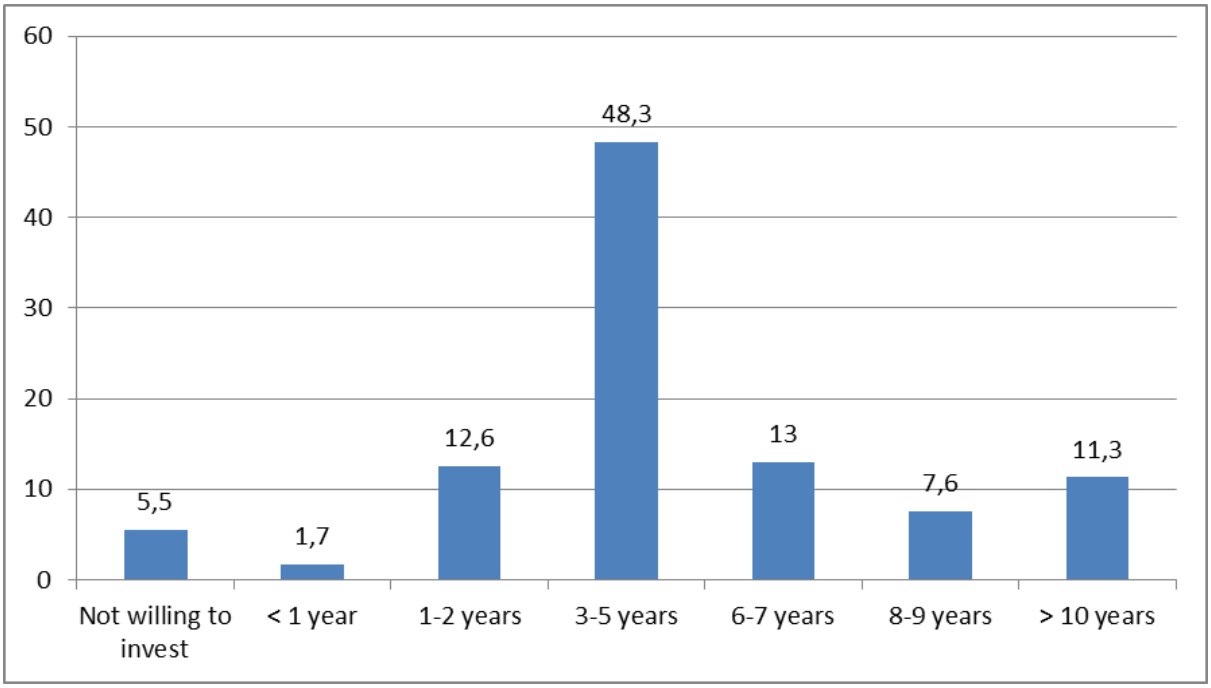


Figure 10. Payback period of sustainability investments (Source: author, 2014)

4.1.9. Searching for information regarding sustainability practices

Three questions were asked in order to determine which media the respondents use and whether they are actively searching for information regarding sustainability practices. The three questions are as follows:

1. Do you visit fairs/conferences regarding sustainability and if so, which one(s)?
2. Do you read papers/magazines regarding sustainability and if so, which one(s)?
3. Do you visit websites regarding sustainability, and if so, which one (s)?

It was possible for the respondents to provide more than one answer per question, which resulted in a total amount of 1695 answers.

For question 1, 479 answers were provided which results in the division as presented in figure 11. The results show that the Vakbeurs Facilitair is visited most frequently, with 90 respondents stating that they visit this conference (18,8%). This can be explained by the fact that the questionnaire was mostly completed by facility- or real estate managers. Other frequently visited fairs/ conferences are PROVADA, which is mentioned 70 times (14,6%), the Dutch Green Building Week, which is stated 53 times (11,1%) and the Energievakbeurs, which is stated 51 times (10,6%). Moreover, 75 answers were provided where it was stated that the respondents do not visit fairs/conferences regarding sustainability practices (15,7%).

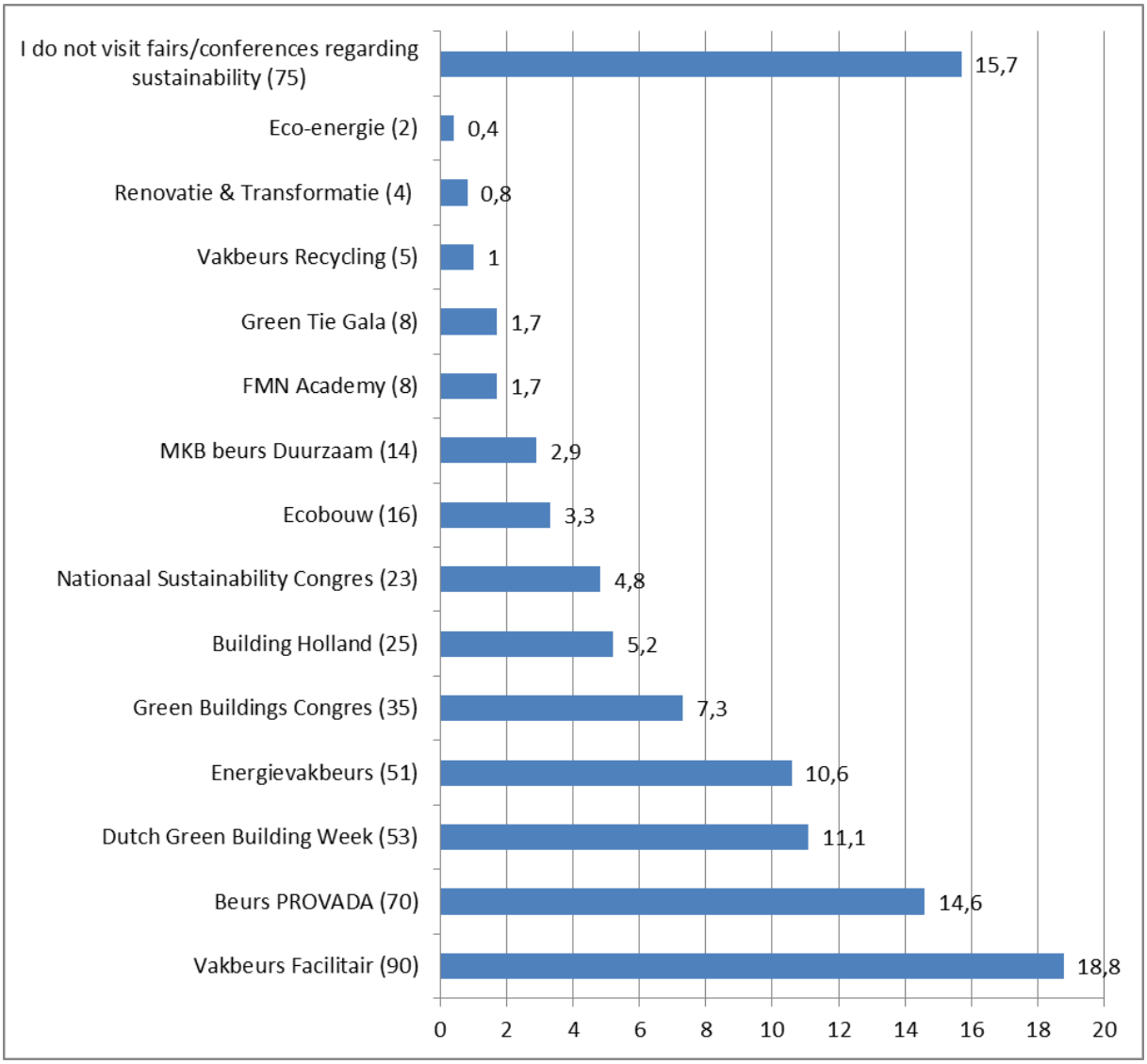


Figure 11. Fairs and conferences visits regarding sustainability practices (Source, author, 2014)

The second question that was asked was: 'Do you read papers/magazines regarding sustainability and if so, which one(s)'? The number of answers that are provided is 548, which are divided in figure 12. The results show that Facility Management Magazine (21,2%) and Facilitair and Gebouwbeheer (17,9%) are the most frequently mentioned magazines among the respondents, which are mentioned 116 and 98 times. Other magazines that are popular among the respondents are Facto Magazine and FMI. The high frequency in magazines concerning the facilities field can be explained by the fact that most respondents are facility- or real estate managers. Moreover, the high frequency of the magazine FMI can be explained by the fact that the majority of the respondents who are facility- or real estate managers are also member of FMN and they automatically receive FMI when being a member. Finally, 57 respondents state that they do not read any papers or magazines regarding sustainability practices (10,4%).

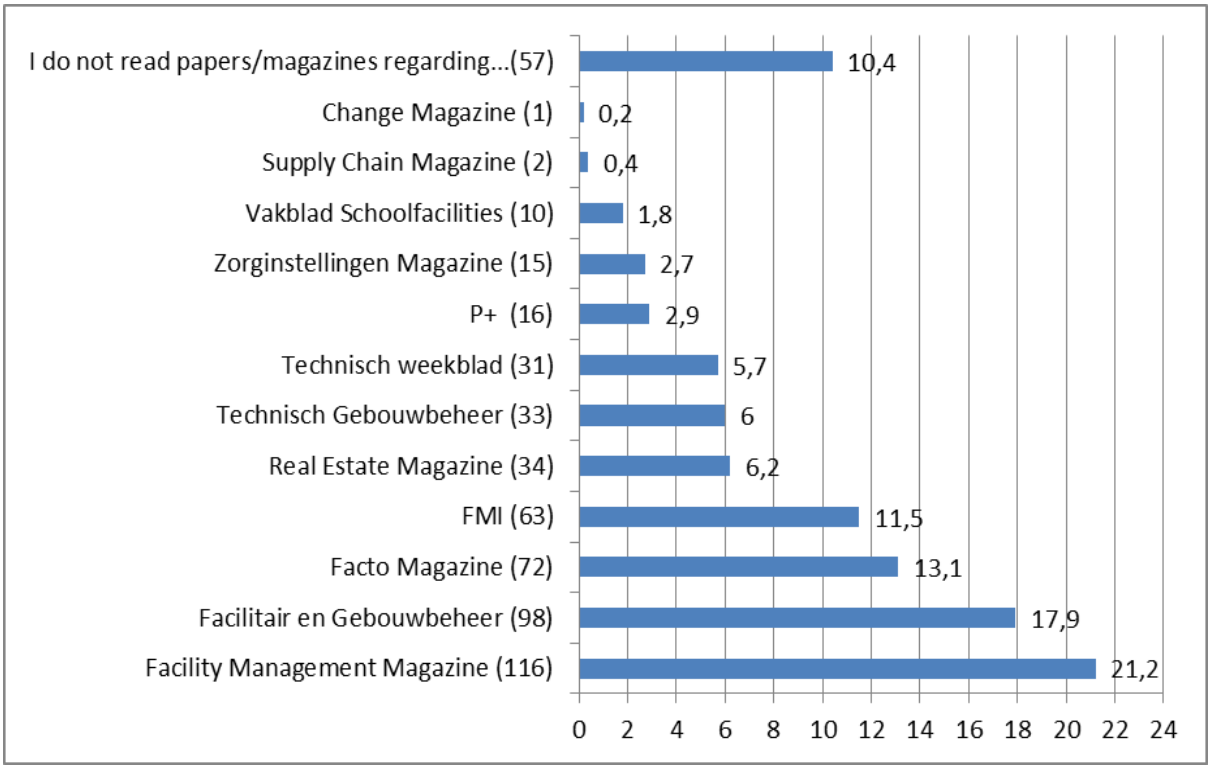


Figure 12. Papers and magazines used for information regarding sustainability practices (Source, author, 2014)

The third question that was asked was: 'Do you visit websites regarding sustainability, and if so, which one (s)'? The number of answers that were provided is 668 times, which have been divided in figure 13.
The results show that the most popular website to visit is 'google.nl' (18,6%), which was mentioned 124 times by the respondents. Considering that 'google.nl' is an online search machine, these results show that 124 respondents enter search terms in order to be directed to the websites with the appropriate information. Other websites where respondents search for information regarding sustainability practices are' RVO.nl' (10,3%), 'BREEAM.nl' (10,5%) and 'MVONederland.nl', (10,8%), which were mentioned, 69, 70 and 72 times. In addition, 8,8% of the answers provided show that the respondents do not use websites regarding information regarding sustainability practices, which was mentioned 59 times.

Axis for segmentation
The above stated questions regarding whether respondents are actively searching for information are used for the preparation of the segmentation. The third axis will therefore be called 'actively searching for information or not actively searching for information'. The consideration of being actively searching for information or not actively searching for information, is calculated by the number of times the respondents state that they do not use certain media in order to search for information regarding sustainability practices. Therefore, it is stated that if the respondents mention 'I do not search for…' two times or more, than the respondents are not actively searching for information regarding sustainability. Conversely, if 'I do not search for..' is mentioned once or not at all, then the respondents are actively searching for information regarding sustainability practices.

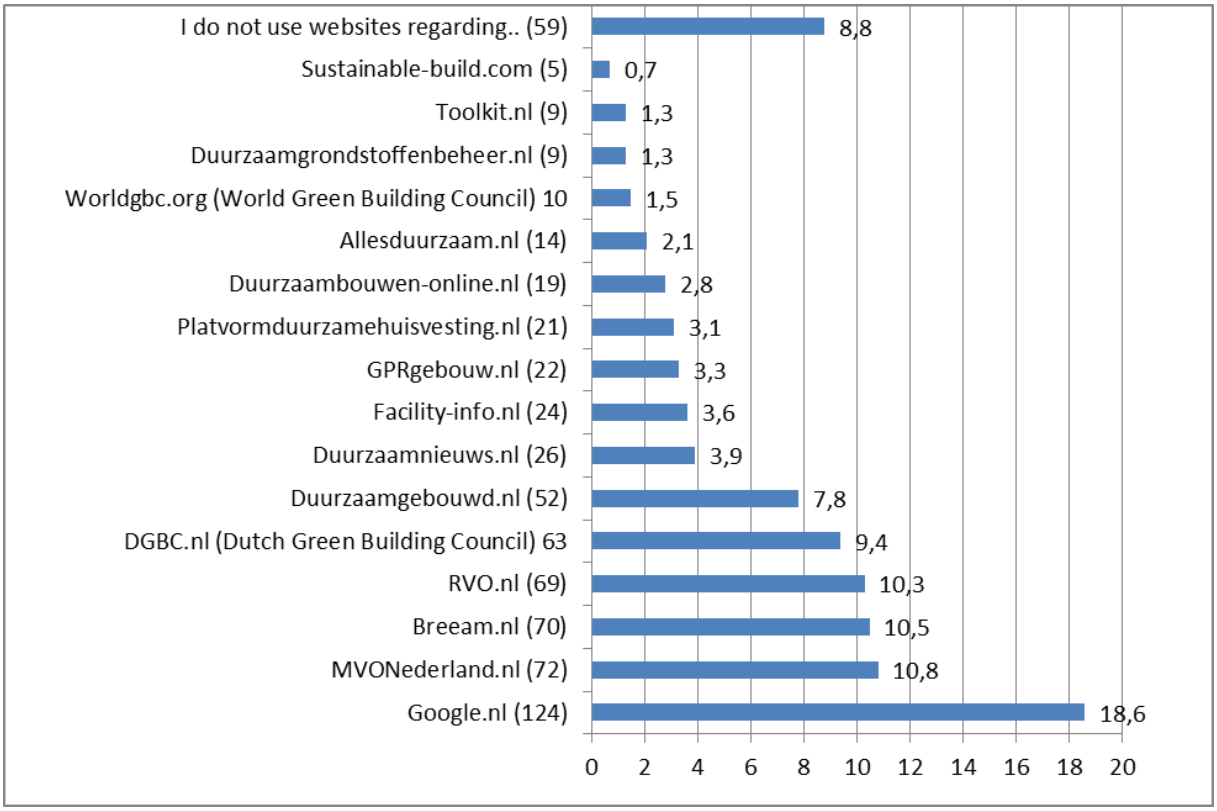


Figure 13. Websites used for information regarding sustainability practices (Source, author, 2014)

Constraints for improving the sustainability performance of buildings

One of the most important questions that this research has addressed is which constraints end users face when considering to improve the sustainability performance of their buildings. The results show that the most prominent constraint is an inadequate investment budget. The respondents were allowed to choose more than one answer, which resulted in 442 answers provided. An inadequate investment budget[3] was mentioned as a constraint 145 times (32,8%), which shows that this is by far the most important constraint that the respondents face when considering to improve the sustainability performance of their building.

67 times the lack of a clear action plan was provided, which represents 15,2% of the answers provided. Moreover, the constraint of not enough insight in the possibilities for improving the sustainability performance among decision makers is mentioned 51 times (11,5%). Other frequently mentioned constraints are insufficient time available (9%) not enough support from the board (7,9%) and an inadequate cost budget available (7,5%). The constraint of not enough support from the management and the problem of the 'split incentive' are both mentioned 27 times, which both represent 6,1% of the answers provided. Finally, 2,9% of the answers provided consists of experiencing no constraints at all in order to improve the sustainability performance of their buildings (3,9%). These results are depicted in figure 14.

[3] It is worth noting that there is a difference between an investment budget and a cost budget. The investment budget has a long term aspect and influences the organisation on the long term, while cost budgets are prepared for a shorter period and have less influence on organisations in the long term (Gelders, 2008).

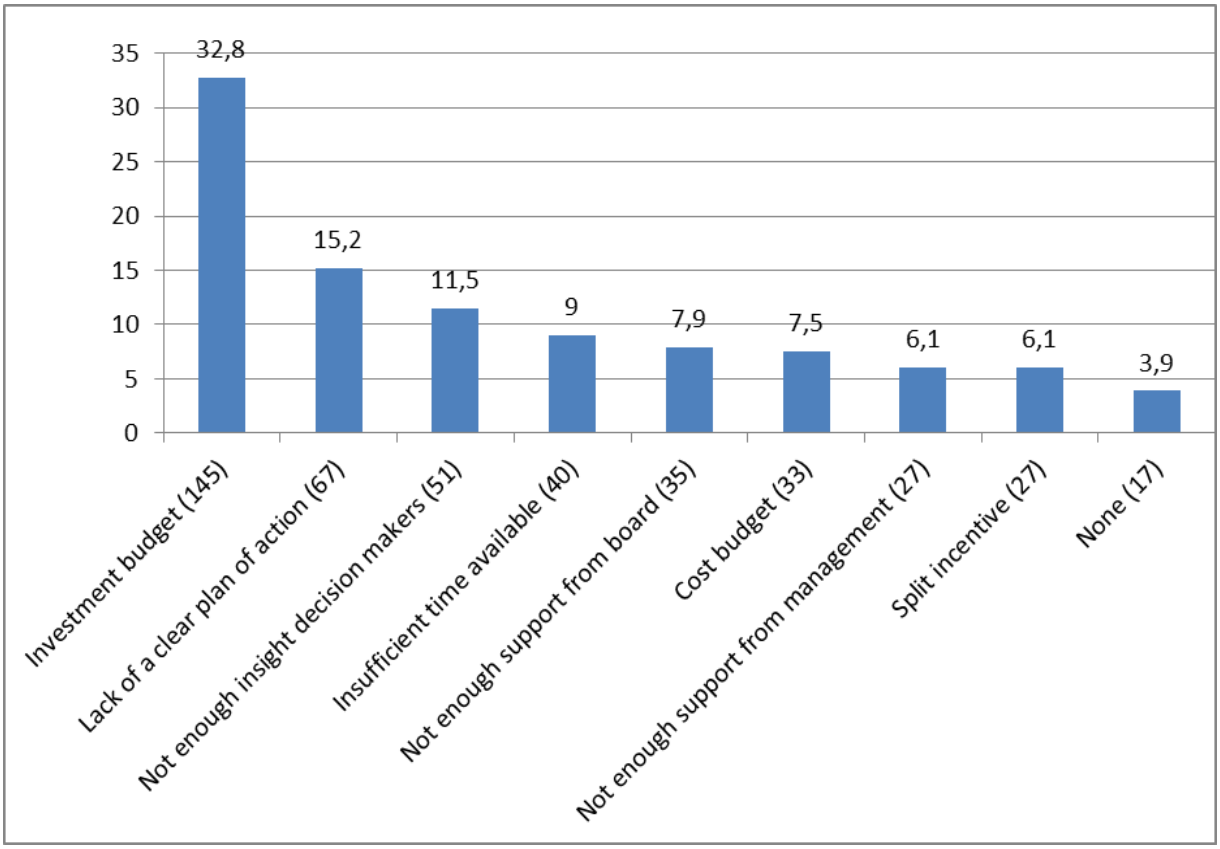


Figure 14. Constraints for improving the sustainability performance of buildings (Source: author, 2014)

4.2 Results per segment

In the previous paragraph the general results were presented. In this paragraph the segmentation deriving from the questionnaire is described. In addition, the segments with the largest potential to improve the sustainability performance of the built environment will be identified and these will be subjected to further research.

Based on the results deriving from the questionnaire, eight segments can be identified.
The three axes that are determined in order to form the segmentation are:

1. Axis 1: Willing to invest vs. not or barely willing to invest
2. Axis 2: Investment goal: cost savings vs. strategic value
3. Axis 3: Actively searching for information vs. not actively looking for information

The three axes form the following eight segments:

1. End users who are willing to invest with the goal of saving costs and who are actively searching for information.
2. End users who are willing to invest with the goal of saving costs and who are not actively searching for information.
3. End users who are not or barely willing to invest, who see improvement of the sustainability performance as a way to save costs and are actively searching for information.
4. End users who are not or barely willing to invest, who see improvement of the sustainability performance as a way to save costs and are not actively searching for information.
5. End users who are not or barely willing to invest, who see improvement of the sustainability performance as a strategic value and are actively searching for information.

6. End users who are not or barely willing to invest, who see improvement of the sustainability performance as a strategic value and are not actively searching for information.
7. End users who are willing to invest with the goal of achieving strategic added value and who are actively searching for information.
8. End users who are willing to invest with the goal of achieving strategic added value and who are not actively searching for information.

These segments are portrayed in the general pie-chart below (not yet divided based on the respondents of this research):

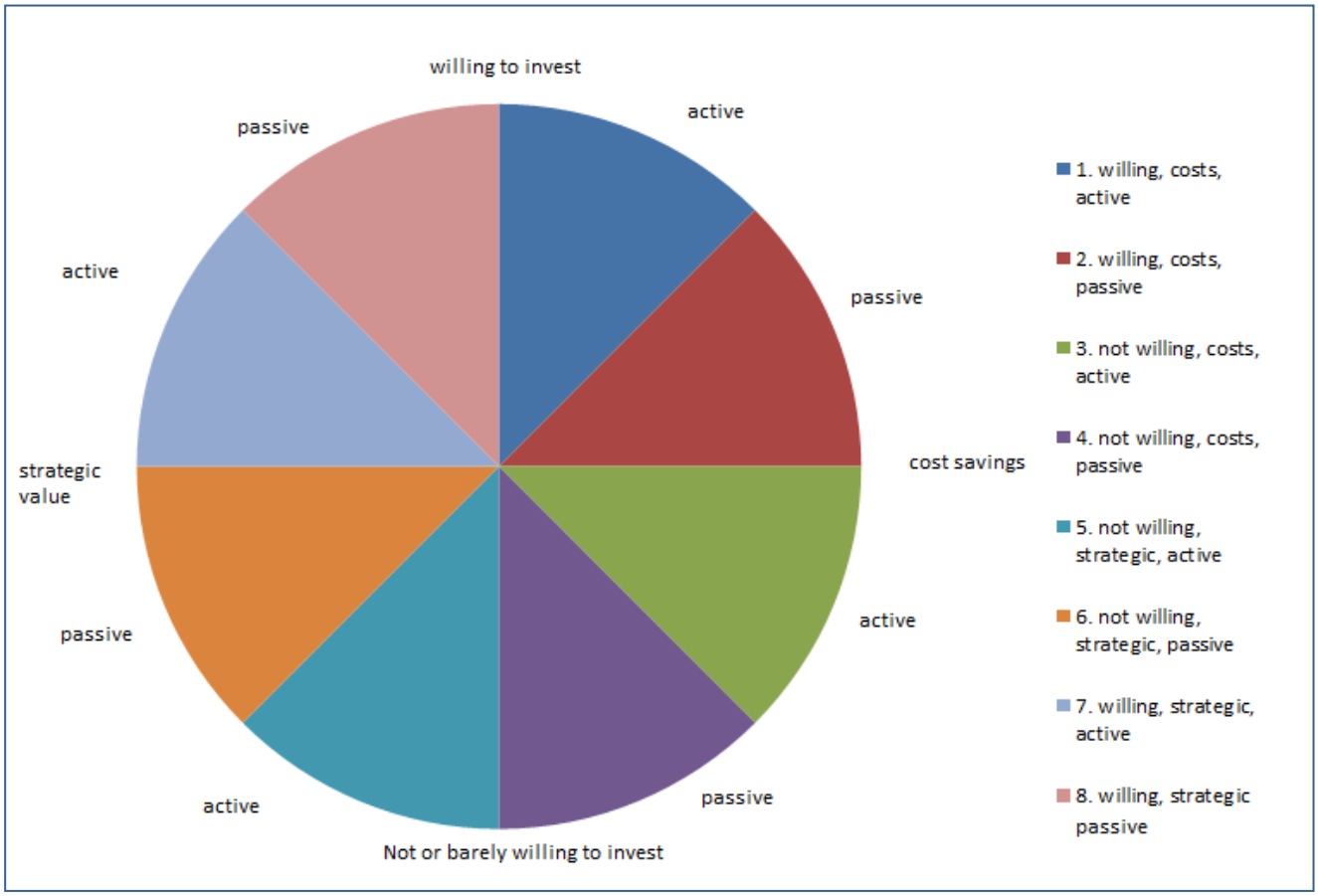


Figure 15. Segmentation model of end users (Source: author, 2014)

Resulting from the calculation, a total of 208 of the 331 respondents are represented in the eight segments. Of these respondents, the majority is represented in segment 1 (willings, costs, active), which is over 40%. Moreover, segment 7 (willing, strategic, active) represents almost 23% and segment 6 (not willing, strategic, passive) is not represented at all.
The other segments represent between 1% and almost 12% of the respondents. The division is presented in figure 16.

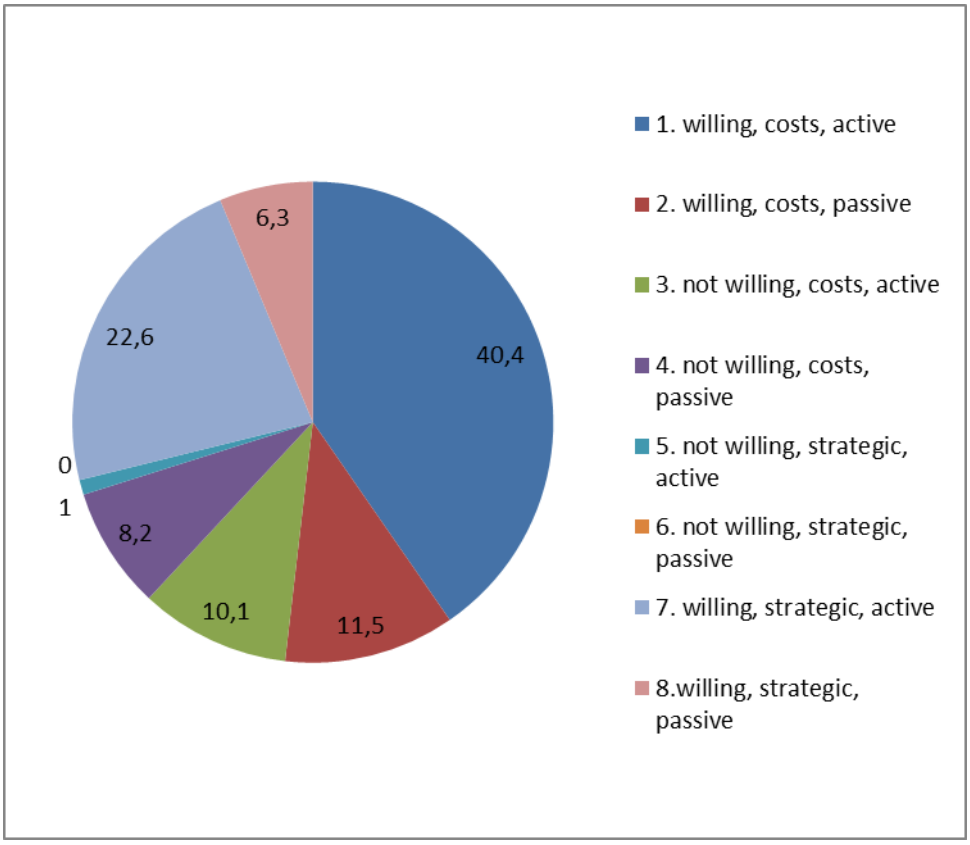


Figure 16. Results segmentation of end users (Source, author, 2014)

Division of respondents in segments

Now the respondents are divided into the different segments, the segments with the largest potential to improve the sustainability performance of the built environment can be identified. These segments are identified through three variables, being the willingness to invest, the ability to reach these segments (based on the extent of their activity in looking for information concerning sustainability practices) and the number of square meters that these segments represent. This will be discussed below.

Segment 1: This segment of end users is willing to invest with the goal of cost savings and is actively searching for information regarding sustainability practices. Moreover, this segment represents over 40% of the respondents, who together are responsible for 15.957.162 m^2 of buildings. This segment is most promising to reach considering the end users in this segment are willing to invest, they are actively searching for information, which means they can be reached through media and this segment has the largest potential of all segments due to the amount of square meters in buildings. Therefore, this segment will be further examined in paragraph 4.2.1.

Segment 2: This segment of end users is willing to invest with the goal of cost savings and is not actively searching for information regarding sustainability practices. This segment represents 11,5% of the respondents who are together responsible for 1.592.725 m^2. This segment can be promising to reach, however this segment is not actively searching for information. This means that the field is not able to reach these segments with marketing strategies through media, which makes approaching them rather expensive. However, considering the potential in this segment, it will be further investigated in paragraph 4.2.2.

Segment 3: This segment of end users is not or barely willing to invest. However, they are actively searching for information regarding sustainability practices. Moreover, this segment represents over 10% of the respondents, who together are responsible for 796.925 $m^2$of buildings. This segment is

considerably smaller than segment 1 and 2 when considering the amount of square meters, thus the potential in this segment is smaller. Moreover, considering that this segment is not willing to invest, it will therefore be excluded from further examination.

Segment 4: This segment of end users is not or barely willing to invest and is not actively searching for information regarding sustainability practices. This segment represents a little over 8% of the respondents, who together are responsible for 796.925 m^2 of buildings. Considering that this segment is not willing to invest and not reachable with marketing strategies through media, it will be excluded from further examination.

Segment 5: This segment is not or barely willing to invest, but does see the strategic value of improving the sustainability performance of their building. Moreover, it is actively searching for information regarding sustainability practices. This segment represents 1% of the respondents, who together are responsible for 7500 m^2. Clearly, this is a small segment with a very small potential. Therefore, it would not be appropriate to develop a specific marketing strategy in order to reach this segment. This segment will not be further investigated.

Segment 6: This segment is not or barely willing to invest, but does see the strategic value of improving the sustainability performance of their buildings. However, this segment is not actively searching for information. Furthermore, 0% of the respondents is represented in segment 6, which means that this segment is non-existing. Therefore, this segment is excluded for further examination.

Segment 7: This segment is willing to invest and sees the strategic value of improving the sustainability performance of their buildings. This segment is actively searching for information regarding sustainability practices. In addition, this segment represents almost 23% of the respondents, who together are responsible for 5.364.475 m^2 of buildings. Considering that this segment is willing, actively looking for information, and has a big potential, it is an interesting segment to reach. Therefore, this segment will be further investigated in paragraph 4.2.3.

Segment 8: This segment is willing to invest and sees the strategic value of improving the sustainability performance of their buildings. However, this segment is not actively searching for information. Furthermore, this sector represents 6% of the respondents, who together are responsible for 1.244.603 m^2 of buildings. This segment is interesting to reach, considering the potential in square meters and the willingness to invest. However, they cannot be targeted with specific strategies through media, which makes reaching this segment more expensive.
Even though, considering the potential to improve the sustainability performance of the built environment, it will be further investigated in paragraph 4.2.4.

Segments with the largest potential
Resulting from the division of the respondents into different segments, the segments with the largest potential can be identified. The segments that will be subjected to further examination are segment 1 (willing, costs, active), segment 2 (willing, costs, passive), segment 7 (willing, strategic, active) and segment 7 (willing, strategic, passive). In the different segments a number of results will be presented being, which kind of respondents are in the different segments, the sectors in which the respondents operate, which sustainability themes gain most attention, whether they are in the possession of a sustainability certificate, which kind of media they use, the size of the organisations considering the number of employees, the amount of square meters and the constraints these segments face. These results will be presented in the following paragraphs.

4.2.1. Segment 1 (willing, costs, active)

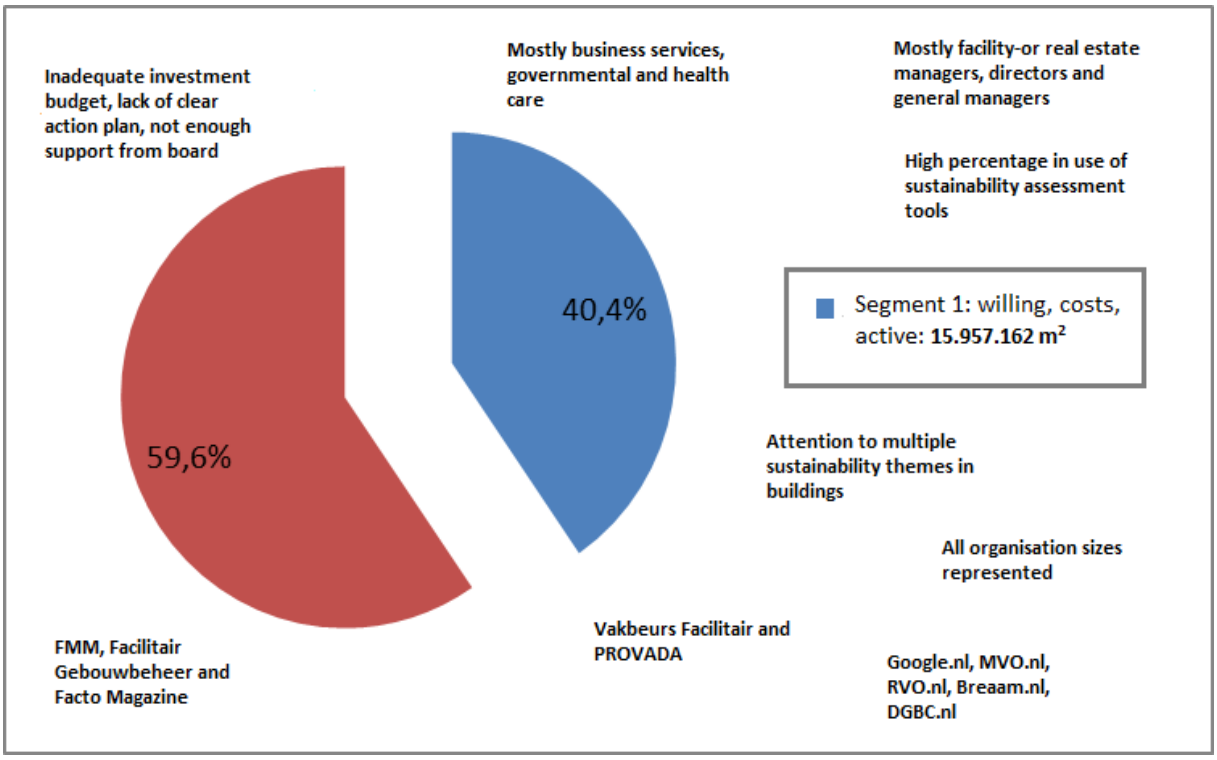


Figure 17. Segment 1: willing, costs, active (Source, author, 2014)

The respondents

The respondents in segment 1 (willing, costs, active) mostly comprise of facility- or real estate managers, being 46,2%. Furthermore, 18% of the respondents are general managers and 15,4% are directors. Sustainability managers and the project managers both comprise 3,8%, and 11,5% in this segment are advisors. In addition, 1,3% of the respondents are purchasing managers. Therefore, in order to target this market, the most important players to reach are facility- or real estate managers, directors and general managers.

The sectors in which these respondents operate are mostly the business services sector (35%), the governmental sector (27,5%) and the health care sector (13,8%). Other sectors which are represented in segment 1 are the educational sector (7,5%) and the industrial sector (12,5%). The sectors which comprise a very small part in this segment are the retail sector (1,3%) and the construction sector (2,5%). These results are depicted in figure 18.

The size of the organisations is fairly evenly distributed in this segment. 18,3% of the organisations consists of less than 250 employees. Moreover, 26,8% of the organisations in this segments comprise between 251 and 1000 employees, 18,3% of the organisations comprise between 1001 and 2500 employees and 14,6% comprises between 2501 and 500 employees. Finally, 22% of the organisations comprise of over 5000 employees.

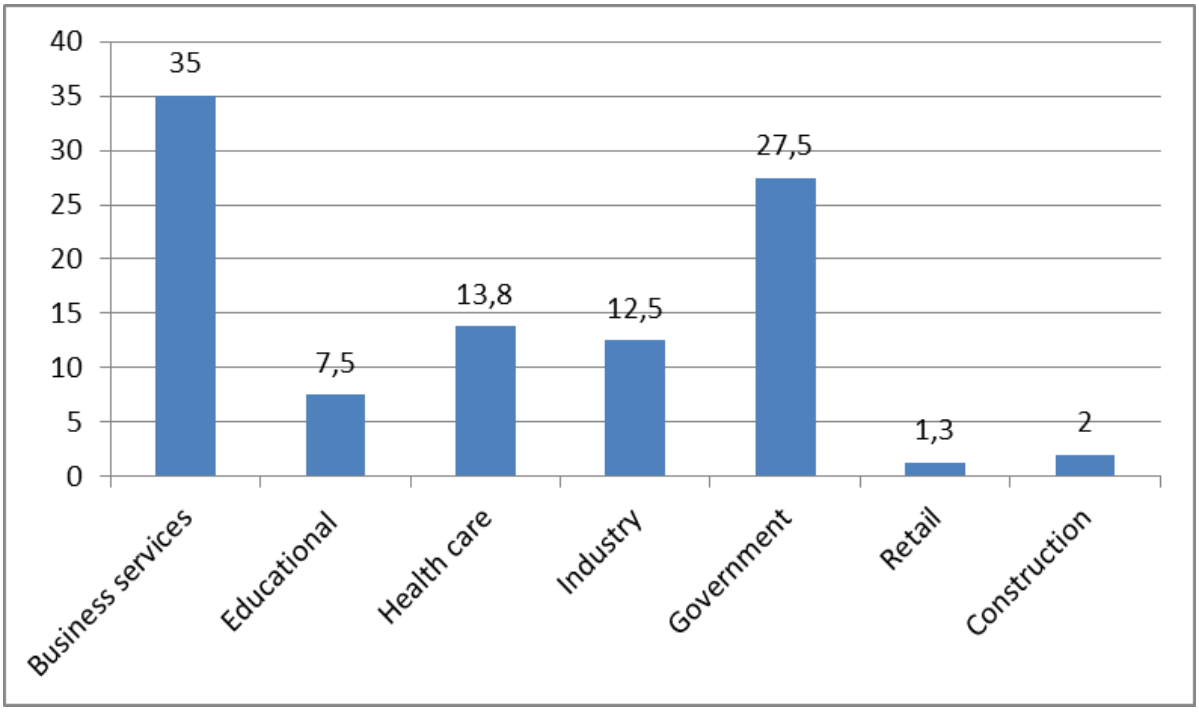


Figure 18. Sectors represented in segment 1 (Source, author, 2014)

Attention to sustainability themes

The results show that the sustainability themes which gain more than average attention among the organisations in this segment are energy (83,3%), health (72,6%), waste (69,1%), management (61,4%), pollution (50,6%), materials (49,4%) and transport (45,8%). Energy gains the most attention while water and land use and ecology are gaining less attention in this segment, considering that only 25% pays above average attention to water and 20,3% pays above average attention to land use and ecology. These results show that organisations in this sector already pay a lot of attention to improving the sustainability performance of their buildings. The biggest opportunities to further improve the sustainability performance of the buildings in this sector are present within sustainability practices regarding water and land use and ecology. Moreover, this segment can be targeted with innovative solutions regarding the sustainability themes which already gain above average attention among these organisations. This is depicted in figure 19.

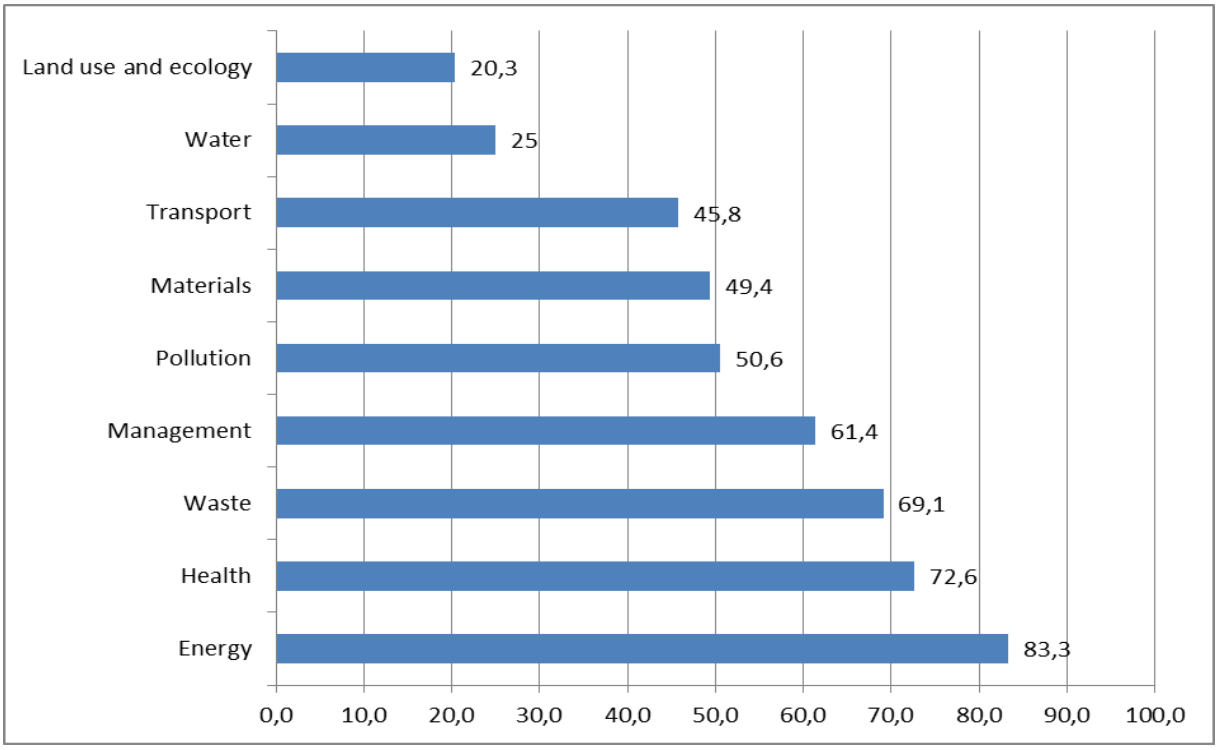


Figure 19. Sustainability themes that gain more than average attention in segment 1 (Source, author, 2014)

The organisations in this segment have mostly invested in 2013 in energy, health, management, transport, materials, waste and pollution, which is consistent with the previous results. The themes in which organisations invested less or not at all, are water and land use and ecology.
The results show a high frequency in the answer possibility 'I do not know', which shows that a fairly high frequency of the respondents are not familiar with most of the investment practices regarding improvement of the sustainability performance. This could mean that the respondents who answered this question are not involved in the decision making process.

Invested in 2013	Yes	No	I do not know
Energy	88,1%	9,5%	2,4%
Health	71,4%	15,5%	13,1%
Management	53,6%	33,3%	13,1%
Transport	55,4%	33,7%	10,8%
Water	32,5%	55,4%	12,0%
Materials	57,1%	34,5%	8,3%
Waste	69,0%	25,0%	6,0%
Land use and ecology	16,9%	60,2%	22,9%
Pollution	44,6%	42,2%	13,3%

Table 3. Investments in sustainability themes in 2013 in segment 1 (Source, author, 2014)

Use of sustainability assessment tools
In segment 1, 66,6% of the respondents is in the possession of a sustainability certificate regarding their buildings. The most popular sustainability assessment tools that are used are the Energy Label (33%) and BREAAM-NL (20,8%), Other used sustainability assessment tools are GreenCalc (5,7%), LEED (4,7%) and GPR Gebouw (2,8%). Furthermore, 33% of the respondents is not in the possession of a sustainability certificate. These results are depicted in figure 20.

Again, also here it has to be noticed that the Energy Label is obligated when a building is transferred to a new owner or tenant (RVO, 2008b). This also applies to the other segments which use this sustainability assessment tool.

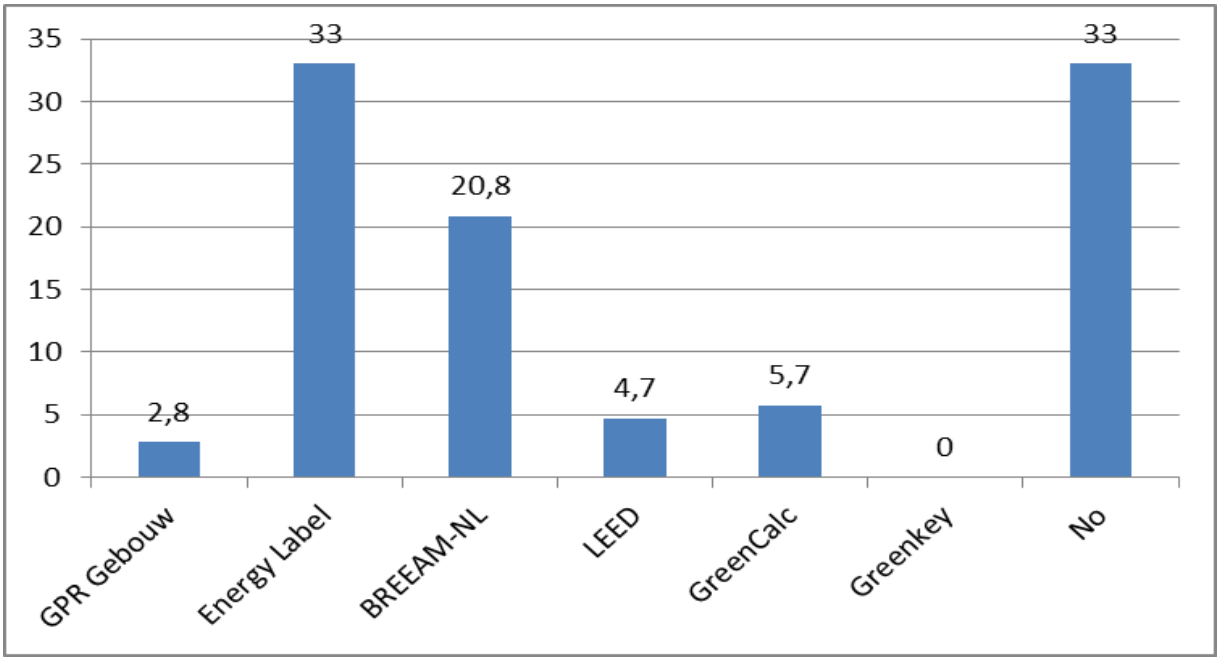


Figure 20. Use of sustainability assessment tools in segment 1 (Source, author, 2014)

Searching for information regarding sustainability practices
In order to discover which kind of media the respondents in this segment use, the use of three media types will be presented, being which fairs and conferences this respondents visit, which papers and magazines they use and which websites they use. The respondents were allowed to choose more than one answer in every category, which provided a total of 637 answers.

Regarding the fairs and conferences that the respondents in this segment visit, a total of 183 answers were provided, which results in the division as presented in figure 21.
The results show that the respondents in this segment mostly visit are Vakbeurs Facilitair, which was stated by 35 respondents (19,1%) and PROVADA, which was stated by 31 of the respondents (16,9%). Other popular fairs/conferences in this segment are the Dutch Green Building Week, which resulted in 12,6% of the answers provided and Energievakbeurs, which resulted in 12% of the answers. Some other mentioned fairs/conferences are Nationaal Sustainability Congres (6%), Green Buildings Congres (7,7%) and Ecobouw (4,4%). Furthermore, 6% of the answers provided shows that they do not visit fairs/conferences regarding sustainability practices.

Regarding the papers/magazines that the respondents in this segments use, a total of 199 answers was provided, which results in the division as presented in figure 22.
The results show that the respondents in segment 1 mostly read Facility Management Magazine, which results in 22,6% of the answers provided. Other popular magazines among these respondents are Facilitair en Gebouwbeheer (18,1%), Facto Magazine (13,1%) and FMI (11,6%). Other

papers/magazines which are read by the respondents are Technisch Weekblad (7,5%), Technisch Gebouwbeheer (7%) and Real Estate Magazine (7%). Finally, 2,5% of the respondents do not read papers/magazines regarding sustainability practices.

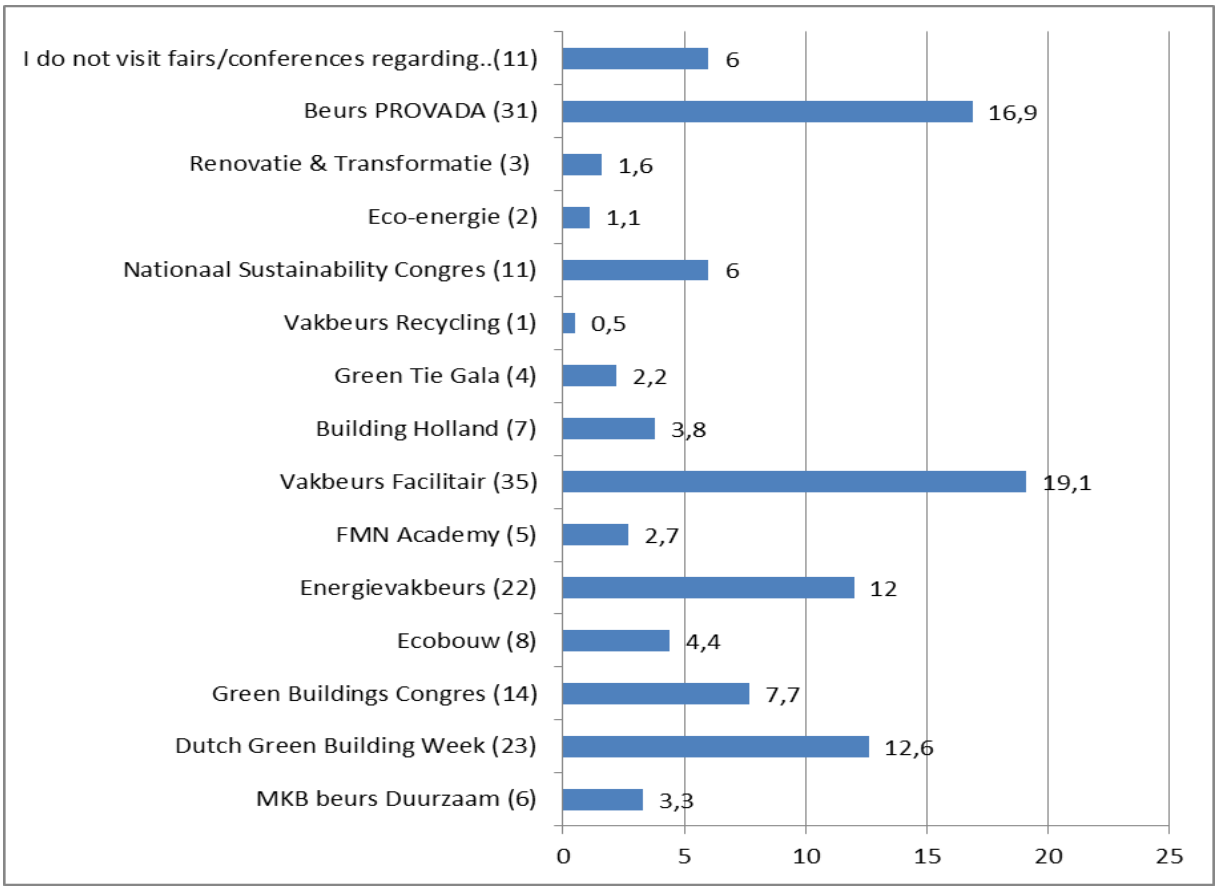


Figure 21. Fairs and conferences visits regarding sustainability practices in segment 1 (Source, author, 2014)

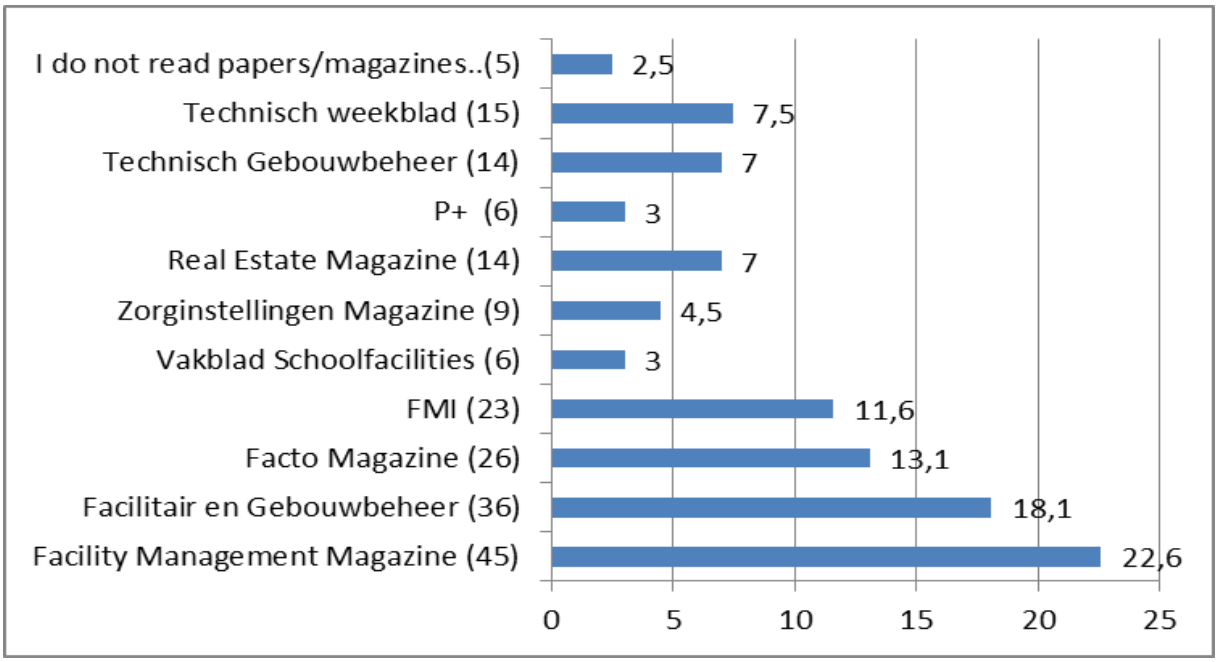


Figure 22. Papers and magazines used for information regarding sustainability practices in segment 1 (Source, author, 2014)

Regarding the websites that the respondents in this segment use, a total of 255 answers were provided, these results are depicted in figure 23.
The results show that the most frequently used website is 'google.nl', which was stated 51 times by the respondents in this segment (20%). The high frequency regarding the use of this website shows that respondents like to use search terms in order to be redirected to websites with the appropriate information regarding sustainability practices. Other frequently mentioned websites are 'MVONederland.nl' (12,2%%), RVO.nl' (10,6%), 'Breeam.nl' (10,2%) and 'DGBC.nl' (10,2%), which were mentioned 31, 27, 26 and again 26 times by the respondents. Furthermore, 3% of the answers provided show that the respondents in this segment do not use websites regarding sustainability practices.

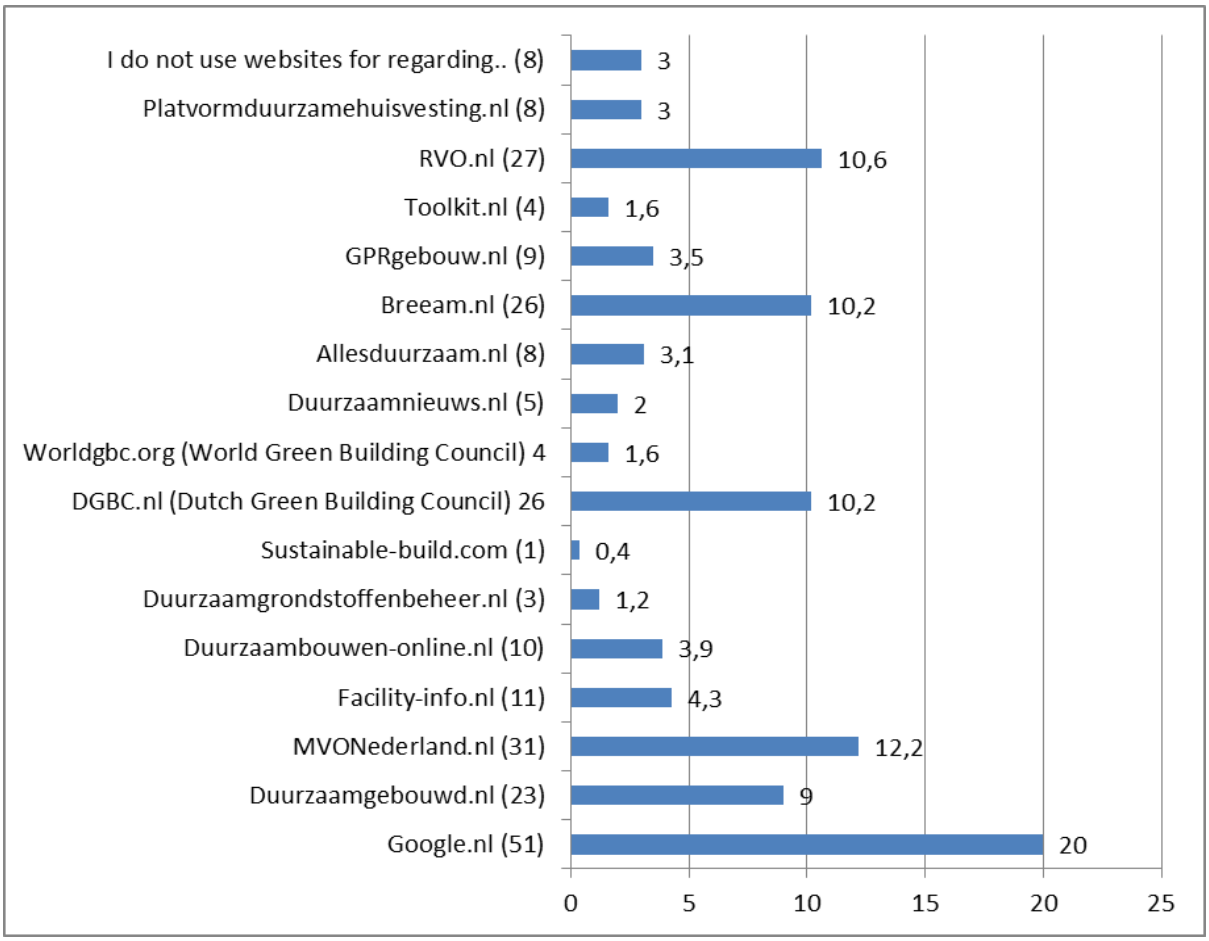


Figure 23. Websites used for information regarding sustainability practices in segment 1 (Source, author, 2014)

Constraints for improving the sustainability performance of buildings
The biggest constraints that organisations in this segment face when considering (further) improvement of their buildings is an inadequate investment budget. The respondents were allowed to choose more than one constraint, which resulted in 143 answers provided. The constraint of an inadequate investment budget was mentioned 51 times, which represents 35,7% of the constraints mentioned. The second most mentioned constraint in this segment is the lack of a clear action plan (11,2%), which was mentioned by 16 of the respondents. Other constraints are not enough support from the board (10,5%), not enough insight in the possibilities for improving the sustainability performance among decision makers (9,8%), inadequate cost budget available (9,1%) and insufficient time available (7,7%). The constraints of not enough support from management and the problem of the split incentive are both mentioned 9 times, which represents 6,3%. Finally, 6 respondents state that they do not experience any constraint when considering improvement of the sustainability performance of their building (6,3%). This can partly be explained by the fact that within this

segment organisations are represented who already have a building with a desirable sustainability performance. The constraints in segment 1 are depicted in figure 24.

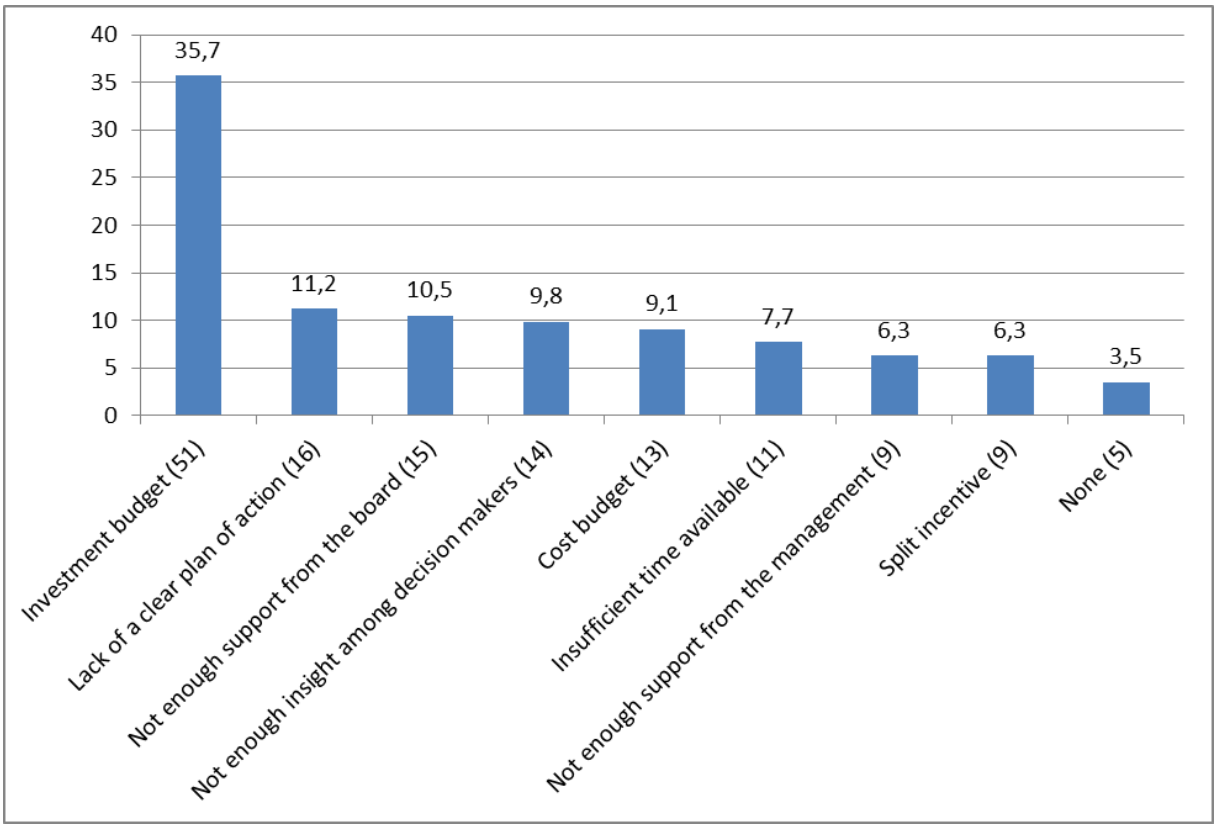


Figure 24. Constraints for improving the sustainability performance of buildings in segment 1 (Source, author, 2014)

4.2.2 Segment 2 (willing, costs, passive)

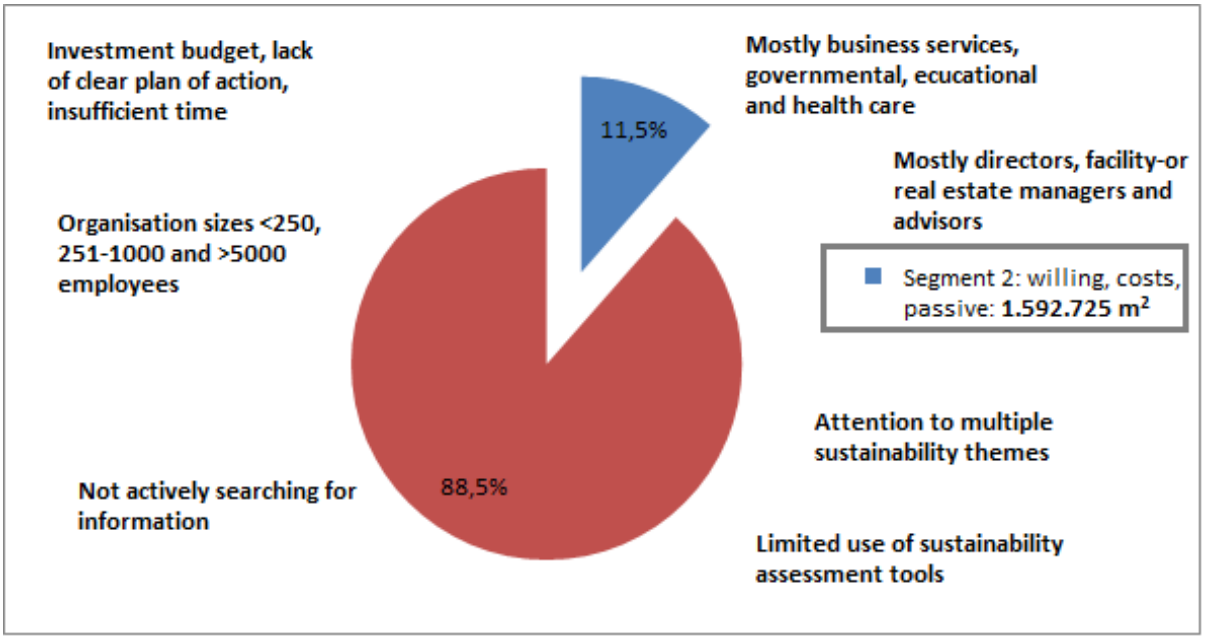


Figure 25: Segment 2: willing, costs passive (Source, author, 2014)

The respondents

The respondents in segment 2 (willing, costs, passive) mostly comprise of directors, being 45% of the respondents. Moreover, 25% of the respondents are facility-or real estate managers and 10% are advisors. Other occupations of the respondents are purchasing managers, financial managers, general managers and project managers, which all represent 5% of the respondents. Therefore, in order to target this market, the most important players to reach are directors, facility-or real estate managers and advisors.

The sectors in which the organisations operate in segment 1 consist of the business services sector (23,8%), the governmental sector (23,8), the educational sector (19%) and the health care sector (19%). The sectors which are less represented are the industrial sector (9,5%) and the retail sector (4,8%). These figures are depicted in figure 26.

The size of the organisations in segment 2 mostly consists of less than 250 employees (33,3%). Furthermore, 28,3% of the organisations in this segment consists of between 251 and 1000 employees and 19% consists of over 5000 employees. In addition, organisations with sizes between 1001 and 2500 and organisations with sizes between 2501 and 5000 employees both represent 9,5%.

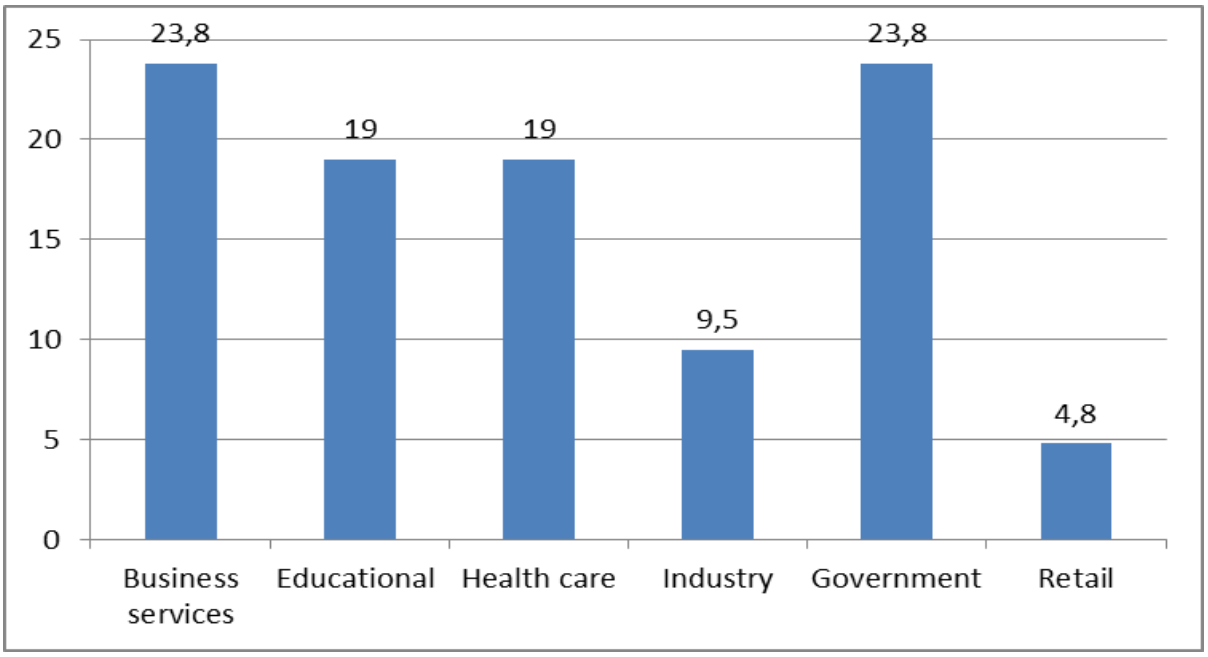


Figure 26. Sectors represented in segment 2 (Source, author, 2014)

Attention to sustainability themes

The sustainability themes that gain more than average attention among the organisations in segment 2 are health (79,2%), energy (66,7%), waste (58,3%), management (54,2%), materials (54,2%) and pollution (45,9%). Health gains most attention in this segment, while water (37,5%), transport (20,9%) and land use and ecology (12,5%) gain the least above average attention. These results show that organisations in this sector already pay a lot of attention to improving the sustainability performance of their buildings. The biggest opportunities to further improve the sustainability performance of the buildings in this segment are present within sustainability practices regarding water, transport and land use and ecology. This segment can be targeted with innovative solutions regarding the sustainability themes which already gain above average attention among these organisations. This is depicted in figure 27.

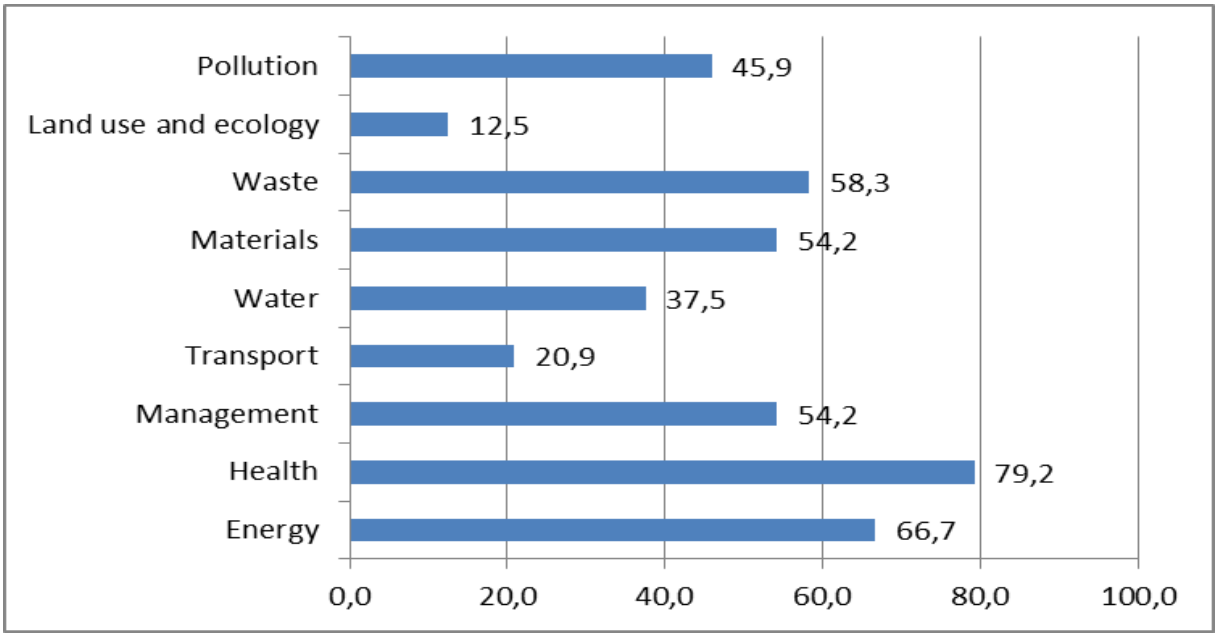


Figure 27. Sustainability themes that gain more than average attention in segment 2 (Source, author, 2014)

Organisations in this segment have mostly invested in 2013 in energy, waste, health and transport, with the most popular themes being energy (70,8%) and waste (62,5). Noteworthy here is that regarding the improvement of health, 45,8% of the organisations have invested in 2013, while previous results show that 79,2% pay more than average attention to this sustainability theme. Furthermore, 41,7% of the respondents state that they have invested in transport in 2013, while the results show that 20,9% stated that they pay above average attention to this subject. These results are depicted in table 4.

The results show a high frequency in the answer possibility 'I do not know' in the categories health (25%), materials (20,8%), land use and ecology (25%) pollution (25%) and materials (20,8%). This suggests that about one in four respondents are not familiar with investments in this area.

Invested in 2013	Yes	No	I do not know
Energy	70,8%	25%	4,2%
Health	45,8%	29,2%	25%
Management	37,5%	45,8%	16,7%
Transport	41,7%	45,8%	12,5%
Water	50%	37,5%	12,5%
Materials	45,8%	33,3%	20,8%
Waste	62,5%	29,2%	8,3%
Land use and ecology	20,8%	54,2%	25%
Pollution	41,7%	33,3%	25%

Table 4. Investments in sustainability themes in 2013 in segment 2 (Source, author, 2014)

Use of sustainability assessment tools

In segment 2, 53,6% of the organisations is not in the possession of a sustainability certificate regarding their buildings. The most popular tool in this segment is the Energy label, which is used by 21,4% of the respondents in this segment. Other sustainability assessment tools that are used among the organisations in this segment are BREEAM-NL (10,7%) and GreenCalc (7,1%). In addition, GPR Gebouw and LEED are used. However, these tools are only used by a small amount of the organisations, both being 3,6%. These results show that the attention for sustainability assessment tools in this segment is smaller as opposed to segment 1. These results are presented in figure 28.

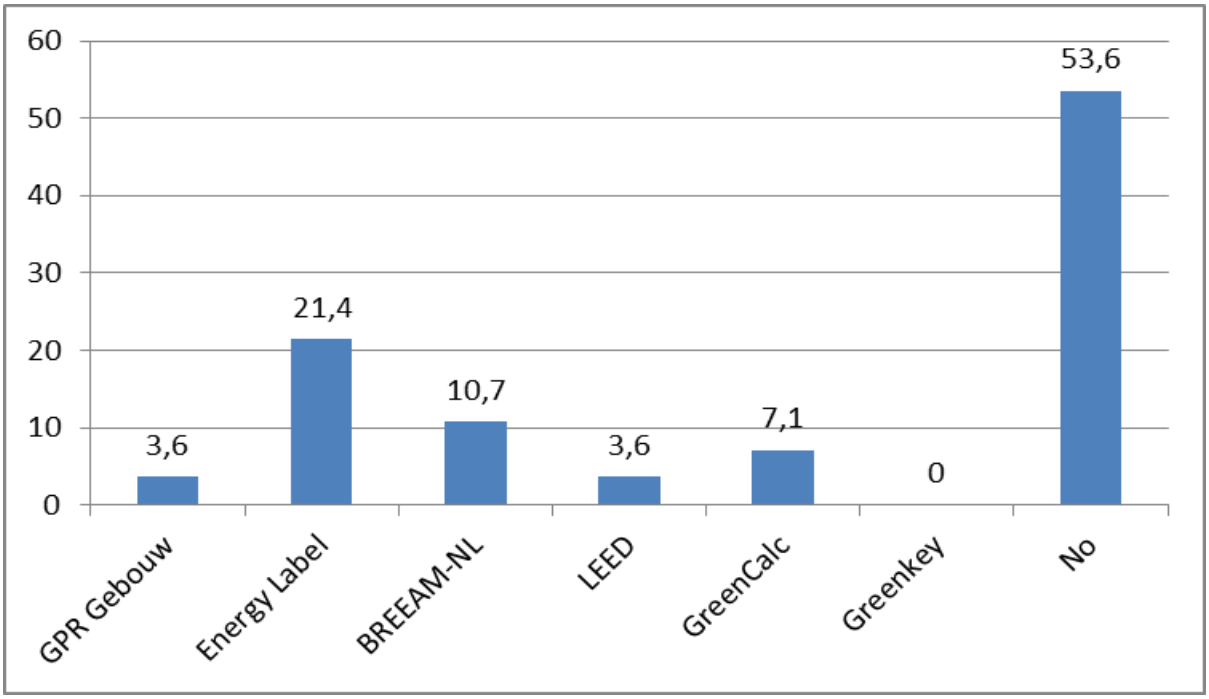


Figure 28. Use of sustainability assessment tools in segment 2 (Source, author, 2014)

Searching for information regarding sustainability practices

In this segment organisations are not actively looking for information regarding sustainability practices through media sources. 87,5% of the respondents do not visit fairs/ conferences regarding sustainability practices. 79,2% of the respondents do not read papers/ magazines regarding this subject and 62,5% do not use websites regarding information about sustainability practices. Consequently, in order to target this segment with marketing strategies, other channels have to be used.

Constraints for improving the sustainability performance of buildings

The biggest constraints that organisations in this segment face when considering (further) improvement of their buildings is an inadequate investment budget. The respondents were allowed to choose more than one constraint, which resulted in a total of 36 answers provided. The constraint of an inadequate investment budget was mentioned 13 times, which represents 36,1% of the answers provided. The second most mentioned constraint is a lack of a clear plan of action, which represents 16,7% of the answers provided. In addition, insufficient time available (13,9%) and not enough insight in the possibilities for improving the sustainability performance among decision makers (11,1%) are mentioned as a constraint, which is stated 5 and 4 times by the respondents.

Other occasionally mentioned constraints are an inadequate cost budget available (5,6%), not enough support from the board (5,6%), not enough support from the management (5,6%) and the

problem of the split incentive (2,8%) Finally, 1 respondent states that he or she did not experience any constraints. These results are presented in figure 29.

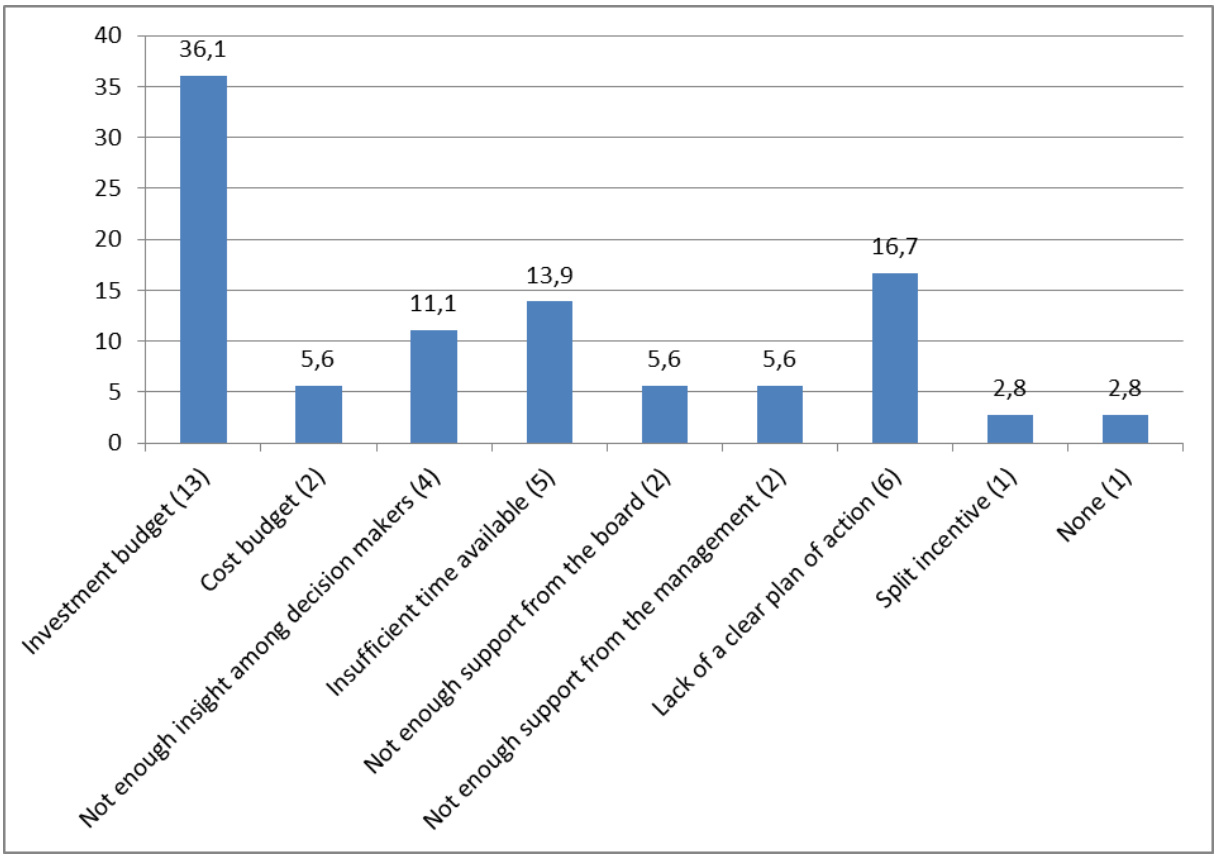


Figure 29. Constraints for improving the sustainability performance of buildings in segment 2 (Source, author, 2014)

4.2.3 Segment 7 (willing, strategic, active)

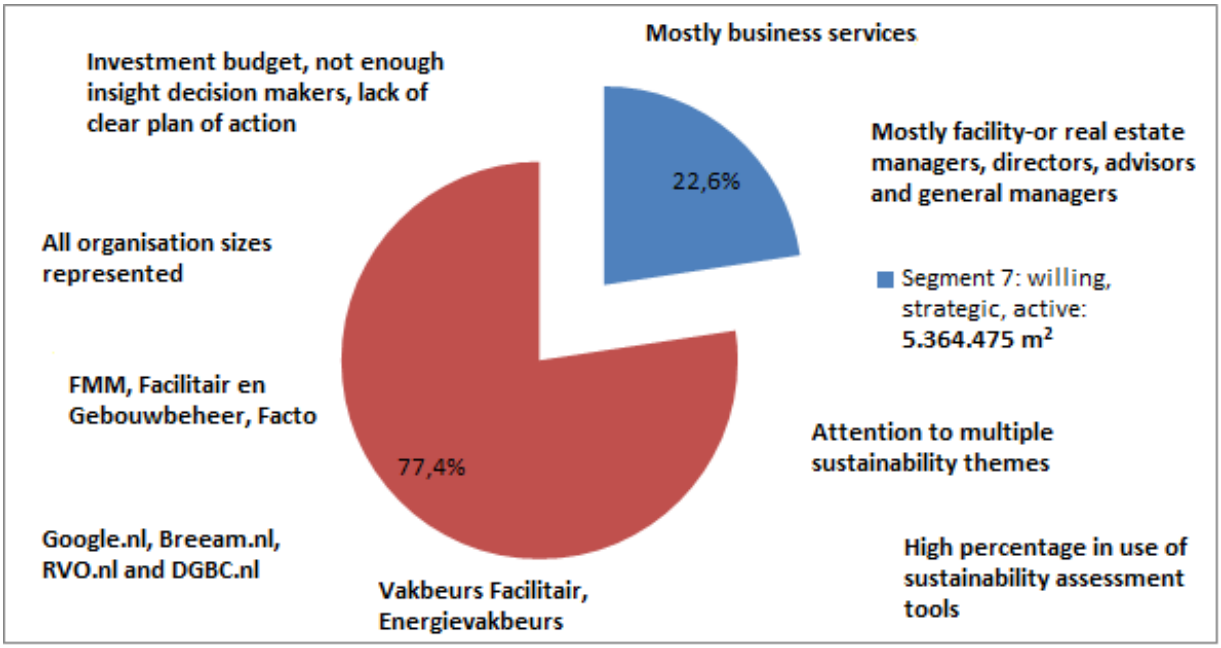


Figure 30. Segment 7: willing, strategic, active (Source, author, 2014)

The respondents

The respondents in segment 7 (willing, strategic, active) mostly comprise of facility-or real estate managers, being 45,2%. Furthermore, 21,4% are directors, 14,3% are advisors and 11,9% are general managers. Other occupations of the respondents are project managers (4,8%) and sustainability managers (2,4%). Therefore, in order to target this market, the most important players to reach in this segment are facility-or real estate managers, directors, advisors and general managers.

The majority of the respondents represented in segment 7 operate in the business services sector (62,8%). Furthermore, 16,3% operates in the governmental sector and 11,6% in the educational sector (11,9%). Other sectors that are represented in this segment are the industrial sector (7%) and the health care sector (2,3%). These figures are depicted in figure 31.

The size of the organisations in segment 7 mostly consists of less than 250 employees (32,6%) and 251 till 1000 employees (19,6%). In addition, 17,4% of the organisations consists of sizes between 2501 till 5000 employees and 17,4% of the organisations consist of sizes of over 5000 employees. Finally, 13% of the organisations in this sector consist of sizes between 1001 and 2500 employees.

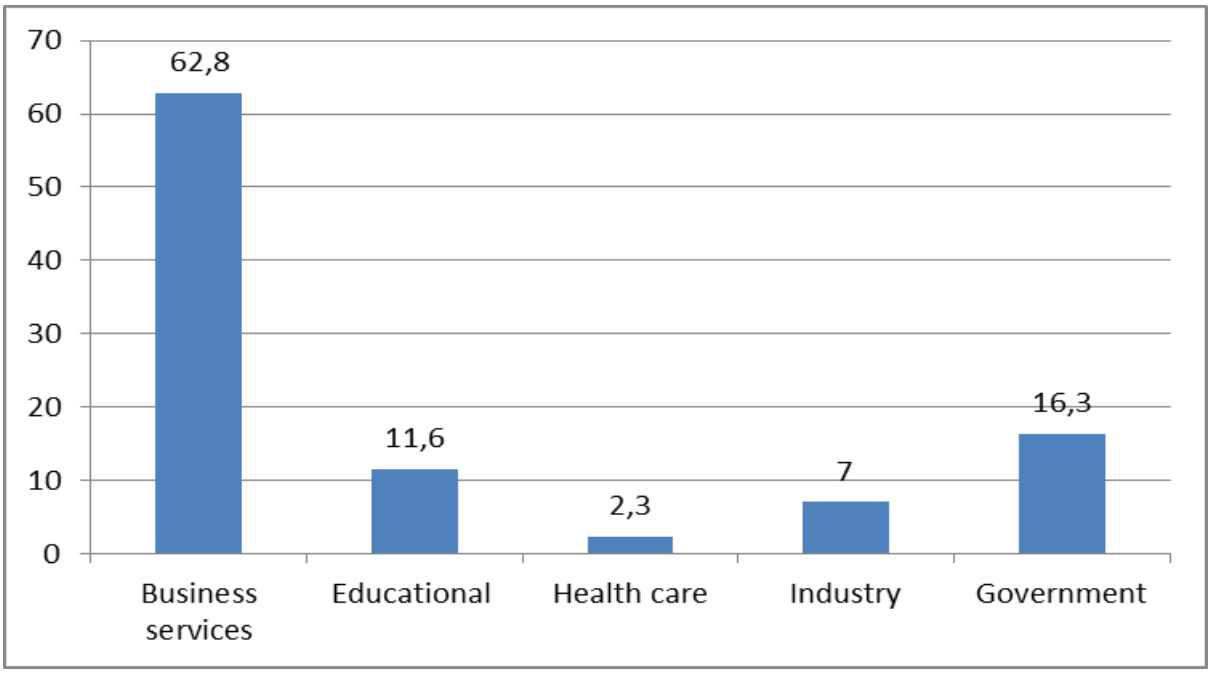


Figure 31. Sectors represented in segment 7 (Source, author, 2014)

Attention to sustainability themes

The sustainability themes that gain more than average attention among the organisations in segment 7 are energy (83%), health (76,6%), waste (72,3%), management (60,8%), materials (57,4%) and transport (55,3%). Energy gains most attention within this segment, while water (36,2%) and land use and ecology (26,1%) gain the least attention.

These results show that also in this sector, organisations already pay a lot of attention to improving the sustainability performance of their buildings. The biggest opportunities to further improve the sustainability performance of the buildings in these sector are present within sustainability practices regarding water, and land use and ecology. Moreover, this segment can be targeted with innovative solutions regarding the sustainability themes which already gain above average attention among these organisations. These results are depicted in figure 32.

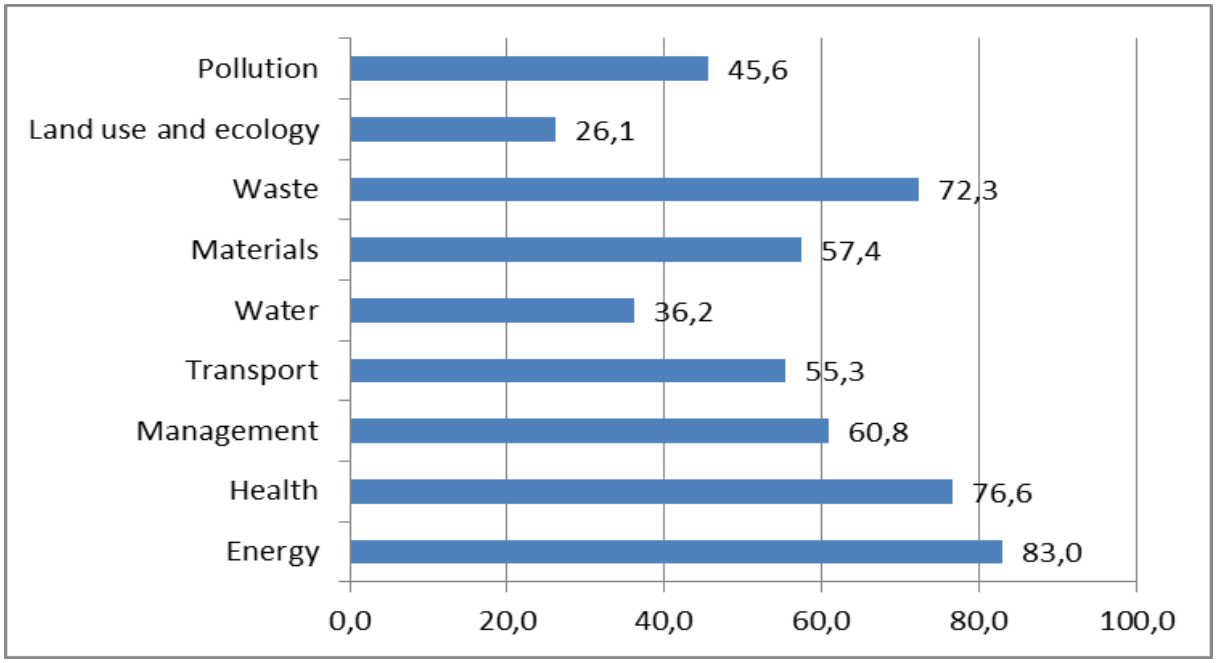


Figure 32. Sustainability themes that gain more than average attention in segment 7 (Source, author, 2014)

In addition to the previous results, organisations have mostly invested in 2013 in energy, health, management, materials, waste and transport, which is consistent with the previous results. The sustainability themes in which organisations less invested in or not all are water and land use and ecology. These results are presented in table 5.

The results show a high frequency in the answer possibility 'I do not know' regarding the sustainability themes land use and ecology and pollution. This shows that the respondents are not that familiar with this subject.

Invested in 2013	Yes	No	I do not know
Energy	87,2%	12,8%	0%
Health	76,7%	23,4%	0%
Management	62,2%	31,1%	6,7%
Transport	55,3%	40,4%	4,3%
Water	38,3%	57,4%	4,3%
Materials	59,6%	34%	6,4%
Waste	70,2%	27,7%	2,1%
Land use and ecology	26,1%	56,5%	17,4%
Pollution	37%	50%	13%

Table 5. Investments in sustainability themes in 2013 in segment 7 (Source, author, 2014)

Use of sustainability assessment tools

In segment 7, 70% of the organisations are in the possession of a sustainability certificate regarding their buildings. The most popular sustainability assessment tools in this segment are Energy Label (26,7%) and BREEAM-NL (25%). Other used sustainability assessment tools are GreenCalc (6,7%), GPR Gebouw (5%), LEED (5%), and Greenkey (1,7%). In addition, 30% of the organisations is not in the possession of a sustainability certificate. This is depicted in figure 33.

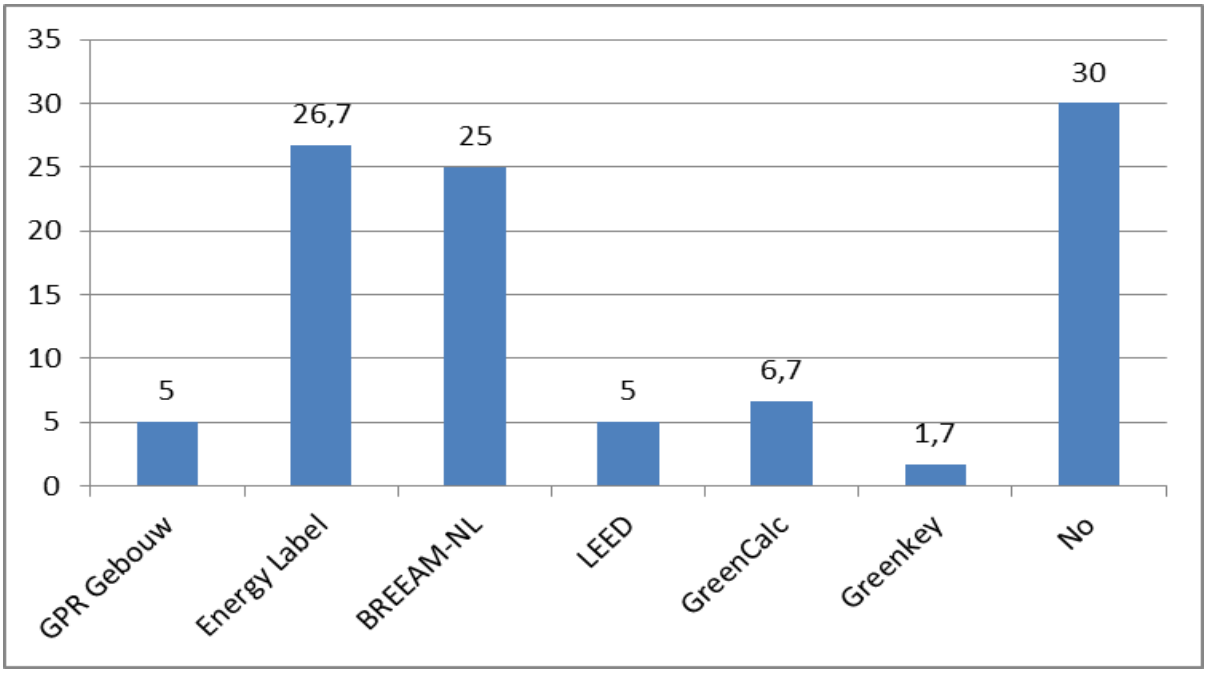


Figure 33. Use of sustainability assessment tools in segment 7 (Source, author, 2014)

Searching for information regarding sustainability practices

In order to discover which kind of media the respondents in this segment use, the use of three media types will be presented: which fairs and conferences these respondents visit, which magazines they use and which websites they use. The respondents were allowed to choose more than one answer in every category, which provided a total of 438 answers.

Regarding visits to fairs and conferences, a total of 126 answers were provided, which resulted in the division as presented in figure 34.

The results show that the respondents in this segment mostly visit Vakbeurs Facilitair, which was stated by 26 respondents (20,6%) and Energievakbeurs, which was stated by 18 of the respondents (14,3%). Other popular fairs/conferences in this segment are PROVADA (13,5%) the Dutch Green Building Week (11,9%) and Green Building Congres (11,1%). Some other mentioned fairs/conferences are Building Holland (7,1%), Ecobouw (5,6%) and Nationaal Sustainability Congres (4%). Furthermore, 4,8% of the answers show that some respondents do not visit fairs/conferences regarding sustainability practices.

Regarding the papers/magazines that the respondents in this segments use, a total of 124 answers were provided, which resulted in the division as presented in figure 35.

The results show that the respondents in segment 7 mostly read Facility Management Magazine, which results in 22,6% of the answers provided. Other popular magazines among these respondents are Facilitair en Gebouwbeheer, which represents 21% of the answers provided and Facto Magazine, which represents 16,1% of the answers provided. Other papers/magazines which are read by the respondents are FMI (13,7%), Real Estate Magazine (6,5%) and Technisch Gebouwbeheer (6,5%). Finally, 3,2% of the respondents do not papers/magazines regarding sustainability practices.

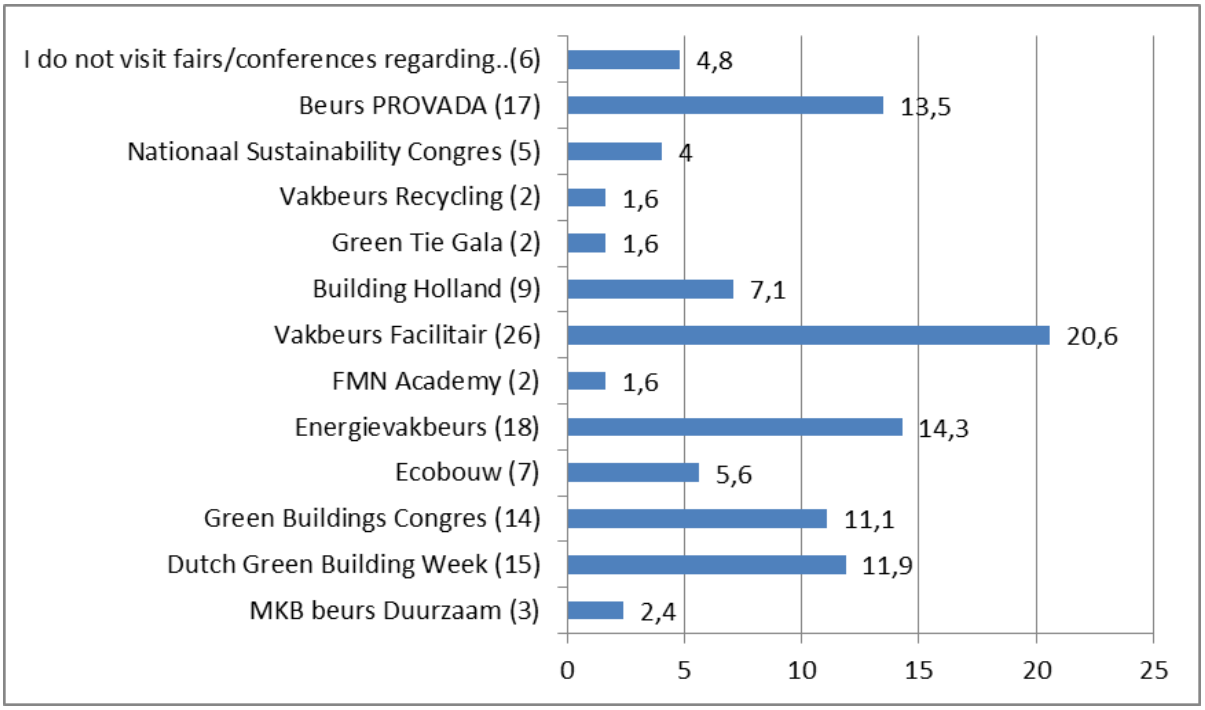


Figure 34. Fairs and conferences visits regarding sustainability practices in segment 7 (Source, author, 2014)

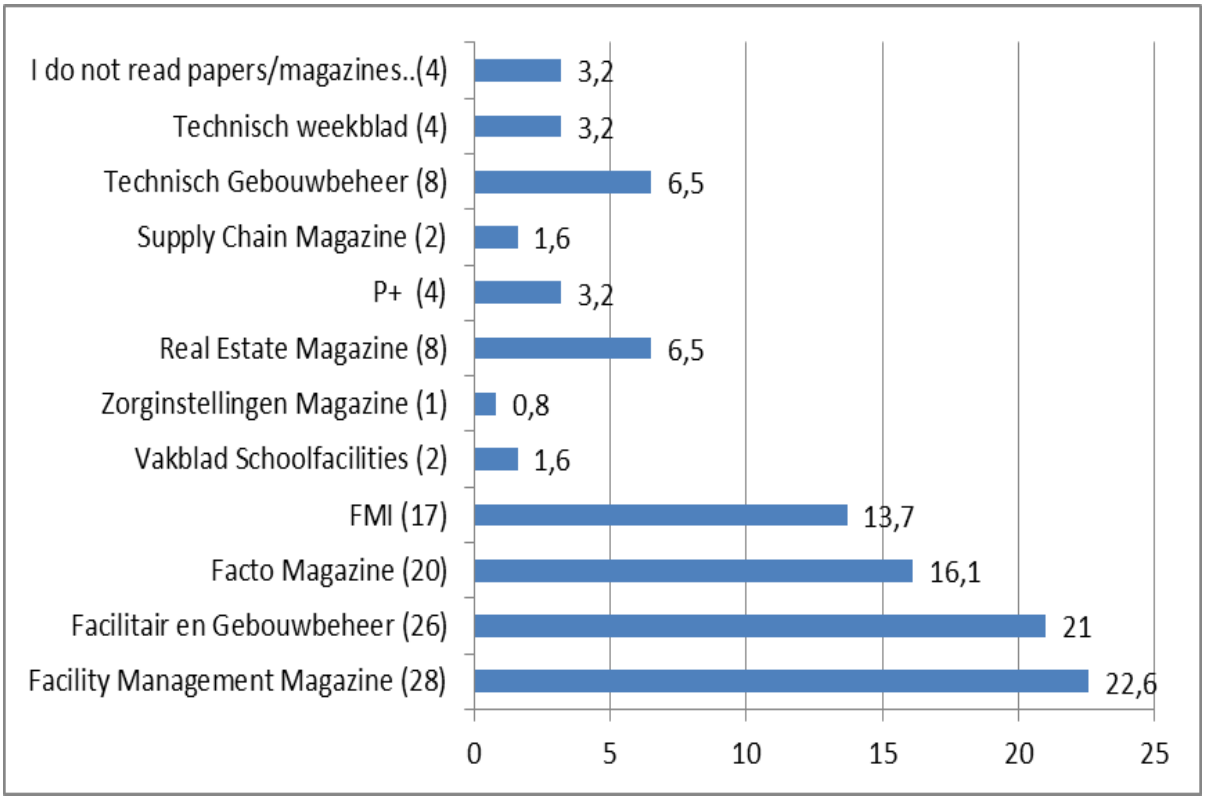


Figure 35. Papers and magazines used for information regarding sustainability practices in segment 7 (Source, author, 2014)

Regarding the websites that the respondents in this segment use, a total of 188 answers were provided, these results are depicted in figure 36.
The results show that the most frequently used website is 'google.nl', which was stated 34 times by the respondents in this segment (18,1%). The high frequency regarding the use of this website shows that respondents like to use search terms in order to be redirected to websites with the appropriate information regarding sustainability practices. Other frequently mentioned websites are 'BREAAM.nl'(13,3%), 'RVO.nl' (11,7%), 'DGBC.nl'(10,1%), which were mentioned 25, 22 and 19 times by the respondents in this segment. Furthermore, 1,6% of the answers provided show that the respondents in this segment do not use websites regarding sustainability practices.

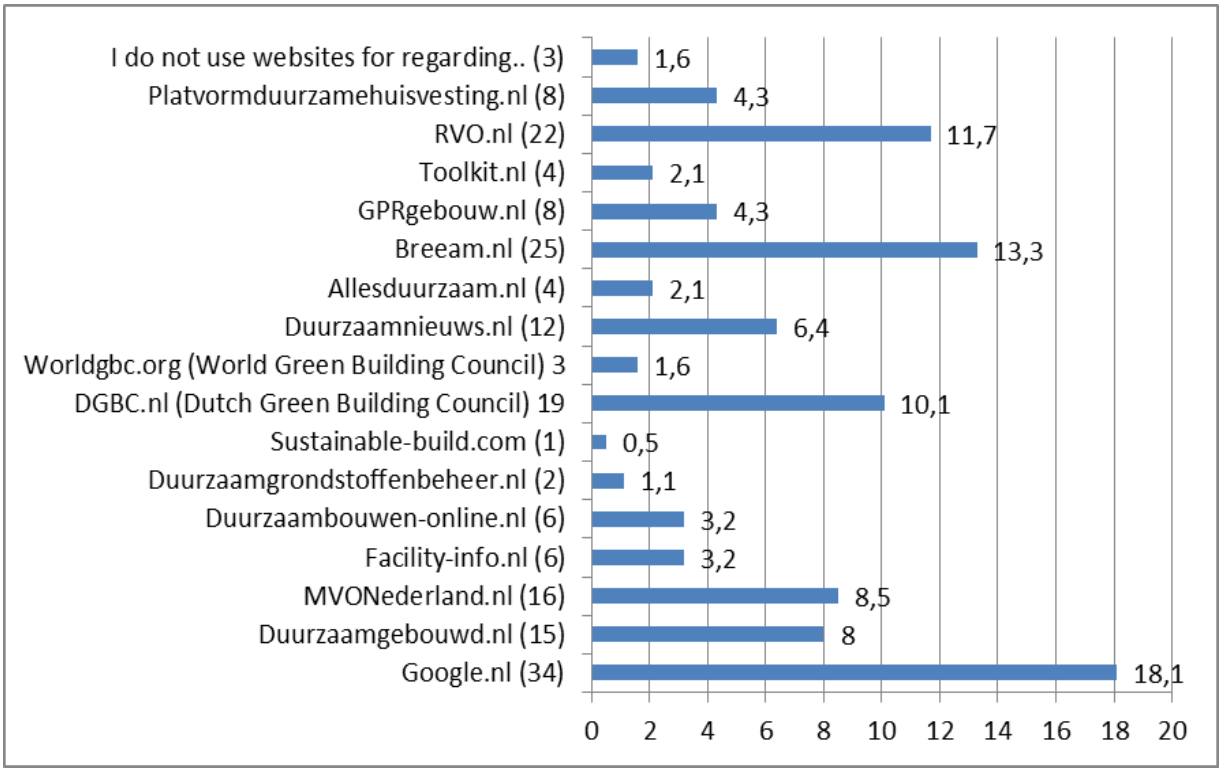


Figure 36. Websites used for information regarding sustainability practices in segment 7 (Source, author, 2014)

Constraints for improving the sustainability performance of buildings
The biggest constraint that organisations in this segment face when considering (further) improvement of their buildings is an inadequate investment budget. The respondents were allowed to choose more than one constraint, which resulted in a total of 86 answers. The constraint of an inadequate investment budget was mentioned 25 times, which represents 29,1% of the answers provided. The second and third most mentioned constraints are not enough insight in the possibilities for improving the sustainability performance among decision makers, which represents 17,4% of the answers provided, and the lack of a clear plan of action, which represents 16,3% of the answers provided. In addition, insufficient time available is mentioned by 10 respondents, which represent 11,6%. Other occasionally mentioned constraints by the respondents in segment 7 are inadequate cost budget available (5,8%), not enough support from the management (5,8%), not enough support from the board (4,7%) and the problem of the split incentive (4,7%).
Finally, 4 respondents state that they did not experience any constraints. These results are presented in figure 37.

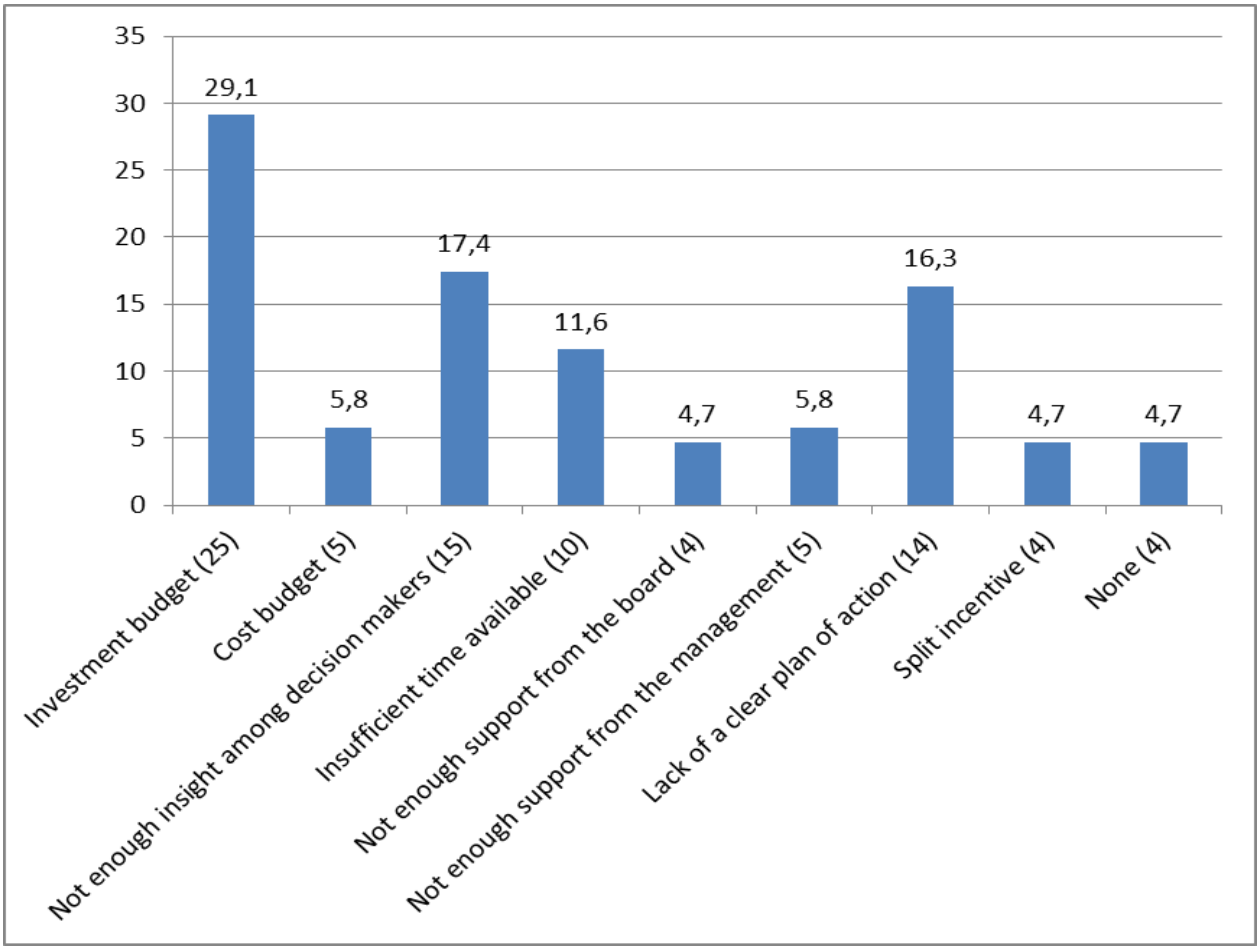


Figure 37. Constraints for improving the sustainability performance of buildings in segment 7 (Source, author, 2014)

4.2.4 Segment 8 (willing, strategic, passive)

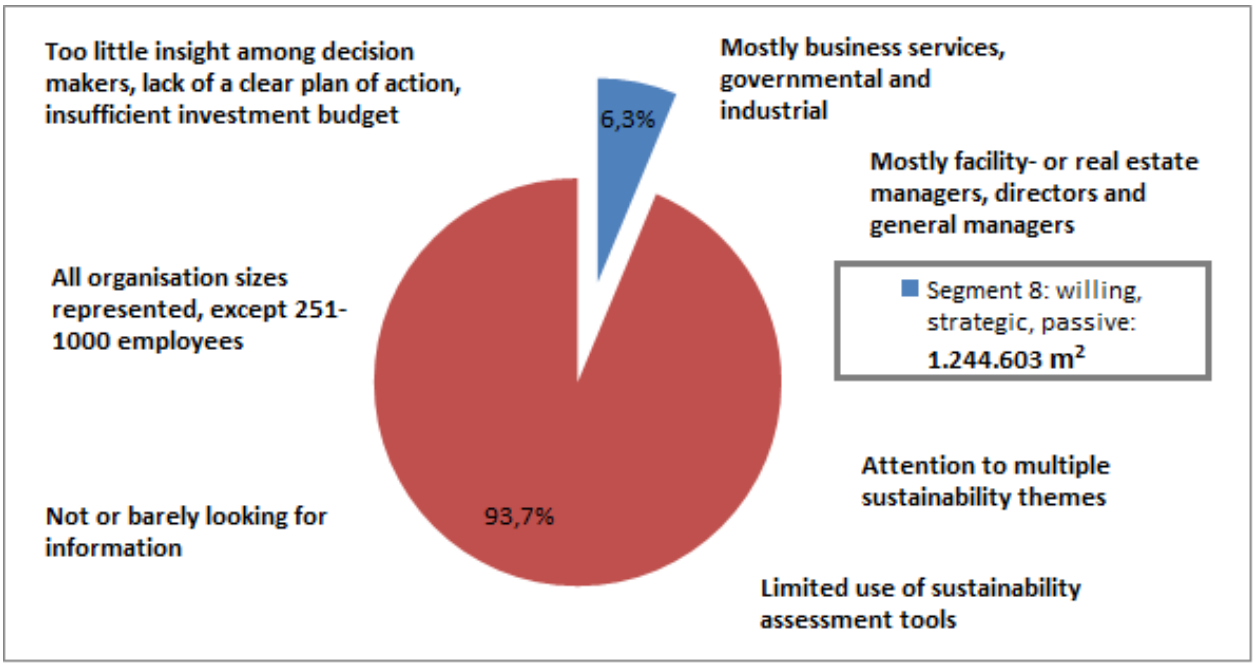


Figure 38. segment 8: willing, strategic, passive (Source, author, 2014)

The respondents
The respondents in segment 8 (willing, strategic, passive) mostly comprise of facility- or real estate managers (30%), directors (20%) and general managers (20%). Other occupations of the respondents in this segment are purchasing managers (10%), sustainability managers (10%) and project managers (10%). Therefore, in order to target this market, the most important players to reach in this segment are facility-or real estate managers, directors and general managers.

The sectors in which the organisations operate in segment 8 are mostly the business services sector (41,7%) and the governmental sector (25%). Other sectors which are represented in this segment are the industrial sector (16,7%) the educational sector (8,3%) and the health care sector (8,3%). This division is presented in figure 39.

The organisation sizes in segment 8 mostly consists of less than 250 employees (41,7%) and over 5000 employees (33,3%). Moreover, 16,7% of the organisation sizes consist between 1001 and 2500 employees and 8,3% of the sizes of the organisation consist between 2501 and 5000 employees.
The organisation sizes between 251 and 1000 employees are not represented in this segment.

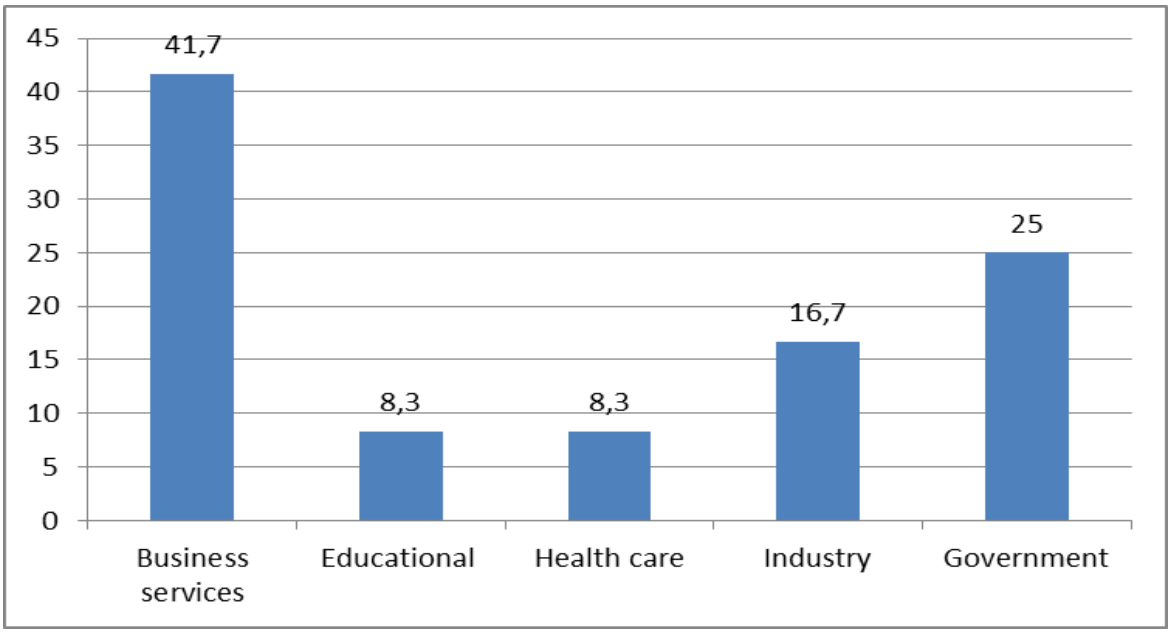


Figure 39. Sectors represented in segment 8 (Source, author, 2014)

Attention to sustainability themes
The sustainability themes that gain more than average attention among the organisations in segment 8 are energy (92,3%), waste (77%), health, (76,9%), pollution (75%), materials (69,1%), management (61,6%) and transport (58,4%). In this segment energy is a very important attention point for organisations. Just 7,7% pays little attention to energy, while 92,3% pays above average attention to this subject. Furthermore, water (33,4%) and land use and ecology gain the least attention, with just 33,4% and 36,4% paying above average attention to this subject.
These results show that organisations in this sector already implemented multiple sustainability practices in order to improve the sustainability performance of their building. However, also in this segment, water and land use and ecology still receive the least attention, which is also visible in the other segments. Therefore, the biggest opportunities for further improvement of the sustainability performance of the buildings in these sector are again present within the themes water and land use and ecology. Moreover, this segment can be targeted with innovative solutions regarding the

sustainability themes which already gain above average attention among these organisations. This is depicted in figure 40.

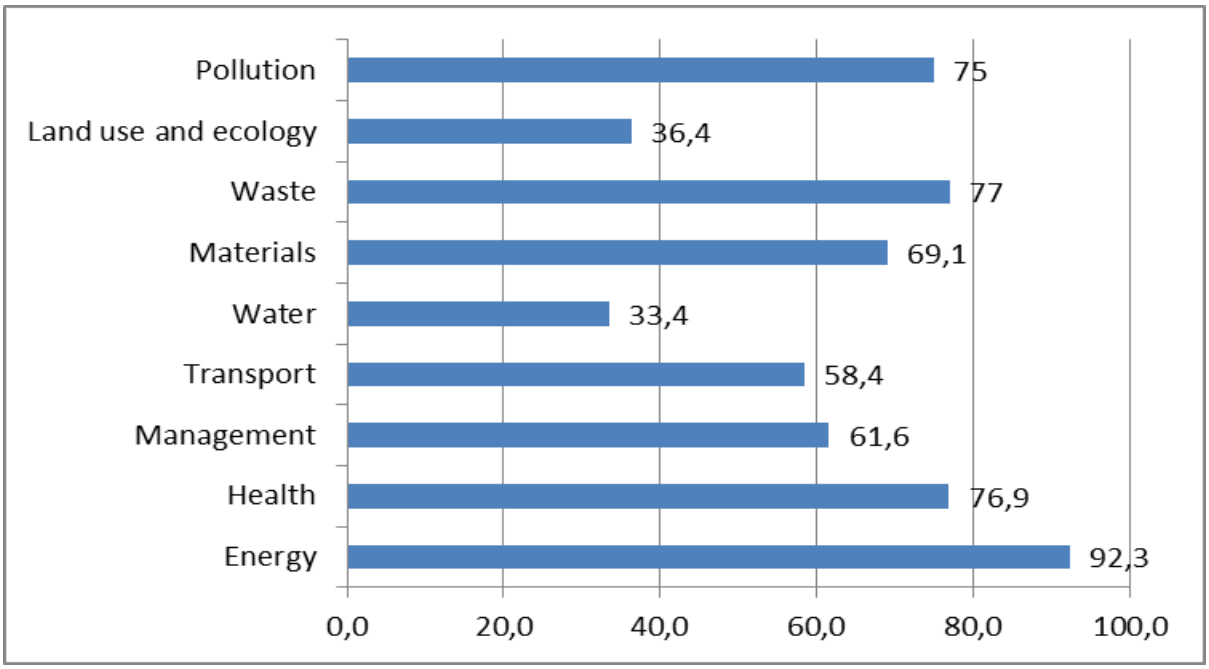


Figure 40. Sustainability themes which gain more than average attention in segment 8 (Source, author, 2014)

In addition to the previous results, in 2013 the organisations have mostly invested in energy, health, materials, and waste. Noteworthy here is that the sustainability theme management is gaining above average attention by 61,6% of the organisations, while only 46,2% has invested in this theme in 2013. In addition, the sustainability theme pollution is gaining above average attention among 75% of the organisations, while only 46,2% has invested in this theme in 2013.
The themes in 2013 that were less attractive for organisations to invest in are water and land use and ecology, which is consistent with earlier results. These figures are depicted in table 6.

Invested in 2013	Yes	No	I do not know
Energy	84,6%	15,4%	0%
Health	76,9%	7,7%	15,4%
Management	46,2%	38,5%	15,4%
Transport	53,8%	30,8%	15,4%
Water	41,7%	41,7%	16,7%
Materials	76,9%	23,1%	0%
Waste	84,6%	15,4%	0%
Land use and ecology	23,1%	46,2%	30,8%
Pollution	46,2%	30,8%	23,1%

Table 6. Investments in sustainability themes in 2013 in segment 8 (Source, author, 2014)

Use of sustainability assessment tools

In segment 8, 58,3% is in the possession of a sustainability certificate. However, it has to be recognized that 50% of the organisations is in the possession of an Energy Label. Furthermore, just one organisation uses LEED (8,3%). Finally, 41,7% of the organisations do not use any sustainability assessment tools. Therefore, it can be concluded that the use of sustainability assessment tools in this segment is limited.

Searching for information regarding sustainability practices

In this segment organisations are not actively searching for information regarding sustainability practices through media sources. 76,9% of the respondents do not visit fairs/ conferences regarding sustainability practices. 61,5% of the respondents do not read papers/ magazines regarding this subject and 76,9% do not use websites regarding information about sustainability practices. Consequently, in order to target this segment with marketing strategies, other channels have to be used.

Constraints for improving the sustainability performance of buildings

The biggest constraints that organisations in this segment face when considering (further) improvement of their buildings is not enough insight in the possibilities for improving the sustainability performance among decision makers and the lack of a clear plan of action. The respondents were allowed to choose more than one constraint, which resulted in a total of 17 answers. The above mentioned constraints were both mentioned four times, which represent 23,5% of the answers. The third most mentioned constraint is an inadequate investment budget available, which was mentioned by three of the 13 respondents (17,6%). Other constraints among the organisations in this segment are insufficient time available (11,8%) and the problem of the split incentive (11,8), which were both mentioned twice by the respondents.

Occasionally mentioned constraints by the respondents in segment 8 are not enough support from the board (5,9%) and not enough support from the management (5,9%). These results are presented in figure 41.

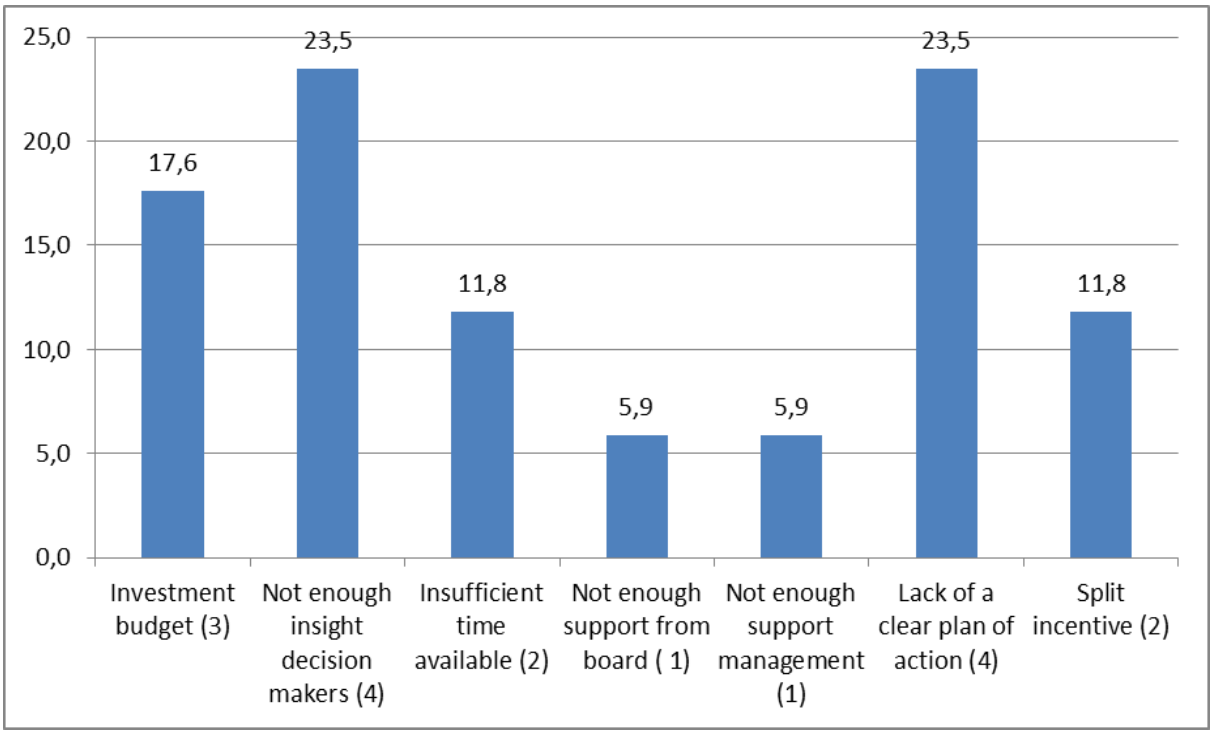


Figure 41. Constraints for improving the sustainability performance of buildings in segment 8 (Source, author, 2014)

4.3 Hypotheses

Finally, the research proposed several hypotheses, these will be discussed below.

(H1) Segments which are willing to invest in the improvement of the sustainability performance of their buildings experience on average less constraints than segments which are not willing to invest.

In order to calculate whether this hypothesis is correct, a T-test is performed which assesses whether a significant relationship exists between the willingness to invest and the constraints that the respondents experience when considering implementing sustainability practices.
The results show that the segments which are willing to invest experience on average 1.74 constraints and the segments which are not willing to invest experience on average 1.63 constraints. The standard deviation for the segments which are willing to invest is 1.117 and for the segments which are not willing, the standard deviation is 0,883. It appears that the segments which are willing to invest experience more constraints than the segments which are not willing to invest. In order to assess whether a significant relationship exists, the significance is calculated by the p- value. The p-value assesses the probability that the difference is based on coincidence. Therefore, it is stated that if the p-value is smaller than 0,05, a significant relationship exists between the willingness to invest and the experienced constraints. The results deliver a p-value of 0.59, therefore it can be concluded that this relationship cannot be generalized for the entire population. Thus, the hypothesis is rejected.

(H2) Certain sectors in which organisations operate are more willing to invest in the improvement of the sustainability performance of their buildings.

In order to calculate whether certain sectors are more willing to invest than others, a Chi-Square test is performed which assesses whether there is a significant difference between the different sectors.
The Chi-Square test calculates the expected willingness to invest if there would be no difference between the different sectors.
The p-value is 0.015, which is smaller than 0.05. Thus, a significant difference exists between sectors.
The results show that the industrial sector is less willing to invest than other sectors. Moreover, the governmental sector is more willing to invest than other sectors. Unfortunately, the group of respondents is too small in order to conclude anything about the other segments. Moreover, above stated results are not reliable. In order to perform the Chi Square test, every group has to consist of at least five respondents and this is not the case. However, derived from above stated results (even though not reliable) it can be concluded that the proposed hypothesis is correct. Thus, there are certain sectors which are more willing to invest than other sectors.

(H3) People with certain occupations are more willing to invest in the improvement of the sustainability performance of their buildings.

In order to calculate whether this hypothesis is correct, again a Chi-Square test is performed. The p-value is 0,71, which is not smaller than 0,05. Therefore, no significant difference is discovered in the different groups. Also the reliability of this calculation is very low, because the groups are too small in order to draw reliable conclusions. Therefore, the hypothesis cannot be generalized for the total population and thus is rejected.

(H4) People with a certain role in the decision making process regarding improvement of the sustainability performance are more willing to invest in the improvement of the sustainability performance of their buildings.

In order to calculate whether this hypothesis is correct, again a Chi-Square test is performed. The p-value is 0,74, which is not smaller than 0,05. Therefore, no significant difference is discovered in the different groups. Also for this calculation, the reliability is very low, because the groups are too small in order to draw reliable conclusions. Therefore, the hypothesis cannot be generalized for the total population and is rejected.

(H5) Organisations with certain sizes based on the amount of employees are more willing to invest.

Also for this calculation, a Chi-Square test is performed. The p-value is 0,19, which shows that no significant relationship is discovered in the different groups. Again for this calculation the reliability is very low, considering the small amount of people in every group. Thus, the hypothesis cannot be generalized for the total population and therefore is rejected.

5. Conclusions

This research has been performed in order to gain insight in the market of end users of buildings in the Netherlands. The following main question was proposed, which will be answered in this chapter:

Which segments of end users are the most promising to reach in order to improve the sustainability performance of the built environment in the Netherlands?

Eight different segments were determined through this research. Of these eight segments, four promising segments were identified, being segment 1 (willing, costs, active), segment 2 (willing, costs, passive), segment 7 (willing, strategic, active) and segment 8 (willing, strategic, passive). Together these segments have a potential to (further) improve the sustainability performance of 24.158.965 m^2 of buildings in the Netherlands.

In segment 1 (willing, costs, active) end users are mostly facility-or real estate managers, general managers and directors. The sectors in which these end users operate are mostly the business services sector, the governmental sector and the educational sector. In addition, all sizes (based on the amount of employees) of organisations are represented in this segment.
Furthermore, 66,6% of the end users in this segment is in the possession of a sustainability certificate, with the most popular being the Energy Label and BREEAM-NL.
The end users in this segment already pay a lot of attention to several sustainability themes, which are energy, health, management, waste, transport, materials and pollution. Themes that gain less attention are water, and land use and ecology.
Segment 1 can be reached through media. The most frequently visited fairs/conferences regarding sustainability practices are Vakbeurs Facilitair, PROVADA, the Dutch Green Building week, and the Energievakbeurs. The most frequently read papers/magazines regarding sustainability practices are Facility Management Magazine, Facilitair en Gebouwbeheer, Facto Magazine and FMI. The most frequently visited websites are 'Google.nl', 'MVONederland.nl', 'RVO.nl', 'Breeam.nl' and 'DGBC.nl'.
Finally, the most prominent constraint in this segment is an inadequate investment budget, followed by the lack of a clear action plan and not enough support from the board.

In segment 2 (willing, costs, passive) end users are mostly directors, facility-or real estate managers and advisors. The sectors in which these end users operate are mostly the business services sector, the governmental sector, the educational sector and the health care sector. Furthermore, the majority of this segment represents organisations with less than 250 employees, however also other sizes are represented in this segment. In addition, 53,6% of this segment is not in the possession of a sustainability certificate.
Segment 2 already pays a lot of attention to several sustainability themes. The themes that gain most attention among the end users are health, energy, waste, management, materials and pollution. Themes that gain less attention are water, transport, and land use and ecology.
This segment is not actively searching for information regarding sustainability practices through media. Therefore, in order to target this market, other channels have to be used.
Finally, the most prominent constraint in this segment is an inadequate investment budget. Other constraints mentioned by the end users are the lack of a clear plan of action, insufficient time available and not enough insight in the possibilities for improving the sustainability performance among decision makers.

In segment 7 (willing, strategic, active) end users are mostly facility-or real estate managers, directors, advisors and general managers. The majority of these end users operate in the business services sector. Other sectors which are well represented are the governmental sector and the

educational sector. In addition, the majority of this segment represents organisations with less than 250 employees, however also other sizes are represented. Furthermore, 70% of this segment is in the possession of a sustainability certificate, with the most frequently used tools being Energy Label and BREEAM-NL.
This segment already pay a lot of attention to several sustainability themes, with the most important being energy, health, waste, management, transport and materials. Again, water and land use gain the least attention.
The end users in this segment can be reached through media. The most frequently visited fairs/conferences among the end users are Vakbeurs Facilitair, Energievakbeurs, PROVADA and the Dutch Green Building Week. The most frequently read papers/magazines are Facility Management Magazine, Facilitair en Gebouwbeheer, Facto Magazine and FMI. Moreover, the most frequently used websites are 'Google.nl', 'Breeam.nl', 'RVO.nl', 'DGBC.nl'.
Finally, the biggest constraint in this segment is again an inadequate investment budget, followed by not enough insight in the possibilities for improving the sustainability performance among decision makers and the lack of a clear plan of action.

In segment 8 (willing, strategic, passive) end users are mostly facility-or real estate managers, directors and general managers. The sectors in which these end users operate are mostly the business services sector, the governmental sector and the industrial sector. Furthermore, all sizes of organisation are represented, except organisational sizes between 251 and 1000 employees. In addition, 58,3% of this segment is in the possession of a sustainability assessment tool, with only the Energy label and LEED represented. This segment already pays a lot of attention to several sustainability themes. The most important themes are energy, waste, health, pollution, materials, management and transport. In this segment energy is very important, 92,3% state that they pay above average attention to this subject. The themes water and land use and ecology gain less attention in this segment.
This segment is not actively searching for information regarding sustainability practices. Therefore, this segment has to be reached through other channels. Finally, the constraints in this segment to improve the sustainability performance of their buildings are not enough insight in the possibilities for improving the sustainability performance among decision makers and the lack of a clear action plan. Surprisingly, the third most mentioned constraint is an inadequate investment budget, which shows that this is a less prominent constraints than in other segments.

Overall, it can be concluded that the most important people to reach in the promising segments are identified, alongside with the sectors which are most promising to reach. The results discovered that all organisational sizes (based on the amount of employees) are represented, which shows that the willingness to invest is not confined to certain organisational sizes. Moreover, the four segments already pay a lot of attention to several sustainability themes. Therefore, the biggest opportunities to (further) improve the sustainability performance of the buildings in these segments are present within sustainability practices regarding water, transport and land use and ecology. In addition, these segments could be targeted with innovative solutions regarding the sustainability themes which already gain above average attention.
The segments which are actively searching for information regarding sustainability practices can be reached through fairs and conferences, papers and magazines, and websites. The segments which are not actively searching for information, have to be reached through other channels.
Finally, the most prominent constraints in these segments are an inadequate investment budget, not enough insight in the possibilities to improve the sustainability performance among decision makers, lack of a clear plan of action and insufficient time available. Therefore, in order to target these segments, solutions for these constraints have to be provided and consequently, appropriate marketing strategies can be developed.

6. Suggestions for further research

This research was conducted in order to gain insight in the market of end users and discover segments of end users which are promising to reach in order to improve the sustainability performance of the built environment. The research provided useful data about this market of end users for the field and serves as a basis for further research. Therefore, a number of suggestions for further research are proposed. First, this research should be conducted again on a large scale. This research was conducted in a time period of four months, which resulted in a total of 331 respondents. Even though this seems like a good basis for analysis, when calculating the segmentation, only 208 remained. The consequence was that one segment was not represented at all and some other segments were too small in order to draw reliable conclusions. Moreover, it was not possible to calculate all the possible hypotheses which the researcher would have seen tested.
One of the hypotheses that was suggested by the researcher is whether certain sectors in which end users operate are more willing to invest in the improvement of the sustainability performance of their buildings. Based on the calculation it seems that the industry is less willing to invest in sustainability practices than other sectors, while the governmental sector is more willing to invest in sustainability practices than other sectors. Unfortunately, the groups were too small in order to be reliable and to draw any conclusions about the other sectors.
Second, another hypothesis that was proposed is whether people with certain occupations are more willing to invest in the improvement of the sustainability performance of their buildings. The calculation showed no significant relationship, however when conducting this research on a larger scale it would be possible to test this relationship again.
Third, the researcher was interested in whether end users with a certain role in the decision making process regarding improvement of the sustainability performance are more willing to invest in the improvement of the sustainability performance of their buildings. Again, the calculation showed no relationship and this could be due to the lack of sufficient data. Therefore, this relationship should be tested on a larger scale.
Fourth, another relationship that should be tested on a larger scale is whether organisations with certain sizes (based on the amount of employees) are more willing to invest. Again, the calculation showed no relationship. However, it is possible that indeed a relationship can be discovered.
Other relationships that could be tested in further research comprise the degree in which end users actively search for information regarding sustainability practices. It would be interesting to test whether end users with certain occupations and/or certain roles in the decision making process are more active than others. In addition, the relationship between the degree of actively searching for information and the sectors in which these end users operate could be tested. If more depth is desired, it is also possible to discover whether end users with certain occupations and/or certain roles use certain types of media sources (certain fairs/conferences, papers/magazines and websites).
Furthermore, the results show which sustainability themes gain most attention among the different segments and the investments in sustainability themes in 2013. A suggestion for further research is to test how these two variables relate to each other.

It is recommended that in addition to quantitative research, qualitative research is performed.
Through qualitative research it is possible to discover more differences and similarities between the different segments. For example, it could be possible that segments which invest with the goal of cost savings choose different options regarding the sustainability practices such as energy etc., than segments which invest with the goal of generating strategic value. This could not be discovered through the conducted research, considering it only shows whether they have invested in certain sustainability practices or not.
Another example is that the results show which constraints the different segments experience, however they do not show the underlying reasons of these constraints. This could be discovered through qualitative research.

Another suggestion for further research would be to investigate the segments that are not willing to invest in sustainability practices. More insight could be provided about the mind-set of the end users in these segments regarding improvement of the sustainability performance of their buildings. In particular it would be preferable to discover what the underlying reasons are for not being willing to invest in sustainability practices.

Finally, this research was conducted to prepare a segmentation of the market of end users in order to enable the field to develop specific marketing strategies. Therefore, the most important suggestion for further research would be to develop marketing strategies based on the segmentation resulting from this research.

Given the opportunity, the researcher would have done a number of aspects differently. First, the researcher should have conducted both quantitative and qualitative research. This was also the intent at the start of this research, but due to the time constraint, the researcher chose to only use quantitative research. By conducting both methods, a triangulation of methods would have been used which would have increased the validity of this research. Moreover, it would have provided more detailed information about the mind-set of end users regarding the sustainability performance of their buildings.
Second, when starting this thesis, the researcher had never used the analysis programme SPSS. The researcher included the answer possibility 'otherwise, being' in almost every question in the questionnaire, with the consequence that many respondents entered qualitative data. Once the researcher began the analysis in SPSS, it was discovered that the majority of these answers could not be used for calculation.
Third, if the researcher had the possibility, the questionnaire would not have been conducted in the summer period. Many possible respondents were on vacation and did not complete the questionnaire. Hence, the response rate of this research is very low.
Finally, the researcher noticed afterwards that one question could not be used for analysis, being:
'Has your organisation budgeted investments in the following sustainability practices in 2014?' (energy, health, management, transport, water, materials, waste, land use and ecology, pollution)
The researcher noticed when analysis the results that one of the answer possibilities was missing, therefore no conclusions could be drawn. This is unfortunate, because it would have been preferable to compare the investments in 2013 to the budgeted investments in 2014. In this manner it would have been possible to see if end users are increasingly investing in sustainability practices or not.

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Appendix 1. Elaborate literature research regarding sustainability worldwide

Sustainable building in the real estate sector

Sustainable building is growing around the world. It has become a manner in which organisations increasingly address the sustainability performance of buildings in the design, construction, and renovation of buildings. Sustainable building is no longer only driven by idealism, it is increasingly being seen as a business opportunity (Kibert, 2004). Looking at the real estate sector, different research shows that the added value of sustainable building is becoming visible in the real estate sector. For example, in the research of McGraw-Hill Construction (2013) among AEC organisations (architects, engineers and contractors), consultants and owners from 62 countries, it showed that 94% of the respondents report using some kind of sustainability feature in their building. By 2015 over 50% of these organisations expect to be at a high level of sustainable building, which means that more than 60% of their building activities are sustainable. This is an 82% increase as compared to 2012. Noticeable is that this trend is not confined to specific parts of the world or specific economies. In each of the 62 assessed countries sustainable building features are increasingly being used, though at different rates. According to RREEF Research (2008) several factors influence the increased attention for sustainable building globally being tenant requirements, government regulations, and demands for socially-responsible investments. These factors are driving a rapid transformation to sustainable building and this is visible by the explosion in the numbers of sustainable buildings that are being developed. In the United states sustainable building is becoming standardized among AEC firms, consultants and owners. In 2012 40% of the respondents state that they are involved in high levels of sustainability and this number is expected to grow to 53% in 2015 (McGraw-Hill Construction, 2013). Blumberg (2012) confirms the increasing attention for sustainable building. According to Blumberg the demand for sustainable buildings is increasing very fast. Consequently, parties in the real estate sector are more willing to make their buildings more sustainable. Moreover, PWC (2013) discovered that the real estate sector is increasingly seeking for opportunities to increase their energy efficiency and implement sustainability features in their buildings.

Even though this research shows positive results for the future of sustainable building, there has to be recognized that the current state of the sustainable real estate construction sector is still depressing (Blumberg, 2012). The biggest constraints for sustainable building in the real estate sector are still the issue with costs and the potential that sustainable investments are not financially viable, and the lack of awareness of the impact of exhausting natural resources (WGBC, 2013a). Luckily, an upward trend is visible and it appears to be that the real estate sector is becoming increasingly aware of the many advantages of sustainable building, especially regarding new constructions. However, the stock of the existing office space in the U.S. greatly outnumbers the new office stock that is being developed each year. Compared to 34 million square feet in new construction and significantly renovated office space, the existing buildings have the largest potential with over seven billion square feet of commercial office space to significantly improve the sustainability performance of the built environment (Blumberg, 2012).

Sustainable building among end users

In 2007, Jones Lang Lasalle conducted a global research among 400 organisations about the attitude of end users regarding sustainable building. According to them the year 2007 represented a tipping point in the mind-set of end users towards sustainability. Most organisations already integrate sustainability in their organisation and are now beginning to pay more attention to the sustainability of their buildings. 47% of the global respondents indicated that the sustainability of their building is a critical issue for them. Moreover, another quarter states that sustainability will become a critical issue within two years. A more recent research of the WGBC (2013b) shows that in Europe the demand among end users is increasing. The number of non-residential projects certified for BREEAM, LEED and others has tripled between 2011 and the first half of 2013. The demand for certification is

the strongest in the offices sector, followed by the industry and retail sector. According to Deloitte (2014) the demand for sustainable buildings among end users worldwide is also visible through the increasing inclusion of sustainability features in their lease agreements. Research also shows that 70% of the respondents are willing to pay more for a sustainable building. 62% states that they would be willing to pay a premium between 1-10% and 8% states that they were willing to pay over a 10% premium for fitting sustainable features. It seems to be that the market of end users is ready for sustainable buildings. However, the same research also shows that 46% of the respondents feel like sustainable buildings from the supply side are hardly available. For example, in the United States only 2% of the commercial real estate is LEED-certified, which shows the small current portion of sustainable buildings (Jones Lang Lasalle, 2007).

It appears that there are still constraints present among the real estate sector and end users worldwide for improving the sustainability performance of their buildings. Therefore, now a closer look will be taken at the current state of sustainable building in the Netherlands.

Appendix 2 Accompanying text questionnaire

Beste gebouwgebruiker,
Duurzaamheid is een term die tegenwoordig niet meer valt weg te denken in de bedrijfsvoering. Veel organisaties houden zich actief bezig met het verduurzamen van hun organisatie of beginnen de principes van duurzaamheid langzaam toe te passen. Dit in tegenstelling tot de gebouwde omgeving, waar blijkt dat een grootschalige verduurzaming uitblijft. Volgens Facility Management Nederland (FMN), de Dutch Green Building Council (DGBC) en Corporate Facility Partners (CFP) spelen eindgebruikers een sleutelrol in de grootschalige verduurzaming van de gebouwde omgeving, alleen onvoldoende partijen weten de eindgebruikers te bereiken of hebben een beeld bij wat de eindgebruikers willen.
Mijn naam is Nadine Wessels en ik ben masterstudent Facility and Real Estate Management aan de Saxion Hogeschool te Deventer. In samenwerking met FMN, DGBC en CFP voer ik een onderzoek uit om segmenten in de markt te vinden die openstaan voor verduurzaming. We willen deze segmenten van duurzame eindgebruikers onderzoeken, om zo de transitie naar een duurzame gebouwde omgeving te versnellen. U kunt ons hierbij helpen!

https://nl.surveymonkey.com/s/7YCPQCN

Om de markt van duurzame eindgebruikers te ontdekken heb ik een enquête opgesteld met 23 vragen. Graag zou ik u willen vragen om deze enquête in te vullen. De enquête blijft drie weken beschikbaar. Het kost u ongeveer tien minuten en uw antwoorden worden volledig anoniem behandeld en verwerkt.
Uw antwoorden zijn van grote waarde voor dit onderzoek en uw input wordt dan ook enorm gewaardeerd. Als dank voor de moeite stellen we graag de belangrijkste resultaten van dit onderzoek aan u ter beschikking. Daarnaast verloten wij onder de deelnemers van de enquête tien bol.com bonnen t.w.v. € 25,-.
Mocht u hier interesse in hebben, dan heeft u aan het einde van de enquête de mogelijkheid om uw e-mailadres in te vullen. Uw e-mailadres zal alleen gebruikt worden om de resultaten toe te sturen en om de winnaars van de bonnen te benaderen.
Mocht u naar aanleiding van deze e-mail nog vragen en/of opmerkingen hebben, dan kunt u contact met mij opnemen. De gegevens staan onderaan deze e-mail vermeld.

Om te starten met de enquête, kunt u klikken op de link:

https://nl.surveymonkey.com/s/7YCPQCN

Hartelijk dank voor de moeite.

Met vriendelijke groet,

Nadine Wessels

Appendix 3 Questionnaire

1. How many square meters are you responsible for?
    - ☐ Open question

2. What is your role in measures regarding sustainability in your organisation? (Multiple answers possible)
    - ☐ Decider
    - ☐ Executer
    - ☐ Project manager
    - ☐ Advisor
    - ☐ No role
    - ☐ Otherwise, being

3. Which colleagues play a role in the decision making process for sustainability measures? (Multiple answer possible)
    - ☐ Director
    - ☐ Facility/Real estate manager
    - ☐ Purchasing manager
    - ☐ Financial manager
    - ☐ General manager
    - ☐ Otherwise, being

4. What are the most important criteria when choosing a building? (Select up to three)
    - ☐ Location
    - ☐ Accessibility by public transport
    - ☐ Accessibility by car
    - ☐ Flexibility in contracts
    - ☐ Technical flexibility
    - ☐ Sustainability
    - ☐ Image/ appearance
    - ☐ Cost of exploitation
    - ☐ Investment costs
    - ☐ Otherwise, being

5. How important is the sustainability performance of the building(s) for your organisation? (Choose one answer)
    - ☐ Very important
    - ☐ Important
    - ☐ Not important/not unimportant
    - ☐ Not important
    - ☐ Not important at all

6. What are the most important motives for enhancing the sustainability performance of a building? (Multiple answers possible)
    - ☐ Innovation
    - ☐ Image improvement
    - ☐ Cost savings
    - ☐ Improvement of the competiveness

- Improvement of performance, satisfaction and health of employees.
- Social responsibility
- Otherwise, being

7. How many attention does your organisation pay to the following sustainability areas? (1= a lot of attention and 5= very few attention)
   - Energy
   - Health
   - Management
   - Transport
   - Water
   - Materials
   - Waste
   - Land use and ecology
   - Pollution

8. Does the organisation use a sustainability assessment tool regarding the building(s)? (Multiple answers possible)
   - GPR Gebouw
   - Energylabel
   - BREEAM-NL
   - LEED
   - GreenCalc
   - No
   - Greenkey
   - Otherwise, being

9. What are the (existing) constraints for improving the sustainability performance of the building(s)? (Multiple answers possible)
   - Inadequate investment budget available
   - Inadequate cost budget available
   - Not enough insight in the possibilities for improving the sustainability performance among decision makers
   - Insufficient time available
   - Not enough support from the board
   - Not enough support from the management
   - Lack of a clear plan of action
   - None
   - Otherwise, being

10. With which payback period would the organisation be willing to invest in sustainability measures? (Choose one answer)
    - Not willing to invest
    - < 1 year
    - 1-2 years
    - 3-5 years
    - 6-7 years
    - 8-9 years
    - > 10 years
    - Otherwise, being

11. What is the most important goal when investing in increasing the sustainability performance of the building(s)? (Choose one answer)
    - Cost savings or competitive advantage

12. What is the most important goal when investing in increasing the sustainability performance of the building(s)? (Choose one answer)
    - Cost savings or image improvement

13. What is the most important goal when investing in increasing the sustainability performance of the building(s)? (Choose one answer)
    - Cost savings or innovation

14. Did your organisation invest in the following sustainability themes in 2013? (Choose yes, no, I do not know)
    - Energy
    - Health
    - Management
    - Transport
    - Water
    - Materials
    - Waste
    - Land use and ecology
    - Pollution

15. Has your organisation budgeted investments in the following sustainability themes in 2014? (Choose yes, no, I do not know)
    - Energy
    - Health
    - Management
    - Transport
    - Water
    - Materials
    - Waste
    - Land use and ecology
    - Pollution

16. Do you visit fairs/conferences regarding sustainability and if so, which one(s)? (Multiple answers possible)
    - MKB beurs Duurzaam 2014
    - Dutch Green Building Week
    - Congres Green buildings
    - Beurs Ecobouw
    - Energievakbeurs
    - FMM Academy
    - Vakbeurs Facilitair
    - Building Holland
    - Green Tie Gala
    - Vakbeurs Recycling 2013
    - Nationaal Sustainability Congres

- Beurs Ecoenergie
- Beurs Renovatie & Transformatie
- Beurs PROVADA
- I do not visit fairs/conferences regarding sustainability
- Otherwise, being

17. Do you read papers/magazines regarding sustainability and if so, which one(s)? (Multiple answers possible)
    - Facility Management Magazine
    - Facilitair en Gebouwbeheer
    - Facto Magazine
    - FMI
    - Vakblad Schoolfacilities
    - Zorginstellingen Magazine
    - Real estate Magazine
    - Change Magazine
    - P+ (bouwtrends)
    - Supply Chain Magazine
    - Technisch Gebouwbeheer
    - Technisch weekblad
    - I do not read papers/magazines regarding sustainability
    - Otherwise, being

18. Do you visit websites regarding sustainability, and if so, which one (s)? (Multiple answers possible)
    - Google.nl
    - Duurzaamgebouwd.nl
    - MVONederland.nl
    - Facility-info.nl
    - Duurzaambouwen-online.nl
    - Duurzaamgrondstoffenbeheer.nl
    - Sustainable-build.com
    - Dgbc.nl (Dutch green building council)
    - Worldgbc.org (World Green building council)
    - Duurzaamnieuws.nl
    - Allesduurzaam.nl
    - Breeam.nl
    - GPRgebouw.nl
    - Toolkit.nl
    - RVO.nl (Agentschap NL)
    - Platvormduurzamehuisvesting.nl
    - I do not use websites for information regarding sustainability
    - Otherwise, being

19. What does your organisation need to become successful regarding sustainability?
    - Open question

20. In which sector does your company operate?
    - Business services
    - Educational

- ☐ Health care
- ☐ Industry
- ☐ Government
- ☐ Retail
- ☐ Otherwise, being

21. What is your occupation?
    - ☐ Director
    - ☐ Facility- or real estate manager
    - ☐ Procurement manager
    - ☐ Financial manager
    - ☐ General manager
    - ☐ Project manager
    - ☐ Advisor
    - ☐ Sustainability manager
    - ☐ Otherwise, being

22. How many employees does the organisation have?
    - ☐ < 250 employees
    - ☐ 251- 1000 employees
    - ☐ 1001-2500 employees
    - ☐ 2501-5000 employees
    - ☐ 5001 employees
    - ☐ Otherwise, being

Thank you very much for your participation in the questionnaire. If you have any questions regarding the questionnaire or this research, please contact Nadine Wessels at n.a.wessels@live.nl.

Would you like a chance to win one of the ten gift certificates from Bol.com with a value of €25-, and are you interested in the results of this research? Please fill in your e-mail address.
Your e-mail address will only be used to send out the results and to approach the winners of the gift certificates.

…….

Appendix 4 Description analysis SPSS

The analysis in SPSS can be described in three stages, being the calculation of the general results, the preparation of the segmentation and the assignment of several variables to each segment.

First, the general results were calculated through descriptive analysis and frequency distribution.
Moreover, a specific calculation was performed in order to determine which roles the respondents have regarding the implementation of sustainability practices. In order to calculate this, a descriptive analysis with cross tabulation is performed.
Furthermore, in order to calculate the accuracy of the hypotheses, a T-test and a Chi-Square test were performed in SPSS.

Second, the preparation of the segmentation. The segmentation is based on three factors, which is the willingness to invest, the goal when investing in sustainability practices and the degree of actively searching for information regarding sustainability practices. These factors form the following axes:
Axis 1: Willing to invest vs. not or barely willing to invest
Axis 2: Investment goal: cost savings vs. strategic value
Axis 3: Actively searching for information vs. not actively searching for information
These axes will be described below, alongside with the accompanying frequency distribution approach in SPSS.

Axis 1: Willingness to invest vs. not or barely willing to invest
the first factor is the willingness of end users to invest in improving the sustainability performance of their building. In order to determine whether they are willing to invest, the following question was asked:
"With which payback period would the organisation be willing to invest in sustainability measures"?
The associated answer possibilities for this question are:

- Not willing to invest
- < 1 year
- 1-2 years
- 3-5 years
- 6-7 years
- 8-9 years
- > 10 years
- Otherwise, being

In order to convert this question for the segmentation, the code Q0010 is entered in SPSS. Moreover, the answer possibilities also received a code for calculation, which is consecutively 1,00, 2,00, 3,00, 4,00, 5,00, 6,00, 7,00 and 0,00. For these codes it is stated that if Q0010 = 1,00, 2,00 or 3,00, than the willingness of end users to invest is not existing or very limited. Conversely, if Q0010 = 4,00, 5,00, 6,00, 7,00, than there is a willingness of end users to invest. Furthermore, if 'otherwise, being' (0,00) was used, it was entered as -99, which means that these answers are excluded from the segmentation. Moreover, if incomplete answers were provided, or the questionnaire was not completed, it was entered as -99 , which means that these answers are also excluded from the segmentation. These results forms the first axis for the segmentation.

Axis 2: Investment goal: cost savings vs. strategic value
The second factor for the segmentation is the goal when implementing sustainability practices in their building. This is divided into 'cost savings' and 'strategic value'. In order to determine this axis, the following question was asked:

- "What is the most important goal when investing in increasing the sustainability performance of the building(s)"?

This question was asked three times, with the converted codes being Q0011_001, Q0012_001 and Q0013_001.
The associated answer possibilities for Q0011_001 are "cost savings or competitive advantage".
The associated answer possibilities for Q0012_001 are "cost savings or image improvement".
The associated answer possibilities for Q0013_001 are "cost savings or innovation".

For the calculation and determination of the axis, the codes Q0011_001, Q0012_001 and Q0013_001 are entered in SPSS. Moreover, the answer possibilities also received a code for calculation, which is 1= cost savings and 2= strategic value. For the determination of the axis it is stated that if 1 is mentioned two or three times, than the main goal to invest is cost savings. Conversely, if 2 is mentioned two or three times, than the main goal to invest is strategic value. Furthermore, if 'otherwise, being' was used it was entered as -99. Moreover, if incomplete answers were provided, or the questionnaire was not completed, -99 was used. As mentioned earlier, if -99 is entered, than these answers are excluded from the segmentation.

Axis 3: Willingness to search for information regarding sustainability practices
The third factor for the segmentation is the willingness to search for information regarding sustainability practices. This is divided into 'actively searching for information' and 'not actively searching for information'. In order to determine this axis, the following questions were asked:

- "Do you visit fairs/conferences regarding sustainability and if so, which one(s)"?
- "Do you read papers/magazines regarding sustainability and if so, which one(s)"?
- "Do you visit websites regarding sustainability, and if so, which one (s)"?

In order to convert these questions for the segmentation, the codes Q0016, Q0017 and Q0018 are entered in SPSS. Moreover, the answer possibilities also received a code for calculation.

- The answer possibilities associated with Q0016 are Q0016_001 till Q0016_0016 and Q0016_other.
- The answer possibilities associated with Q0017 are Q0017_001 till Q0017_0014 and Q0017_other.
- The answer possibilities associated with Q0018 are Q0018_001 till Q0017_0018 and Q0018_other.

For the calculation of the axis it is stated that if the answer possibilities described below are mentioned two times or more, than the respondents are not actively searching for information regarding sustainability. Conversely, if the answer possibilities are mentioned one time or not mentioned at all, than the respondents are actively searching for information regarding sustainability.
The following answer possibilities are used for the calculation:

- "I do not visit fairs/conferences regarding sustainability"
- "I do not read papers/magazines regarding sustainability"
- "I do not use websites for information regarding sustainability"

In order to calculate this with SPSS, the codes Q0016_0015, Q0017_0013 and Q0018_0017 are entered. It is stated that if Q0016_0015, Q0017_0013 and Q0018_0017 are mentioned two times or more, than the respondents are not actively searching for information regarding sustainability. Conversely, if Q0016_0015, Q0017_0013 and Q0018_0017 are mentioned one time or not mentioned at all, than the respondents are actively searching for information regarding sustainability practices. Furthermore, if 'otherwise, being' was used, it was entered as -99. Moreover, if incomplete answers were provided, or the questionnaire was not completed, -99 was used.

Finally, now the axes are determined, the segmentation can be performed. The determination of the three axes will result in eight segments. In order to calculate the eight segments, the three axes are assigned with either 1 or 0. It is stated that if the respondents are willing to invest, than 1 is assigned. If the respondents are not or barely willing to invest, 0 is assigned. Moreover, it is stated that if the goal for investing is cost savings, 1 is assigned. If the goal for investing is strategic value, 0 is assigned. Finally, it is stated that if the respondents are actively searching for information, 1 is assigned. If the respondents are not actively looking for information, 0 is assigned.
The following segments can now be described in SPSS as: 111, 011, 101, 001, 100, 000, 110 and 010. Subsequently, the following questions are translated to the different segments: Q001, Q005, Q007, Q008, Q009, Q0014, Q0016, Q0017, Q0018, Q0021, Q0022 and Q0023. These will be presented and discussed in chapter 4. For more information about the variables, please see the main file in SPSS.

Appendix 5. Analysis of hypotheses

The T-test is used to test the following hypothesis: (H1) *Segments which are willing to invest in the improvement of the sustainability performance of their buildings experience on average less constraints than segments which are not willing to invest.*

These results are presented in the two tables below.

Group Statistics

	Willing to invest	N	Mean	Std. Deviation	Std. Error Mean
Number_constraints	Segments which are not willing	38	1,63	,883	,143
	Segments wich are willing	155	1,74	1,117	,090

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Number_constraints	Equal variances assumed	1,565	,212	-,534	191	,594	-,104	,195	-,488	,280
	Equal variances not assumed			-,615	69,178	,541	-,104	,169	-,441	,233

The Chi-Square test is used to test the following hypothesis: *(H2) Certain sectors in which organisations operate are more willing to invest in the improvement of the sustainability performance of their buildings.*

These results are presented in the two tables below.

Willingness to invest * In which sector does your organisation operate? Crosstabulation

			In welke sector is uw organisatie actief?								
			Otherwise, being	Business services	Eudcational	Health care	Industrie	Government	Retail	Construction	Total
willingness	no	Count	1	19	2	3	11	2	2	1	41
		Expected Count	2,2	16,3	3,5	4,6	5,3	7,7	,9	,5	41,0
	yes	Count	11	70	17	22	18	40	3	2	183
		Expected Count	9,8	72,7	15,5	20,4	23,7	34,3	4,1	2,5	183,0
Total		Count	12	89	19	25	29	42	5	3	224
		Expected Count	12,0	89,0	19,0	25,0	29,0	42,0	5,0	3,0	224,0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17,431[a]	7	,015
Likelihood Ratio	17,790	7	,013
Linear-by-Linear Association	,009	1	,926
N of Valid Cases	224		

a. 7 cells (43,8%) have expected count less than 5. The minimum expected count is ,55.

The Chi-Square test is used to test the following hypothesis: *(H3) People with certain occupations are more willing to invest in in the improvement of the sustainability performance of their buildings.*

These results are presented in the two tables below.

What is your occupation * willingness to invest Crosstabulation

			Willingness to invest		
			yes	no	Total
What is your occupation?	Otherwise, being	Count	2	16	18
		Expected Count	3,3	14,7	18,0
	Director	Count	9	37	46
		Expected Count	8,5	37,5	46,0
	Facility- or real estate manager	Count	13	68	81
		Expected Count	14,9	66,1	81,0
	Purchasing manager	Count	1	4	5
		Expected Count	,9	4,1	5,0
	Financial manager	Count	0	1	1
		Expected Count	,2	,8	1,0
	General manager	Count	7	22	29
		Expected Count	5,3	23,7	29,0
	Sustainability manager	Count	0	9	9
		Expected Count	1,7	7,3	9,0
	Projectmanager	Count	3	8	11
		Expected Count	2,0	9,0	11,0
	Advisor	Count	6	17	23
		Expected Count	4,2	18,8	23,0
Total		Count	41	182	223
		Expected Count	41,0	182,0	223,0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5,361[a]	8	,718
Likelihood Ratio	7,081	8	,528
Linear-by-Linear Association	1,188	1	,276
N of Valid Cases	223		

a. 8 cells (44,4%) have expected count less than 5. The minimum expected count is ,18.

The Chi-Square test is used to test the following hypothesis: (H4) *People with a certain role in the decision making process regarding improvement of the sustainability performance are more willing to invest in the improvement of the sustainability performance of their buildings.*

These results are presented in the two tables below.

Role decision making process * willingness to invest Crosstabulation

			Willingness to invest		
			Yes	No	Total
ROL_DEC	Decision maker	Count	9	38	47
		Expected Count	9,5	37,5	47,0
	Executer	Count	4	7	11
		Expected Count	2,2	8,8	11,0
	Projectmanager	Count	6	28	34
		Expected Count	6,9	27,1	34,0
	Advisor	Count	23	93	116
		Expected Count	23,4	92,6	116,0
	No role	Count	4	16	20
		Expected Count	4,0	16,0	20,0
Total		Count	46	182	228
		Expected Count	46,0	182,0	228,0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1,965[a]	4	,742
Likelihood Ratio	1,720	4	,787
Linear-by-Linear Association	,027	1	,870
N of Valid Cases	228		

a. 2 cells (20,0%) have expected count less than 5. The minimum expected count is 2,22.

The Chi-Square test is used to test the following hypothesis: *(H5) Organisations with certain sizes based on the amount of employees are more willing to invest.*

These results are presented in the two tables below.

What is the size of your organisation? * willingness to invest Crosstabulation

			Willingness to invest		
			No	Yes	Total
What is the size of your organisation?	Otherwise, being	Count	0	6	6
		Expected Count	1,1	4,9	6,0
	< 250 employees	Count	15	47	62
		Expected Count	11,3	50,7	62,0
	251- 1000 employees	Count	13	40	53
		Expected Count	9,7	43,3	53,0
	1001-2500 employees	Count	2	28	30
		Expected Count	5,5	24,5	30,0
	2501-5000 employees	Count	4	23	27
		Expected Count	4,9	22,1	27,0
	> 5001 employees	Count	7	39	46
		Expected Count	8,4	37,6	46,0
Total		Count	41	183	224
		Expected Count	41,0	183,0	224,0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7,386[a]	5	,194
Likelihood Ratio	8,989	5	,110
Linear-by-Linear Association	1,516	1	,218
N of Valid Cases	224		

a. 3 cells (25,0%) have expected count less than 5. The minimum expected count is 1,10.

Appendix 6 Project Progress Form

Record the dates of consultations with the tutor, the action points resulting from the discussions, the tasks set for the next appointment and the date for the next appointment. Record telephone conversations (date etc.) and e-mail correspondence (attach copies of any requests and responses). Ensure your tutor initials the "Task Set" section at the end of each session, and keep copies of any notes/correspondence.

Student: Nadine Wessels
Tutor: Adrienn Eros

Date	**Kind of communication (email, phone, in person)**	**Action points**	**Tasks set**	**Date of next meeting**
04-06-2014	In person	- Adapt questionnaire - Set up accompanying text for questionnaire - Process feedback	- Send out questionnaire - Start with literature research	15-7-2014
15-7-2014	In person	- Discuss literature research - Discuss analysis of questionnaire - Discuss using interviews	- Read an learn about SPSS - Start analysis data - Drop interviews	26-8-2014
26-8-2014	Skype	-Discuss hypotheses and progress of research	- Complete draft version dissertation	4-9-2014
4-9-2014	In person	- Discuss draft version dissertation	- Complete dissertation	-