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Thesis

Motivations for adopting Green IT within food processing organisations in the Netherlands

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Abstract

The Dutch government has set a climate goal to reduce greenhouse gases by 20% in 2020 compared to 1990. As a result, climate issues seems to become more important in the public debate, and the interest in sustainability developments in various industries is increasing. Food-processing organisations are a specific group of organisations that are under the influence of public opinion and must respond to sustainability concerns regarding their products. This research discusses to what extent food-processing organisations in the Netherlands are motivated to adopt Green IT to mitigate environmental impact, and if Green IT contributes to developing a sustainable competitive advantage. Based on the OGITA research model a survey was constructed and food-processing organisations were invited to participate. In practice, only a few organisations were willing to participate resulting in a small sample. The latter means that the results in this research are exploratory in nature, and do not lead to strong scientific claims. Nevertheless, some cautious conclusions can be drawn from the results. Only coercive pressure and strategic intent seem motivations for food-processing organisations to adopt Green IT. Moreover, Green IT is not seen as a means to develop a sustainable competitive advantage. These findings seem to create a field of tension if the Dutch government wants to achieve climate goals. The motivation found in strategic intent means that organisations are motivated to adopt Green IT in the long-term, but this might take years from now. Coercive pressure is a means of motivating food-processing organisations to apply Green IT but minimal legislation is in place. No other motivational reasons have been found for adopting Green IT. In conclusion, it seems food-processing organisations respond indifferent towards the use of Green IT. Strategic intent is the only organisational motivation found to adopt Green IT and is perhaps a way to radiate corporate social responsibility. Findings seem to imply that only coercive pressure will motivate organisations to apply technologies such as Green IT. With minimal legislation in place, it is not expected that food-processing organisations in the Netherlands will adopt Green IT in the short-term to increase their sustainability and reduce environmental impact.

Keywords: OGITA, sustainability, Green IT, Green IS, Institutional Pressures, climate change, sustainable competitive advantage.

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Abbreviations

CO2	Carbon dioxide
COP21	2015 United Nations Climate Change Conference
CP	Coercive pressure
CRS	Corporate social responsibility
DOI	Diffusion of innovation
ERP	Enterprise Resource Planning
EU ETS	European Union Emissions Trading System
FSSD	Framework for Strategic Sustainable Development
GDPR	General Data Protection Regulation
GHG	Greenhouse gases
GOC	Greening organisation culture
IPCC	Intergovernmental Panel on Climate Change
IS	Information Systems
IT	Information Technology
MP	Mimetic pressure
NeR	Netherlands Emission Guidelines for Air
NP	Normative pressure
NRBV	Natural Resource-Based View
OGITA	Organisation Green IT Adoption
RA	Relative Advantage
RBV	Resource Based View
SI	Strategic intent
SPSS	Statistical Package for the Social Sciences
TC^1	Technological complexity
TC^2	Technological compatibility
TMS	Top management support
UNFCCC	United Nations Framework Convention on Climate Change

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1 Introduction

Climate change is a growing concern. Humans can have a profound impact on climate change because of their large carbon footprint and dependence on energy sources derived from fossil fuel. Scientists have substantial evidence that if no measures are taken to reduce carbon emission, global temperature will rise two or more degrees with disastrous results for human existence. If humankind wants to survive, governments, organisations and individuals must now take action and unconditionally embrace sustainability so that a catastrophe can be averted.

The Netherlands wants to reduce greenhouse gas emissions by at least 20% in 2020 compared to 1990 and 40% by 2030 (Ministry of Infrastructure and the Environment, 2014). These objectives were agreed upon at the last meeting of the United Nations Framework Convention on Climate Change (UNFCCC) in Paris (COP21). To achieve these agreed climate objectives some challenges will have to be solved. Currently, the primary control mechanism for regulating greenhouse gas (GHG) emissions is the European Union Emissions Trading System (EU ETS). The EU ETS presently regulates 45% of the total greenhouse gas emissions (European Union, 2013). This means that 55% of the emissions are not directly under the command of the EU ETS, which suggests there is much room for interpretation regarding environmental performance. The latter raises the question how organisations not under control of the EU ETS perceive sustainability and if they actively try to mitigate their environmental impact.

In this study, an assessment is made of the food-processing industry in the Netherlands to investigate to what extent green information technology (Green IT) is used to reduce the environmental impact. The aim of this research is twofold. First, to reach a sounder comprehension of whether, and if so, why food-processing organisations adopt Green IT. Secondly, how and whether Green IT contributes to the development of sustainable competitive advantage within food-processing organisations. To find answers, the research model of the *Organization Green IT Adoption* is used as a guideline, or in short OGITA (Deng & Ji, 2015). By evaluating the OGITA research model and additional information on developments regarding the acceptance of Green IT, a better understanding is obtained about what motivates organisations to reduce their environmental impact and what drives them to do so.

1.1 Research question

Climate change seems to be a growing problem and organisations have to adjust their vision accordingly. Organisations have a dependency on the external environment in which they operate and will have to decide how they respond to changing circumstances. Changing circumstances driven by external developments are referred to as external factors. Strategic choices and decisions made within organisations on how to react to changing circumstances are referred to as internal factors. With the use of Green IT, possible benefits can be achieved that contribute to the sustainability of the organisation and may also contribute to the development of sustainable competitive advantage. The combination of external factors, internal factors and the role of Green IT in regard to sustainable competitive advantage leads to the next research question.

What internal and external factors influence organisations in the Dutch food-processing industry to adopt Green IT and does Green IT adoption contribute to the development of a sustainable competitive advantage?

To answer the research question hypotheses formulated and presented in chapter 3. Hypotheses are based on the OGITA research model (Deng & Ji, 2015). Every hypothesis is explicitly addressing an internal or external factor that is of influence on food-processing organisations. Quantitative data is collected through a survey distributed by email. The collected data is used for calculating statistics and report significant results about what factors motivate organisations to adopt Green IT and also whether Green IT contributes to sustainable competitive advantage.

1.2 Targeted organisations

This research aims to understand what motivates food-processing organisations in the Netherlands to adopt Green IT. The importance of IT within organisations will likely depend on the organisation size. To prevent organisations are selected where IT plays a subordinate role because a selection is applied. Organisations are selected ranging from 25 employees and up economically active in the production of food and beverage in the Netherlands.

1.3 Research objectives

Climate change is a worldwide problem, and the situation does not seem promising at this moment. If organisations see the mitigating of their environmental impact as an opportunity to distinguish themselves from competitors, sustainability might become a new standard, stimulating the economy and contributing to reducing greenhouse gases. If not, society as a whole can face major challenges and other measures will have to be taken. To prevent a catastrophe, any insight related to climate performance is more than welcome. If a positive trend is found in adopting Green IT this means organisations are mitigating environmental impact. If organisations adopt Green IT to develop a sustainable competitive advantage, this can mean that awareness grows and that the potential of green technology is recognised. In a broad perspective, a better understanding is sought not solely related to whether organisations recognise the problem, but also how they are progressing in mitigating their environmental impact. In summary, the research objective is to provide more insight into the sustainability developments within food-processing organisations in the Netherlands and aims to find sufficient evidence to support evidential claims.

1.4 Value and contribution of this inquiry

By carrying out this research, information will become available about the environmental performance of food-processing organisations in the Netherlands. From an academic point of view, this research contributes to the descriptive literature by applying OGITA specifically to food-processing organisations in the Netherlands. Also, it provides valuable insight into the most critical external pressures, and internal motivations are for adopting Green IT. In the broadest sense, this research provides valuable insight into the environmental performance of food-processing organisations. More specific, this research will contribute to a better understanding what motivates organisations to adopt Green IT. Regardless of the outcome, the results will provide valuable insight into what motivates food-processing organisations in the Netherlands to use Green IT and whether they thereby develop a sustainable competitive advantage.

2 Literature Review

To investigate why sustainability, and as part of it Green IT, becomes essential for food-processing organisations a short overview is given about climate change in general and also the problem faced by the Dutch government. From this general perspective, an overview is presented of the role the food industry in which food-processing organisations operate and what consumer behaviour is recognised. Following the general introduction, the terminology Green IT is clarified and how Green IT can be used to mitigate environmental impact. Once the general conditions and definition are explained, the OGITA (Deng & Ji, 2015) model is introduced. In addition, the theories used in the model are addressed. To view theories from a broader perspective, a discussion is started based on previously conducted research in accordance with the introduced external drivers and internal motivations as used in OGITA. The final section of this chapter an explains in what way Green IT can contribute to developing a sustainable competitive advantage.

2.1 A general overview of climate change

Climate change has become more visible in the past decades. As well on land, as in seas, the devastating effects of climate change are becoming evident, and it threatens to change for the worse, threatening species and society as a whole. Corel Reaves disappear due to pollution and rising sea temperature, glaciers are melting, and the North Pole is shrinking (Flannery, 2015). Humanity faces a considerable challenge because more extreme weather events are expected to happen, and earth might strike back with devastating results. While the influence of people on climate change seems evident, most people distance themselves from the subject because they feel powerless and see no possibility to change their behaviour, the problem is 'just' too big (Stoknes, 2015). There is limited legislation in place to reduce greenhouse gases (GHG), and it is hard to align economic interest with the problem of global warming. On the last climate conference held in Paris December 2015 (UNFCCC, 2015) some goals were formulated by 195 countries. Although the press release states, "….*first-ever universal, legally binding global climate deal*" (European Commission, 2015), commitment seems wafer-thin. This becomes painfully visible on 1 June 2017 when President Trump announces America will withdraw from the Paris agreement (Ben van Raaij, 2017). The aspect 'legally binding' is aimed at the ambition to reduce the effects of climate change, but in reality, the objectives can be ignored without sanction. Tim Flannery also recognises this problem in his book "*An Atmosphere of hope*" (2015). Economies mostly dependent on fossil fuel and if no action is taken, emissions will not decrease but increase instead due to the growing economy (Flannery, 2015). Although targets are set to reduce GHG in Europe by 20% in 2020, the Paris agreement does not require legal action until 2020 (Anon, 2016). The implications would be to leave it up to organisations by stimulation measures with subsidy and other financial benefits, but is this enough? Projections are that humans released 40 gigatonnes of CO2 in 2014 of which about 80% directly related to burning fossil fuels for energy and transport (Flannery, 2015). With minimal legislation and growing demand for energy, climate change seems to become one of the most challenging problems governments, and organisations face around the world. At present, the attitude towards climate issues seems to change. Governments, organisations and public opinion push the climate debate, it seems a tipping point has been reached, and a new equilibrium is sought by all stakeholders (Stoknes, 2015).

2.1.1 *Climate goals of the Netherlands*

The Dutch government set a target to reduce GHG by 20% in the year 2020 compared to 1990 ("Klimaatbeleid," n.d.). This goal has been formulated in 2007 and endorsed by the European Parliament in its resolution on 31 January 2008 (European Parliament, 2009). In 2011, a letter was sent from the ministry of infrastructure and environment, the message was clear, targets most likely would be in reach, and the Netherlands was on track in accordance with the 2008 resolution. Recently in 2016, questions were asked in the second chamber (part of the Dutch government) about CO2 reduction. The conclusions were that in 2016 there is almost no further decrease in emissions compared to 2015 (H.G.J. Kamp & Sharon A.M. Dijksma, 2017). What is important to emphasise here is that the economy has grown 60% between 1990 and 2015, while CO2 emissions are about the same as 1990, showing only a small decline in GHG emission (CBS- Central Bureau voor de Statistiek (NL), 2016). The Dutch climate agenda is in accordance with the IPCC ("Klimaatbeleid," n.d.). According to the IPCC, it is necessary to reduce greenhouse gases, another 40% to 70% by 2050 compared to 2010 and nearly reduce emissions to zero by 2100 to keep the planet from warming more than 2 degrees Celsius (IPCC, 2014, p. 82). Currently, the EU ETS targets 45% of the GHG emissions produced by approximately 11,000 power stations and manufacturing plants in Europe[1] (European Union, 2013). It seems the EU ETS alone has not caused the effect to comply with the 20% GHG reduction by 2020. Also, slowing progression might raise questions for policymakers on how to reduce GHG and how to urge organisations to become sustainable. It seems unlikely climate goals will be achieved without the support from organisations.

2.1.2 *Food-processing industry*

The total industrial food system is estimated to be responsible for 44 up to 57% of all global GHG emissions (Grain, 2011). Its estimated food production from fertiliser to packaging is responsible for 19%-29% of global anthropogenic GHG emissions (FAO, 2015; Gilbert, 2012). Emissions produced by the food industry include major GHG such as carbon dioxide, methane and nitrous oxide (FAO, 2015). There is an important side note to add, the food industry, in general, lacks a clearly defined definition. Without a precise definition, it is difficult to estimate which organisations fall under which parts in the food industry and on which such a statement is based. The European Commission also recognises the absence of a precise definition, figures relating to emissions in the agricultural sector are combined with hunting and forestry. For instance, specific regional data per sector within the food industry only provides limited insight (European Commission, 2007; Mcarthur, n.d.). Because the lack of a generally accepted definition in this research the following definition is used to define the food industry, "*The food industry is the complex network of farmers and diverse businesses that together supply much of the food consumed by the world population*" ("Food industry," n.d.). This research targets the food-processing industry, which is part of the food industry as a whole. Food-processing organisations process raw materials, such as agricultural products, into food for consumption on an industrial scale. Consumers have become more aware and critical of how food is produced. In a market analysis report "*Global Trends Sustainable Food and Beverages*" (2011), it was found that the majority of people worldwide (58%) feel it is important to buy ethical or socially responsible food products and 43% changed their buying behaviour (Canada, 2011).

[1] "*28 EU Member States plus Iceland, Liechtenstein and Norway*", (European Union, 2013).

An overview is shown in Figure 1; it shows the purchase behaviour for food products of consumers per country. China, India and Brazil show the highest number of people altering their response and purchasing behaviour. Cultures that are more western seem to score significantly lower.

To what extent do you agree or disagree with the following statements?

	It is important to buy ethical or socially responsible products			*I have altered my purchasing habits to purchase more ethical or*		
	Agree	Neither agree nor disagree	Disagree	Agree	Neither agree	Disagree
ASIA PACIFIC						
Australia	57%	33%	9%	44%	38%	18%
China	83%	16%	1%	69%	28%	3%
India	80%	13%	7%	75%	18%	8%
Japan	51%	44%	5%	27%	61%	11%
South Korea	74%	24%	2%	55%	38%	7%
EUROPE						
France	61%	32%	7%	45%	36%	19%
Germany	41%	45%	14%	27%	46%	27%
Italy	58%	36%	6%	39%	43%	18%
Netherlands	35%	50%	15%	16%	43%	41%
Russia	49%	32%	19%	39%	36%	25%
Spain	62%	30%	8%	47%	41%	12%
Sweden	41%	45%	14%	27%	51%	22%
U.K.	44%	42%	13%	35%	38%	27%
LATIN AMERICA						
Brazil	86%	11%	3%	65%	27%	8%
NORTH AMERICA						
U.S.	50%	40%	10%	36%	41%	23%
GLOBAL						
Overall	**58%**	**33%**	**9%**	**43%**	**39%**	**18%**

Figure 1 - Source: Global Trends Sustainable Food and Beverages (Canada, 2011)

The Netherlands shows the lowest agreement scores, only 35% agree with the statement that it is essential to buy ethical or socially responsible products and only 16% altered their purchasing habits. It seems the Dutch are very indifferent in response to purchasing sustainable products. Aforementioned might also imply the Dutch food-processing industry feels less pressure from consumers to produce in an environmentally friendly way. Because the climate debate is gaining momentum, it is expected awareness will grow among consumers. Organisations now have the opportunity to contribute to sustainability while improving productivity, lowering costs and increasing profitability through the use of Green IT (Watson, Boudreau, & Chen, 2010).

2.2 What is Green IT

Much ground is covered in the last decades addressing green in information technology. Still, the terminology lacks a generally accepted definition (Elliot & Binney, 2008). A distinction is made between the definition of Green IT (Information Technology) and Green IS (Information Systems) (Dedrick, 2010; Loeser, 2013). There are several practices and frameworks proposed, but no general model covering all aspects of Green IT and IS is generally accepted. This research uses the definition Green IT an umbrella terminology addressing both Green IT and IS (as later explained in this chapter). For clarification, the distinction between Green IT and IS is explained. In general, Green IT intends to find practices to minimise the environmental impact of computer equipment and peripherals throughout the lifecycle of the product, while Green IS aims to find practices and solutions to reduce environmental impact internally and externally by the use of information technology. To visualise the distinction more clearly Figure 2 is used.

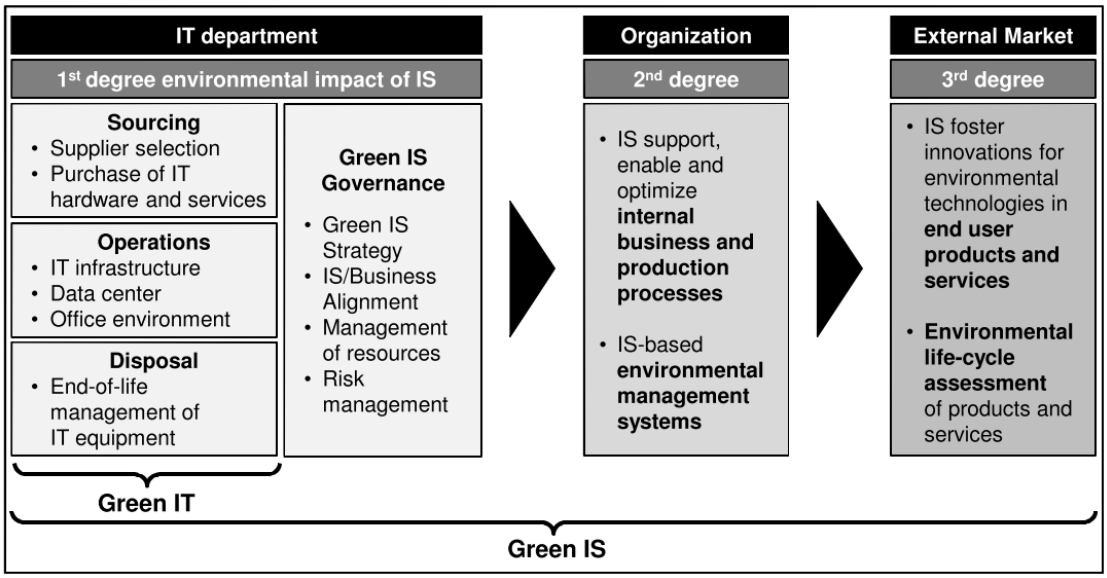

Figure 2 - Distinction between Green IT and IS (Loeser, 2013)

Figure 2 displays different focus areas displayed in three domains, or the 1st, 2nd and 3rd degree. The first degree is mainly focusing on core infrastructure and direct effects within an IT department. Equipment, power consumption, lifecycle management and other IT infrastructure elements are deployed with the aim to reduce environmental impact. The second degree is targeting the organisation and is focusing on optimising internal processes. The third degree also takes into account the external environment or external market, searching for ways to optimise the products and services. Once green adoption pushes on and beyond the IT infrastructure, IS solutions can be used to optimise the organisation and the surrounding environment they operate in, maximising environmental yield.

Definition of Green IT used in this research

Green IT and IS has been studied extensively, and different angles of incidence have been argued. OGITA uses a broad definition combining Green IT and IS (Deng & Ji, 2015). The definition originates from a study "*The role of IT for environmental sustainability in China: an empirical analysis*" (Cai, Chen, & Bose, 2013). The Green IT definition used states the following:

> *"Green IT is the practice of designing, manufacturing, using and disposing of computer, servers and associated subsystems efficiently and effectively with minimal or no impact on the environment, and with a strong focus on using information systems to enhance sustainability across the economy."* (Cai et al., 2013, p. 493)

What is important to emphasise here is that the definition does not solely focuses on IT equipment like servers and computers, but also on IS (information systems). As presented in Figure 2 Green IT corresponds with the 1st to the 3rd degree, addressing the internal and external environment part of its domain. In conclusion, this research uses the terminology "Green IT" as proposed and thus constitutes an umbrella terminology including both IT and IS.

2.3 Organisational Green IT Adoption Research Model

OGITA is a research model developed by Deng & Ji in 2015 and recognises some internal motivations and external drivers that are of influence on organisational Green IT adoption. The research model is offering a more *"holistic"* view of what drives organisations towards Green IT adoption and if adoption contributes to sustainable competitive advantage. In the following sections, the original work by Deng & Ji (2015) is assessed and complemented with additional information for clarification if needed.

2.3.1 Theoretical background on OGITA

OGITA is emphasising on several theories and explains two essential aspects. Firstly, it explains why organisations adopt Green IT for which the following theories are used: a) Diffusion of innovation (DOI) theory (Rogers, 1962), b) Institutional theory (DiMaggio & Powell, 1983; Scott, 1995) and c) Organisational Culture Theory (Allaire & Firsirotu, 1985). Secondly, how the use of Green IT can contribute to developing sustainable competitive advantage, the theories used are: d) Resource-Based View (Barney, 1991; Wernerfelt, 1984) and e) Natural-Resource-Based View (Hart, 1995). Based on theories above, internal motivations and external drivers are converted into pressures that work on and in an organisation. To visualise the internal motivations and external drivers, the OGITA research model is displayed in section 2.3.2.

2.3.1.1 Theoretical Motivations for Adopting Green IT

Many theories have been developed to provide insight into *why* organisations develop in a certain way and what motivates them to do so (Deng & Ji, 2015). Assumable the reasons for changing will differ per organisation. It can be because of shifting organisational culture, the availability of successful new technologies or externally from public opinion. Motivations will likely vary and to better understand these different pressures 'on' or 'in' an organisation, the following three theories are used.

a) Diffusion of innovation (DOI) theory

The diffusion of innovation theory was first published in 1962 by Everett Rogers (Rogers, 1962). Diffusion of innovations (DOI) is a theory that seeks to explain how and why new ideas or technologies are adopted and how they spread through organisations or among groups of people. There are five essential characteristics recognised that will determine if people use an innovation: 1) relative advantage, 2) compatibility, 3) complexity, 4) trialability and 5) observability. The theory of Rogers study is focusing on individual adoption (Rogers, 1962). Because OGITA is focusing on organisations, the view of Andrew van der Ven (1993) is adopted. Van der Ven argues innovation characteristics play an important role in organisational adoption and thereby refers to, relative advantages, technical compatibility and technical complexity. (van der Ven, 1993).

b) Institutional theory

The institutional theory was first introduced in sociology. The theory provides an insight into how organisations become homogeneous under the influence of social pressure (Scott, 1995). The process of how and why organisations become heterogeneous can best be described as isomorphism. There are three main types of isomorphism normative isomorphism, coercive isomorphism and mimetic isomorphism (DiMaggio and Powell, 1983). Deng & Ji use institutional theory because it provides insight into the reason arising from institutional pressure for accepting Green IT (Deng & Ji, 2015). In the OGITA research model, the institutional theory is

primarily used to capture external pressures to discover what motivates organisations to adopt Green IT. The pressures referred to are, coercive pressure, mimetic pressure and normative pressure.

c) Organisational Culture Theory

Organisational culture is the essence of organisational existence because its members create and maintain a shared sense of reality. Organisational Culture Theory is a broad concept supported by studies at various levels found in organisations (Allaire & Firsirotu, 1985). There have been some studies concluding the positive relationship between organisational culture and Green IT adoption (Deng & Ji, 2015). The relations between organisation culture and IT adoption can differ per organisation. Cultural traits can be of influence on the willingness of the organisation to adopt new technology. In the OGITA research model, its proposed organisation culture plays an essential role in Green IT adoption, especially if there is a greening organisation culture this will likely positively contribute in sustainability practices (Deng & Ji, 2015).

2.3.1.2 Theoretical drivers for developing a sustainable competitive advantage

OGITA research model uses two theories to relate Green IT to sustainable competitive advantage. One, the Resource-Based View (RBV) (Barney, 1991; Wernerfelt, 1984) and two, the Natural Resource-Based View (NRBV) (Hart, 1995). Both theories acknowledge that organisational resources can build unique advantages. According to Hart (1994), the RBV might be inadequate and possible destructive because it lacks a relation to the natural environment (Hart, 1994, p. 2). Because the NRBV builds upon the knowledge of the RBV, both theories are explained below.

d) Resource-based view (RBV)

The resource-based view suggests a firms resource can contribute to building competitive advantage. Wernerfelt first introduced the theory itself with a focus on strategic management (Wernerfelt, 1984). Later, in 1991 the RBV theory was formalised, recognising that resources can contribute to sustainable competitive advantage (Barney, 1991). According to Barney, a resource must have four attributes to become unique and contribute to sustainable competitive advantage. 1) It must be valuable, in the sense that it exploits opportunities and, or, neutralises threats in a firm's environment. 2) It must be rare among a firm's current and potential competitions. 3) It must be imperfectly imitable. 4) There cannot be strategically equivalent substitutes for this resource (Barney, 1991). The resource-based view is one of the most influential theories in the history of management theorising (Kraaijenbrink, Spender, & Groen, 2010). Within the OGITA research model, the RBV is used to explain the potential of Green IT as a resource to build a sustainable competitive advantage.

e) Natural-Resource-Based View

While the Resource-Based View builds on firm resources, the Natural Resource-Based View introduces the firm's relationship to its natural environment (Hart, 1995). The NRBV build upon three interconnecting strategies connecting the firm to its external environment. The strategical goals to pursue are; pollution prevention, product stewardship and sustainable development. Pollution prevention aims to reduce emissions using continuous-improvement mechanisms and explicit environmental objectives. Product stewardship aims to select raw materials and

product designs to reduce environmental impact. Sustainable development is promoted through an active social, environmental goal. Together, the three aim to reduce the environmental impact of the entire organisation. Within the OGITA research model Green IT can be used to acquire an environmental resource while also providing a potential source for building competitive advantage (Deng & Ji, 2015).

2.3.2 *Organisational Green IT Adoption research model*

Based on the theories outlined in the previous sections, the relationship between the organisation and the adoption of Green IT is made visible in the OGITA research model in Figure 3 (Deng & Ji, 2015). A distinction is made between external drivers and internal motivations for adopting Green IT and subsequently, Green IT as a driver for creating a sustainable competitive advantage. The external drivers are 'technical context' and 'institutional pressures', both subdivided into several elements per driver. 'Internal motivations' focus on internal elements that characterise the organisation.

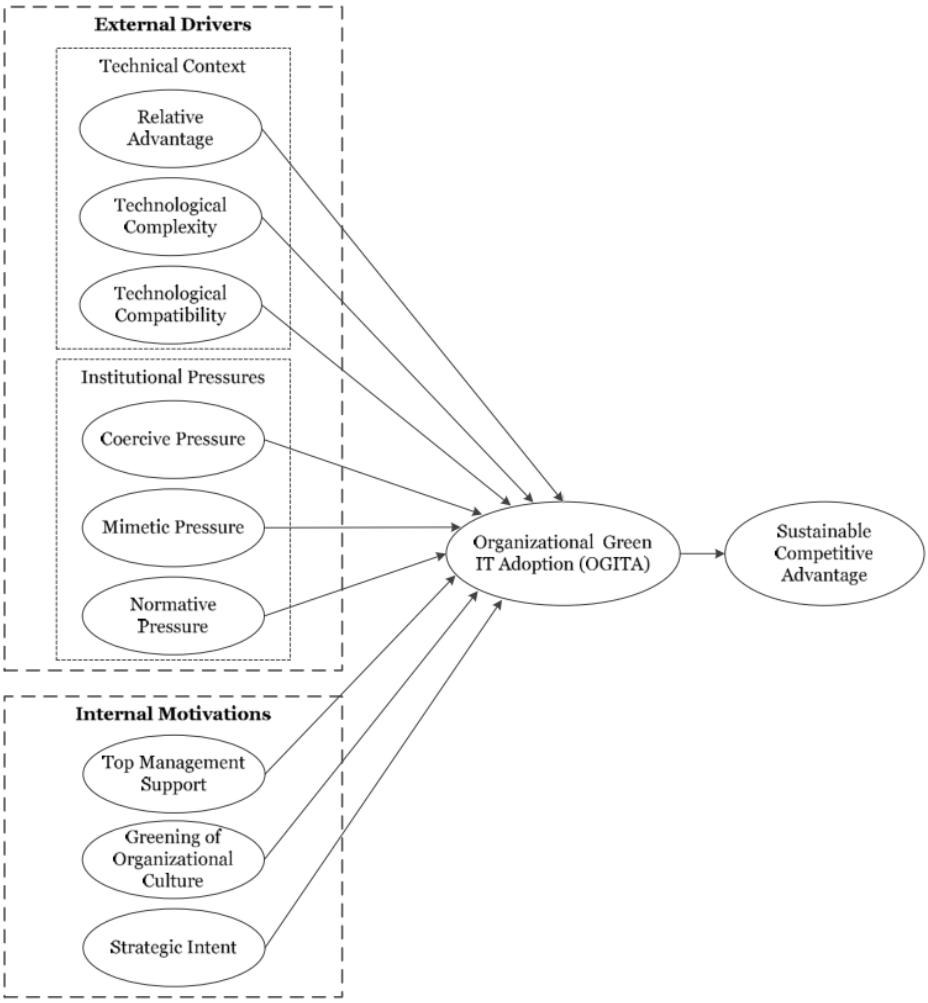

Figure 3 - Organisational Green IT Adoption research model (Deng & Ji, 2015)

In the next sections, the theories used in the OGITA research model by Deng & Ji (2015) are further explained to clarify the distinction between external drivers and the internal motivations. The evaluation provided is based on the original theory as provided in the OGITA research model (Deng & Ji, 2015).

2.3.2.1 *External Drivers*

The OGITA research model recognises two external drivers that arise from developments outside the organisation, technical context and institutional pressure. Both drivers create pressure exerted upon organisations from the outside environment. Opportunities and limitations can arise from external drivers. As a result, organisations are likely to exhibit specific behaviour when dealing with such external drivers. Below, the external drivers are further elaborated to distinguish them from each other and to make them specific.

Technical Context

The diffusion of innovation theory is used to explain the technical context. Three of five essential characteristics derived from the DOI theory that are used in the OGITA research model. The ones used show innovation characteristics, namely, relative advantage, technological complexity and technological compatibility (Rogers, 1962; van der Ven, 1993).

Relative advantage – Relative advantage refers to superior technical solutions. For example, relative advantage can be obtained by, cost reduction, emission reduction and IT innovations. Innovations are all aiming to develop superiority to become highly competitive.

Technological complexity - Technological complexity refers to the how accessible the technology is and if the technology is easy to use. Very complex technologies are difficult to use or understand and might restrain organisations from successfully implementing new technologies.

Technological compatibility - Compatibility refers to the integration possibilities with existing and new IT systems. If innovative technology is not compatible with existing technology infrastructure, it can be challenging to find support for the deployment of new technologies.

Institutional Pressures

The institutional theory acknowledges that institutions and social developments can exert pressure upon organisations. A distinction can be made between the type of pressure and the way in which it is exerted on an organisation. Three analytically separable forms of pressure are recognised, normative pressure, coercive pressure and mimetic pressure (Davidsson, Hunter, & Klofsten, 2006).

Coercive pressure - Coercive pressure is exerted upon organisations by legislation or regulation of formal institutions.

Mimetic pressure – Mimetic pressure is representing the demands to imitate other organisations to cope with uncertainty.

Normative pressure - Normative pressure consists of social pressures that are exerted upon organisations and its members to conform to certain norms.

2.3.2.2 *Internal Motivations*

Top management support, greener organisational culture and strategic intent will largely determine how the organisation handles sustainability issues. The internal motivations or the properties that an organisation possesses will largely determine whether, for example, Green IT will be used. To explain how specific internal

motivations of the organisation contribute to the introduction of sustainable green policies and practises are explained in this section.

Top Management Support – Top management support is an essential motivator for innovation within an organisation and support is therefore crucial to embrace new technology. If an organisation wants to adopt Green IT, it is likely that new technology needs to be introduced and, as a consequence, investments are probably necessary. In literature, there is no consensus on *who* precisely represents top management (Madanayake, 2014). Terminology like champions, senior management and top management are all used to address key decision makers. In this research, top management refers to the highest-ranking executives who make strategic decisions, set long-term goals and plan investments.

Greening Organisational Culture – A greening of organisational culture can be a positive motivator for organisations to adopt Green IT. Some literature is mainly focusing on economic and environmental benefits arising from a greening organisational culture (Harris & Crane, 2002). However, besides economic and environmental interest, organisations can also benefit from a more attractive image (Yang, Sun, Zhang, & Wang, 2017). Den & Ji (2015) describe two essential aspects of greening organisational culture that can contribute positively to an organisation. On the one hand the resource-based view, which emphasises on the development of a unique competitive advantage hard to imitate by the competition. On the other hand, the strategic-fit perspective, where sustainability is of importance to stakeholders. A green organisation culture will likely positively influence Green IT adoption.

Strategic Intent – Strategic intent addresses long-term goals that go beyond strategic planning, working on the organisational mission, vision and goals (Mburu & Thuo, 2015). The earliest discussion on strategic intent is was described as the long-term goals of an organisation (Prahalad & Doz, 1987). Following up on the introduction in 1987, various definitions were formulated to create a better understanding of the fundamental drivers. Strategic intent was later further explained by Hamel and Prahalad as strategic leadership aiming to become superior in the market, formulating long-term views of 10 to 20 years as well as setting a purpose and goals for the organisations (Hamel & Prahalad, 1989).

2.3.2.3 *Green IT to create Sustainable Competitive Advantage*

The Resource-Based View and the Natural Resource-Based View are two essential pillars in the OGITA research model to explain how Green IT can lead to sustainable competitive advantage (Deng & Ji, 2015). As earlier explained in section 2.3.1.2 the theories are both pushed forward if an organisation wants to develop a sustainable competitive advantage. Within the field of Green IT, it is recognised that IT can become a valuable resource offering much potential to an organisation. To emphasise aforementioned a quotation from Deng & Ji is used: "*The adoption of Green IT could be viewed both as acquisition of IT resource and as improvement of IT capability*" (Deng & Ji, 2015, p. 8). If Green IT is seen as a resource that can be used to build IT systems that are unrivalled by competition and difficult to imitate. Green IT can likely offer the potential to contribute to developing a sustainable competitive advantage.

2.3.3 *Summarizing on the OGITA research model*

In the previous sections the work of Deng & Ji is evaluated (Deng & Ji, 2015). The theories presented find their origins in the original work of Deng & Ji (2015). In some cases, additional information was provided to substantiate specific insights

further. In the following sections, additional literature and research are evaluated that relates to the external drivers and internal motivations used in the OGITA research model.

2.4 OGITA research model in relation to existing work

In this section, background information has been added that is related to the OGITA research model. Previously conducted research and publications will be evaluated and found knowledge will be used to explain the internal motivations and external drivers presented in the OGITA research model to better understand them. The information is intended to explain and clarify the discussion about sustainability and to provide insight into current developments. The same structure is applied as in the previous sections, working from the external drivers to the internal motivations.

2.4.1 Technical context stimulating OGITA

Within the technical context, adoption of Green IT can offer organisations the opportunity to optimise operation and enhance services while minimising cost. These enhancements offer a relative advantage and potentially contribute to competitive advantage. There are also possible inhibitory effects like technical complexity, which can restraint organisations for adopting new technology. Also, as complexity increases, this can prevent organisations from adjusting or adding new IT systems because they involve risks and high costs. Still, the advent of compatible smart devices offers an opportunity to reduce the environmental impact beyond the boundaries of the organisation. In the next three sections, the technical potential and limitations will be discussed in more detail.

2.4.1.1 Green IT to gain Relative Advantage

In 2007 an estimate was made that 2% of the GHG was produced by ICT worldwide (Gartner, 2007). The 2% itself seems to present a small percentage, but ICT also offers the opportunity to further reduce GHG (Añón Higón, Gholami, & Shirazi, 2017). It is expected ICT will be responsible for 3% (2.8%) of the total GHG worldwide by 2020. From an optimistic point of view, this offers the potential to reduce the remaining 97% (Dedrick, 2010). Organisations globally have a profound impact on earth resources and society in general. Green IT can offer an opportunity for further mitigate environmental impact by the use of advanced Green IT technologies (GeSI, 2008a, 2008b, 2012; Melville, 2010). Some research estimates that Green IT-enabled solutions can offer a reduction of GHG by 16.5% by 2020 (GeSI, 2012). This reduction is of course only feasible if organisations implement Green IT. Currently, the main reason for pursuing Green IT seems cost reduction and reducing GHG is not the primary goal (Dedrick, 2010; Molla, Pittayachawan, Deng, & Corbitt, 2009). Still, the benefits arising from the deployment of Green IT will probably have a positive side effect on organisations. The operational performance can increase because processes are supported by the latest technologies. Moreover, the use of new green technologies can reduce waste in production, so that an organisation can reduce operational cost and optimise their production while reducing their impact on the environmental. The result is that an organisation can acquire a unique position in comparison to competitors. The moment an organisation tries to gain or gain a technological advantage over competitors with technology, or in our research Green IT, this is seen as a relative advantage.

2.4.1.2 *Green IT in relation to Technological Complexity*

Green IT can offer excellent opportunities for organisations optimise their performance, but there are some considerations to make. For example, ERP (enterprise resource planning) information systems can help organisations to optimise operations by providing insight into resource consumption. It is to expect that more and more smart technology will become available which can contribute to organisational performance and to provide insight into more details. ERP systems can be useful for organisations to provide such insight. When also Green IT is adopted building a sustainable IT resource and mitigate environmental impact at the same time, it is to expect complexity is reduced, because the latest technology is used. Although this might be true, ERP implementation can also lead to disaster when no proper risk management is applied (Gefen & Ragowsky, 2005; Yajun Zeng, 2010). Technical complexity can also become a challenge if the technology is not understood and this can slow down the implementation process. According to analyst firm Gartner, approximately 55 to 75 percent of all ERP projects fail (Deloitte, 2015). Therefore, on the one hand, complexity could stop organisations from integrating or replacing existing systems with Green IT solutions because it is too difficult, complicated and costly. On the other hand, if Green IT is taken into account as part of a new implementation of, for example, ERP, Green IT offers organisations opportunities to position themselves in a favourable position in relation to competitors. Technical complexity will likely grow in the coming years due to the increasing number of legacy systems that lack integration options (Gartner, 2016). Legacy systems might lead to problems with integration between systems and will likely increase technical complexity (Ganly, Hestermann, & Hardcastle, 2015). In short, the use of new Green IT technologies can help organisations to reduce the technical complexity. Still, due to the high replacement cost of existing legacy systems, complexity will likely increase, and restrained organisations from fully implement Green IT at this moment.

2.4.1.3 *Green IT in relation to Technological Compatibility*

Many organisations lack a postmodern application integration strategy or in other words, run information systems that are difficult to integrate and lack compatibility. Estimates are legacy systems will cause integration disorder, greater complexity and higher cost within 90% of organisations by 2018 (Gartner, 2016). If Green IT is seen as a means to become future-proof, ERP or other IT systems will probably have to be integrated, which may not happen because of this aforementioned integration disorder. In a survey conducted in 2013 by Ernst & Young in cooperation with GreenBiz, evaluating growing trends in corporate sustainability, the following is stated about corporate sustainability reporting, "*those tools remain rudimentary, even primitive, compared with those used for reporting on financial measures*" (Ernst & Young & GreenBiz Group, 2013, p. 29). The findings of Ernst & Young about integrating sustainability reporting applications seem to underline the findings by Gartner about integration disorder. Aforementioned could eventually lead to the replacement of equipment and IT systems due to a lack of compatibility. Replacement of legacy systems with new equipment might have a downside. The production of equipment uses toxic substances and has become a significant source of contamination named e-waste. Also, recycling old equipment also creates e-waste because not all parts and chemical components can be reused. E-waste has a profound impact throughout the lifecycle of the technology, which can become a problem if no proper lifecycle management is applied (Elliot & Binney, 2008). If technology becomes obsolete due to the lack of compatibility, old systems need replacement due to a misfit with its current IT environment. Because equipment needs to be replaced by newer Green IT systems,

the amount of e-waste will probably increase. Some critics note more research on e-waste is needed because current numbers presented are too optimistic and might lead to bias on environmental benefits of Green IT (TheElectronicsTakeBackCoalition, 2017). Previously mentioned leads to ambiguity about Green IT. On the one hand, the amount of devices and IT equipment is growing, potentially leading to more obsolete equipment leading to more e-waste. On the other hand, smart technologies can offer great potential for reducing GHG (GeSI, 2012). Due to the increasing available and easy to integrate systems and technologies such as smart devices, cloud solutions and no code development platforms, compatibility is likely to improve in the future. With the deployment of new Green IT technology, the expected integration disorder will decrease due to the introduction of new systems. If appropriate lifecycle management is applied, it is to expect Green IT will eventually generate environmental benefits.

2.4.2 *Institutional pressures stimulating OGITA*

Institutional pressures arise from external sources exerted upon organisations in several ways. When applied with force, through for example legislation, this called coercive pressure. Pressure can also arise from uncertainty. If an organisation implement Green IT just to ensure their position, this is seen as a mimetic pressure. Also, there may also be pressure from the environment, driven by the expectation that an organisation acts in a certain way, or a non-formalized standard, referred to as normative pressure. In the following sections, the institutional pressures exerted upon organisations is explained in more detail.

2.4.2.1 *Legislation and regulation as coercive pressure*

Formal institutions can exert coercive pressure upon organisations through legislation and regulation. As stated in the introduction no legislation is in force explicitly targeting the reduction of GHG emissions. Although it appears that coercive pressure is not present, an indirect pressure that exerts coercive pressure upon organisations. There is legislation on how to deal with environmental topics like toxic substances, air pollution, fertilisers and pesticides. Legislation mentioned is directly, or indirect, applicable to the food-processing industry and can be put to use for mitigating environmental impact. With the ambitions of the government to follow up on the Paris climate agreement, more initiatives have started. Currently, the Netherlands Emission Guidelines for Air (NeR) is developing guidelines for organisations focusing on reducing environmental impact ("Netherlands Emission Guidelines for Air - Rijkswaterstaat Environment," n.d.). Although the NeR authority currently functions as an advising organ that does not have a legally binding status, this may change in the near future. Government plans for 2018 show that more attention will be paid to environmental issues, where results fail, legislation will be considered (Ministerie van Financiën, 2017). In addition to the preceding, in the Netherlands governments are formed by a democratic electorate and thus under the influence of public opinion. Meaning, governments have to respond to cultural and social concerns in society. Public opinion on climate change depends on several factors, social and cultural background, political preference, financial position and media coverage are all part of how well climate change is understood (Carmichael, Brulle, & Huxster, 2017). In recent years attitude towards climate issues seems to have changed (Stoknes, 2015). The changing attitude may be because people are confronted with news reports about more extreme weather conditions related to climate change, or because more scientific publications are becoming available that are increasingly determining the effects of humanity on climate change. In essence, the paradigm seems to shift, and climate change is becoming an increasingly important subject in the public

debate. The changing opinion in society will probably influence the way governments respond to public concern and due to the growing concern on climate change result in more legislation. In the Netherlands political parties have a different view of climate change from conservative to progressive (Hilbers et al., 2017), but inevitably they will have to respond and conform in a socially accepted way. Although at the moment there is minimal climate legislation that organisations must adhere to, this is expected to change due to the fact that climate change becomes more visible year after year. It is unknown whether the current legislation can apply enough pressure on organisations to force them to become sustainable. However, if organisations feel coercive pressure, it is expected this will be a positive incentive to apply new technologies in favour of the environment.

2.4.2.2 *Mimetic pressure as a consequence of growing awareness*

The growing awareness in society about climate change can create uncertainty for organisations. For example, in a survey conducted in 2015 among Americans, people were asked about their opinion on problems faced today. When asked what the most critical problem is that America faces today, jobs and the economy were at the top of the list. When asked what the most essential problem is the world is facing, the environment and global warming where addressed as the most significant problem ("Global warming national poll resources for the future New York Times Conducted by SSRS," 2015). What emerges from the above research is that the urgency and the scale of the changing climate are recognised, implying that a solution must be sought. How is yet to determine, creating uncertainty for organisations. As a result, some organisations recognise this implication by presenting themselves as sustainable. In a study performed by Delmas & Toffel in 2003, about institutional pressure in relation to environmental management practices the following statement is found, "*Several studies have found that company decisions to adopt environmental management practices are influenced by the desire to improve or maintain relations with their communities*" (Delmas & Toffel, 2003, p. 10). From the preceding, one can conclude that organisations can see an economic interest in displaying sustainable, but perhaps also to protect themselves from having no answer critical questions from society regarding environmental their performance. According to some research, organisations active in the food industry are prime targets for public concern about perceived shortcomings in the supply chain (Maloni & Brown, 2006). The growing demand for environmentally friendly foods suggests this will create even more uncertainty for food-processing organisations. Still, while the role of IT has substantially grown within almost every industry in the last decades, there is also evidence that mimetic pressure is not an incentive for Green IT adoption. In a case study performed in 2012 evaluating the willingness of managers to adopt green technology states, "*coercive pressure influences the attitude toward Green IS adoption while mimetic pressure does not*" (Gholami, Binti Sulaiman, Ramayah, & Molla, 2013, p. 431). The observation that only coercive pressure causes organisations to adopt Green IT also creates ambiguity. On the one hand, awareness seems to be a growing among some organisations, and in response, they practise environmental management to strengthen their relationship with the community and prevent becoming a target in public concern (Delmas & Toffel, 2003; Maloni & Brown, 2006). On the other hand, organisations are only motivated to adopt Green IT when coercive pressure is exerted (Gholami et al., 2013). The most important thing to emphasise from afore written is that this ambiguity can also be an incentive for uncertainty and might lead to a mimetic pressure as time progresses. In conclusion, it is expected that mimetic pressure will stimulate organisations to adopt Green IT to protect economic and public interests.

2.4.2.3 *Sustainability through normative pressure*

A norm is a way of doing things that according to general beliefs are considered normal. It is also a specific set value and gives the standard a reference point. Currently, a normative standard for organisations seems that they behave responsibly towards climate issues, also expressed as corporate responsibility (CRS). The extent to which organisations want to comply with this standard, or are aware of it, depends. Corporate sustainability and organisation culture are closely related also referred to as CRS by scholars (Linnenluecke & Griffiths, 2010). The terminology CSR is used to describe the integration of social, environmental and economic concerns into an organisation's culture. In a publication by Maloni & Brown (2006), a broad analysis conducted on a wide variety of pressures exerted upon the food industry by public opinion. As a result, CSR has become one of the pressures food-processing organisations have to reply too. The changing opinion on animal welfare, biotechnology, community, environment, fair trade, health and human rights are all directly related to CRS (Maloni & Brown, 2006). Consequently, organisations cannot ignore public opinion. Because public opinion cannot be ignored, it probably creates a new standard, or in other words, a normative pressure. A norm that originates from a perceived standard can also cause tension in organisations. For example, the food industry is subject to supermarket chains who want to buy products as cheaply as possible; often this is at odds with environmentally friendly production because this possibly can increase production costs and therefore the product price. Organisations can run into the problem that they cannot free up the budget to pursue CSR (Maloni & Brown, 2006). Despite the tension created by price pressure, there is a growing demand for economically friendly products. In the Netherlands, there seems to be a growing demand for Eco food by consumers. According to publications by the Ministry of Economic Affairs, consumers spend € 3.8 billion on animal- and environmentally friendly produced food in 2016, 26% more than the year before. The market share for environmentally-friendly food increased from 8% to 10% in one year, and spendings on sustainable food in the supermarket channel increased significantly in 2016 by + 36%. (Ministerie van Economische Zaken, 2014; "Rijksoverheid stimuleert duurzame productie voedsel | Voeding | Rijksoverheid.nl," n.d.). Due to the growing demand for food produced in an environmentally friendly manner and the growing importance for organisations to show CRS, normative pressure will probably increase. To secure future revenues and market share and prevent becoming the target of special interest groups it is expected normative pressure will stimulate organisations to adopt Green IT.

2.4.3 *Internal motivations stimulating OGITA*

In this section, the internal motivations for organisations to adopt Green IT is described for top management support, greening organisation culture and strategic intent. Top management support is an essential internal driver for putting sustainability on the management agenda and create conditions within an organisation to execute green strategies and practices. Moreover, organisational awareness, expressed in green organisational culture, appears to appeal employees positively. Increasing awareness of climate issues among CEOs and employees seem to stimulate a green organisational culture. Lastly, strategic intent is discussed relating to long-term organisational goals to achieve global leadership. In the next sections provides more background information about the internal motivations.

2.4.3.1 *The role of Top Management Support for sustainability*

Top management support is a critical success factor responsible for successfully adopting new technology. Top management will undoubtedly need to respond to changing market conditions, and sustainability seems to become a genuine part of managerial practices but also comes with challenges. To make Green IT a success, organisations need to adopt a sustainable strategy affecting the enterprise as a whole (Olson, 2008). In a survey by MIT Sloan management review, performed across 113 countries and among 4000 managers its shown that green is an important topic in commercial businesses, approximately 70% of the respondents reported sustainability is permanently on the management agenda (Kiron et al., 2012, p. 3). Also mentioned in the same report is that two-thirds of the respondents recognise sustainability as a necessity to compete with competitors. The value of sustainability might be recognised, but positive effects might not always be visible yet. In a report published in 2010, one of the conclusions is that 93% of CEOs recognise the importance of sustainability, but most don't know how to incorporate sustainability into the organisation (Bertels, 2010, p. 6). The above may seem challenging, but at the same time promising. From a more positive perspective, one might conclude that top management support is evident and organisations are searching for ways to become sustainable. If top management support is committed to making an organisation more sustainable, a kind of framework will probably be used to guide the process. An example of such a framework that researched extensively is The Framework for Strategic Sustainable Development (FSSD[2]). FSSD is a research platform and as they see it, the main academic engine behind a global cross-sector network for sustainable strategic development. FSSD is connecting science with decision-making, their website states, "*The Alliance for Strategic Sustainable Development is an international alliance of universities aligning sustainability research with action through collaboration with businesses, NGOs, communities and policy makers*"("Participating in the Alliance for Strategic Sustainable Development - Summary and Frequently Asked Questions | Alliance for Strategic Sustainable Development," n.d.). In a recent study performed in 2017, reflecting on the 25-year experience, practice and learning about FSSD, the suggestion is made that contributions by scientists and practitioners have been successful for organisations to develop a green strategy (Broman & Robèrt, 2017). The FSSD is not only a tool for top management to implement green strategy, but the framework can also measure progress. If Top Management Support wants to implement a green strategy, they likely support the process by making funds available such as money and personnel. Moreover, it is likely that top management is involved in the implementation process. If top management pursues a green strategy, the expectation is that this will positively influence the conditions for adopting Green IT.

2.4.3.2 *How a greening of organisational culture contributes to sustainability*

A greening organisational culture refers to the internal cultural development that an organisation goes through while at the same time sustainability becomes part of their culture. Before discussing what the organisational traits are that define a green organisation culture, first, a definition is given of what an organisation culture is. In this research the following definition is used, "*Organisation culture refers to a system of shared meaning held by members that distinguishes the organisation from other organisations*" (Robbins, 2013, p. 512). Important to mention is that organisation culture is a

[2] "*In the business world, this framework is known as The Natural Step Framework*", ("Framework for Strategic Sustainable Development (FSSD*) | Alliance for Strategic Sustainable Development," n.d.).

descriptive term and not prescriptive best described as, "*Organizational culture shows how employees perceive the characteristics of an organization's culture, not whether they like them – that is, it's a descriptive term*" (Robbins, 2013, p. 514). For an organisation in pursuit of a green organisation culture, this means the organisation likely has to make sustainability part of the attitude and ethics of the organisation culture. Organisational traits that are most successful in developing a green organisation culture are a participative, open culture, a learning environment, transformational leadership and altruistic values alignment (Collier & Esteban, 2007). Still, some ambiguity is found in organisations even when they claim to build or entail a green organisation culture as found in research assessing green corporate sustainability projects (Corbett, Webster, & Jenkin, 2015). The research shows that there is an inconsistency between organisational sustainability identity and the greenness of their projects. In conclusion, the results show a mismatch of perceived green practices and real live practices when executing the projects (Corbett et al., 2015). Although results might not always be as portrayed, a greening organisational culture seems to become more important for employees. In a survey among 1020 adults working in companies with more than 1000 employees, more than half of the respondents responded they would not work for an organisation that has not got firm environmental commitments (Cone Communications, 2016, p. 5). Aforesaid could also stimulate the thought that a greening organisation culture might not just arise from managerial practices but also from within the workforce. Likely, an organisation with a green organisational culture will not make investments exclusively based on short-term objectives, but also from the conviction that investments provide climate benefits. The expectation is that a greening organisations culture has a positive effect on the adoption of Green IT.

2.4.3.3 *Strategic Intent to formulate a sustainable strategy*

Strategic intent is a long-term vision and can stretch over 10 to 20 years. Strategic intent captures the essence of winning and is stable over time (Hamel & Prahalad, 1989). The whole ordeal of strategic intent can be explained as a quest for winning at all levels of the organisation, leading the organisation to global leadership. To shape such a vision, organisations will need to develop a long-term vision looking beyond the horizon of strategic planning and bring the future into current thinking (Mburu & Thuo, 2015). The idea that IT will be an essential instrument for organisations committed to long-term survival to achieve such goals can be considered as truisms (Arvidsson, Holmström, & Lyytinen, 2014). A clearly defined strategic intent is crucial for an organisation that wants to align resources optimally. Nowadays sustainability will likely be part of this vision. Formulation of strategy and the willingness to become sustainable is not a straightforward planning process. Strategic decisions are hard to make due to uncertainty and fear of failure. Executives and managers have a hard time envisioning new strategies without falling into certainties they can plan and manage (Martin, 2014). Henry Mintzberg recognises there also a difference in deliberate strategy and emerging strategy in his article "Patterns in Strategy Formation" (1978). What is important about the findings of Mintzberg is that emergent strategy sometimes gets confused with conforming to whatever seems obvious to do. What emerges from aforementioned is that a strategy without a strong focus can best be explained as just muddling along (Evered, 1983). An ongoing study in 2015 surveyed 8000 managers in more than 250 organisations leads to the conclusion that "*several widely held beliefs about how to implement strategy are just plain wrong*" (Sull, Homkes, & Sull, 2015). The survey uncovers the mismatch between strategy formulation and the way strategy is executed across an organisation. In a top-down approach, management down the chain of command seems to shifts focus towards processes. Managing the

process seem to become a primary focal point, trying to align existing practice with organisation strategic objectives. The result is that managing the process is becoming the primary objective, focusing on risk and control, instead of seizing the opportunity in conformity with the long-term strategic intent. Some research argues, intent also comes with limitations due to the fact organisations tent to build new systems but incorporate old habits into new systems (Arvidsson et al., 2014). Aforementioned directly reflects on strategic intent and the challenge for organisations to incorporate sustainability into their strategic goals. If organisations want to include sustainability in their strategic intent and move on to strategy, a strong and clearly formulated statement is needed that determines the direction, regardless of the current status quo. The expectation is that once an organisation has a clearly defined strategic intent and translates this into strategy and goals, this will also positively stimulate the adoption of Green IT.

2.5 Green IT for developing sustainable competitive advantage

Sustainable competitive advantage arises from resources that are valuable, rare, imperfectly imitable and non-substitutable (Barney, 1991). The view presented is part of the resource-based view (RBV) and differs slightly from other views about sustainable competitive advantage. A significant contribution to the management literature comes from Porter (1985), and his work on the development of sustainable competitive advantage is widely recognised. Porter claims sustainable competitive advantage arises from unique organisational traits hard to imitate by competitors giving an organisation long-term benefits driving success (Porter, 1985). According to Barney (1991), his view on sustainable competitive advantage differs. Barney argues that Porter explains sustainable competitive advantage as a calendar period and the competitive advantage exists for as long the organisation possesses the advantage (Barney, 1991). The discussion about what sustainable competitive advantage is lies outside the scope of this research. Important to emphasise here is that sustainable competitive advantage within the RBV is not a calendar period an organisation enjoys a competitive advantage, it represents a value creating strategy not being implemented or imitated by competitors at the same moment in time (Barney, 1991). For last mentioned reason the explanation presented by Barney, in the RBV, is used in this research. In additional to the RBV the natural resource-based view (NRBV) is used as introduced by Hart in his article, "*a Natural-Resource-Based View of the Firm*" (Hart, 1995). In the NRBV, sustainable competitive advantage is brought in relation to the natural environment of an organisation. The NRBV builds on three interconnected strategies in for developing sustainable competitive advantage, namely, pollution prevention, product stewardship and sustainable development. The strategies are related to internal competitive advantage development and externally to social legitimacy. Hart recognises this potential and concludes, "*In my view, the natural-resource-based view of the firm opens a whole new area of inquiry and suggests many productive avenues, for research over the next decades*" (Hart, 1995, p. 1009). The reason to note these final words from the originating work is that 15 years later Hart & Dowel recognise there is still much work to be done by organisations to adopt the NRBV (Hart & Dowell, 2011). Hart & Dowel (2011) conclude that organisations and scholars are challenged to develop breakthrough strategies to address environmental problems, in conclusion, they acknowledge organisations are just reducing the environmental impact of their current operation, and that is not enough (Hart & Dowell, 2011). There is evidence that environmental performance is positively influencing financial performance and organisation reputation (Miles & Covin, 2000). At the time of carrying out this research, awareness of climate change seems to have increased. In

sustainable competitive advantage, consumers are likely to choose products that are produced by environmentally friendly organisations. It is expected that organisations will find ways to develop SCA and find solutions to minimise their impact on the environment. Although only the use of Green IT does not necessarily have to generate a sustainable competitive advantage, it can offer organisations the opportunity to distinguish themselves uniquely from competitors the help them become a leader within the sector. In essence, Green IT can positively influence the development of sustainable competitive advantage.

2.6 Literature summary

In this chapter, background information was provided about, climate change, Green IT, the OGITA research model and the findings to date in literature and publications. From a global perspective, we zoomed in on the objectives set by the Dutch government and the influence of the food-producing industry on the climate. What emerges from this evaluation is that in practice it proves difficult to achieve the set climate objectives set by the government. Partly because there are limited control mechanisms and partly because in practice no legal action has to be taken before 2020. To prevent confusion on the terminology '*Green IT*', the definition is presented. The definition as used in this research represents both the physical components and the information systems. After the general introduction the driving theories used in OGITA are evaluated and clarified based on the original work of Deng & Ji (Deng & Ji, 2015). Driving theories for adopting Green IT are, the DOI theory, the Institutional theory and the organisational culture theory. Also, the relationship to sustainable competitive advantage is sought based on the RBV and the NRBV. For clarification, the OGITA research model is illustrated followed by descriptions of the external drivers and internal motivations. In relation to the research model by Deng &Ji (2015) a discussion is started on existing research and publications addressing drivers for adopting Green IT. Technically seen Green IT offers the potential for mitigating environmental impact but complexity, compatibility and cost can slow progression in adoption. Institutional pressures are exerted upon organisations due to a changing political landscape and general public interest. Consumers are becoming more critical about how organisations deal with general social interests such as environmental issues. Uncertainty within organisations can be an incentive to reduce the impact on the environment, especially in order not to fall short of the competition and to prevent criticism from special interest groups. From within organisations, it seems top management, the organisational culture and the long-term objectives are increasingly focusing on sustainability. Nevertheless, it should be mentioned that although there seems to be a strong will within organisations to become sustainable, this is not always visible in practice. The potential of sustainability strategies is recognised, but it is unknown to what extent food-processing organisations are motivated to apply Green IT and whether Green IT is seen as an opportunity to develop a sustainable competitive advantage.

3 Methodology

This chapter explains the methodology used to conduct this research. The procedure is explained, and hypotheses are presented. A survey is used to gather data for this research. An explanation is given on how the survey is structured and how the process for collecting data will take place. At the end of this chapter, it is explained which statistical tests are executed to present findings and results in chapter 4. As a guideline for formulating the research methodology, the book "*The Essence of Research Methodology*" written by Jonker & Pennink (2009) is used and additional information provided by University Leiden.

3.1 Research Methodology

The methodology applied in this quantitative research is descriptive in nature. The research is planned and structured in advance so that the collected data can be used to make statistical calculations to formulate statements about the population. In order to investigate which motivations food-processing organisations have for adopting Green IT, hypothesises are used. The hypothesises are formulated based on the previous presented OGITA research model in chapter 2.3 (Deng & Ji, 2015). This research is cross-sectional, or in other words, a 'slice' is taken from the population at a particular point in time (Trochim, 2006). A quantitative approach is used, and data is collected using a survey. The questionnaire is inspired by the desk research performed in chapter 2. Food-processing organisations are selected based on the information available in the database of the chamber of commerce. The survey is carried out in two steps. First, the questionnaire is compiled and sent to an organisation to test whether questions are correctly understood. Second, food-processing organisations are invited to participate in this research. The data is analysed using analytics software SPSS and JASP. The research question is answered using inductive reasoning, working from specific applications to a general assumption, or in other words, from the bottom up.

3.2 Hypothesis formulation

In this section, ten hypotheses are presented inspired by the OGITA research model by Deng & Ji (2015) and brought in relation to the food-processing industry. A brief description of the theory used for formulating the hypotheses is attached to establish the relationship to, technical context, institutional pressure, internal motivations and sustainable competitive advantage. Each hypothesis consists of a null hypothesis (H_0) and an alternative hypothesis (H_1) that are later used for analysing the results. All hypotheses are aimed explicitly at the motivation of food-producing organisations to use Green IT and are based on external drivers and internal motivations as presented in the OGITA research model (2.3).

Technical context

Green IT technology can offer the potential for organisations to reduce cost and optimise integration with the external environment and mitigating environmental impact at the same time, creating a relative advantage (RA) (2.4.1.1). The downside is that technological complexity (TC^1) might stop organisations from adopting Green IT due to high investment costs and the risk involved (2.4.1.2). When organisations use new compatible technology and apply proper lifecycle management, it is to expect technological compatibility (TC^2) will offer the opportunity to mitigate environmental impact (2.4.1.3). The following hypotheses are formulated to examine this premise:

$H_0$1a Relative advantages have no influence on organisational Green IT adoption in the food-processing industry.

$H_1$1a. Relative advantages have an influence organisational Green IT adoption in the food-processing industry.

$H_0$1b. Technological complexity has no influence on organisational Green IT adoption in the food-processing industry.

$H_1$1b. Technological complexity has an influence on organisational Green IT adoption in the food-processing industry.

$H_0$1c. Technological compatibility has no influence on organisational Green IT adoption in the food-processing industry.

$H_1$1c. Technological compatibility has an influence on organisational Green IT adoption in the food-processing industry.

Institutional Pressures

The Dutch governments and formal institutions increasingly start to regulate GHG emission to comply with the set objectives to reduce GHG in correspondence with the Paris climate agreement. It is to expect the government will introduce more legislation and exert coercive pressure (CP) (2.4.2.1). Awareness about climate change seems to grow, and the attitude in public opinion starts to change. This change in attitude results in a growing interest in the CRS organisations display which can create uncertainty for organisations, causing mimetic pressure (MP) (2.4.2.2). The food-producing industry is producing more environmentally friendly food over the last decade, so the choice for sustainable production may become a standard. A new normative standard creates a normative pressure (NP) (2.4.2.3). The following hypotheses are formulated to examine this premise:

$H_0$2a. Coercive pressure has no influence on organisational Green IT adoption in the food-processing industry.

$H_1$2a. Coercive pressure has an influence on organisational Green IT adoption in the food-processing industry.

$H_0$2b. Mimetic pressure has no influence on organisational Green IT adoption in the food-processing industry.

$H_1$2b. Mimetic pressure has an influence on organisational Green IT adoption in the food-processing industry.

$H_0$2c. Normative pressure has no influence on organisational Green IT adoption in the food-processing industry.

$H_1$2c. Normative pressure has an influence on organisational Green IT adoption in the food-processing industry.

Internal motivations

Internal motivations from within an organisation should be visible in different ways if sustainability is pursued. Top management support (TMS) will be of decisive influence in stimulating sustainability throughout all layers of the organisation (2.4.3.1). A greening organisation culture (GOC) will affect sustainability initiatives stimulate an organisation to adopt new green technology (2.4.3.2). Organisations that pursue a green strategy are expected to have a long-term vision, or strategic intent (SI), on how they want to deal with sustainability issues to strengthen their market position

market in the future (2.4.3.3). The following hypotheses are formulated to examine this premise:

$H_0$3a. Top management support no influence on organisational Green IT adoption in the food-processing industry.

$H_1$3a. Top management support will influence organisational Green IT adoption in the food-processing industry.

$H_0$3b. A greening of organisational culture will not influence on organisational Green IT adoption in the food-processing industry.

$H_1$3b. A greening of organisational culture will influence organisational Green IT adoption in the food-processing industry.

$H_0$3c. The alignment between strategic intent and Green IT adoption has no influence on organisational Green IT adoption in the food-processing industry.

$H_1$3c. The alignment between strategic intent and Green IT adoption will influence organisational Green IT adoption in the food-processing industry.

Sustainable Competitive Advantage by OGITA

Organisations that stimulate innovation through the use of Green IT are expected to develop a sustainable competitive advantage (2.5). This suggests that organisations that develop unique characteristics by the use of Green IT differentiate themselves from the competition. The following hypothesis is formulated to examine this premise:

$H_0$4. Organisational Green IT adoption does not influence the development of sustainable competitive advantage in the food-processing industry.

$H_1$4. Organisational Green IT adoption does influence the development of sustainable competitive advantage in the food-processing industry.

This last hypothesis has been added to allow the organisation to assess whether a sustainable competitive advantage can be achieved through the use of Green IT. If this research shows that the null hypotheses are accepted for technical context, institutional pressure and internal motivations, it would be strange if organisations indicate that they are motivated to achieve a sustainable competitive advantage with the use of Green IT. If the latter proves to be true, this will require further explanation in the analysis and discussion.

3.3 Survey setup

The surveys consist of two main elements. The first part contains some general questions to obtain information about the person and the company that completes the survey. The second part will concentrate on the data that used for analysis. The first questions have categorical variables about the organisation they are representing. Data of the second part is collected via questions that have a single choice and are based on the 7-point Likert scale (Likert, 1932). The 7-point Likert scale questions have an ordinal variable to collect data in a bipolar way, ranging from 'strongly disagree' to 'strongly agree'. For every hypothesis, four to five questions are formulated. The number of questions is limited to prevent the respondent to not take the survey at all or brake-off the survey due to the long time that is needed. Reducing the time required increases the willingness to participate in the survey and prevents the questions from

being answered sloppily at the end of the survey (Galesic & Bosnjak, 2009). The estimated time to complete the survey is about 10 and 15 minutes. For clarifications, an example of the variables used in the survey is shown in Appendix A – Used variables. An overview of the survey questions and the construct used for analysis is available in Appendix B – Survey and construct.

3.4 Data collection process

This research explicitly targets Dutch food-processing organisations with more than 25 full-time employees representing the population. Address information is purchased from the chamber of commerce in the Netherland and form a homogeneous sample group (Fricker, 2008). Based on the selection criteria 201 organisations were found active in the Netherlands producing food and beverages (Appendix C – Selection Chamber of Commerce). The list of food-processing organisations can also be referred to as the sampling frame because all members of the population are known. The list of address from the Chamber of Commerce does not contain e-mail addresses. To find email addresses to send the survey to all websites of the organisations found in the address list are visited to find public email addresses. Not all organisations have their email address published on their website, so it is not possible to do a census of the sample frame. Aforementioned could lead to a sample that resembles a convenience sample, but since the email addresses have not been harvested randomly from an unknown source, the sampling method used can better be described as list-based probability sampling (Daniel, 2012; Fricker, 2008). Because the population is relatively small, all organisations whose e-mail addresses are found receive an invitation to participate in the survey. In this research, Qualitrics.com is used for sending the surveys and collecting data. The invitation email is sent in Dutch and English. The survey will be available for a period of four weeks.

3.5 Analysing the results

After collecting the data, a number of statistical tests will be performed to make statistics of the sample. The respondents are assessed according to the sample characteristics presented in Appendix A – Used variables. The values of the collected data are recoded for further analysis so that they correspond to the positive and negative response for the bipolar queries in accordance with the 7-point Likert scale (Likert, 1932). To validate internal consistency of the constructs, a reliability analysis is conducted using Cronbach alpha (Cronbach, 1951) and as an alternative the McDonald coefficient omega (McDonald, 1999). Per construct, the mean is calculated for further hypothesis testing and statistical inference. Two-tailed hypothesis tests will be conducted using a one-sample t-test and as an alternative the Bayesian one-sample t-test to compare and validate results. The reason for using a different test method is because in case a small sample is collected, the Bayesian t-test may be able to report more accurate results with one sample (Schönbrodt, Wagenmakers, Zehetleitner, & Perugini, 2017, p. 322). If no positive or negative effect is measured, the null hypothesis fails to be rejected and is accepted. In the final test, the Spearman's rho correlation coefficient is calculated between the constructs to represent correlations between two values. Results are being presented in tables and in written form. Results and findings are used for the analysis and discussion in chapter 5.

4 Results and Findings

This chapter presents results and findings of the tests. A summary of the sample characteristics is presented and the recoded values. To measure the internal consistency of the survey construct a reliability analysis is conducted by the use of Cronbach alpha and McDonald's ω omega (Cronbach, 1951; McDonald, 1999). After altering the construct to match the minimal reliability hypothesises, are tested using frequentist and Bayesian statistics. The frequentist statistics are conducted using a one-sample t-test, and Bayesian statistics are conducted using a Bayesian one-sample t-test. After conducting the hypothesis tests, a Spearman's rho correlation matrix is presented with the correlations found between conducts.

4.1 Sample characteristics

In total 201 food-processing organisations were found in the chamber of commerce database (Appendix C), and for 156 organisations email addresses were retrieved. All 156 organisations have been invited to participate in the survey. In total, 17 surveys were started, 5 emails bounced, and 8 surveys were successfully finished (n = 8). An overview of information about participating organisations is presented in Table 1, displaying the organisation size and the job function of the participant.

Variable	Frequency	Percent
Organisation size		
51-75	2	25,0
76-100	1	12,5
101-150	1	12,5
201-250	1	12,5
251-500	1	12,5
501-1000	1	12,5
2000 or more	1	12,5
Total	8	100,0
Job Function		
Salaried Employee	1	12,5
IT Employee / IT Administrator	3	37,5
Manager	2	25,0
Senior Manager	1	12,5
Director	1	12,5
Total	8	100,0

Table 1 – Overview of organisations size and job function participants

Participating organisations range from 51 FTE to 2000 FTE or more. The job function of the participants vary, 50% of the surveys are filled in by salaried employees or IT employees operational active, and the other 50% of the surveys are filled in by a manager, a senior manager and a director.

4.1.1 Recoding values

The survey is based on statements that relate to a hypothesis and can be answered in favour or to the detriment of a particular statement. The collected data via qualitrics.com is based on the 7-point Likert scale (Likert, 1932), and values correspond with standard, strongly agree once as value 1, to very strongly disagree as value 7. Values are recorded in correspondence with Table 2. Values for RA, TC^1, TC^2, CP, MP, NP, TMS, GOC, SI and SCA are adjusted so that the results can be interpreted more easily and positive or negative responses are presented in accordance with the two-tailed hypotheses. The result of adjusting the values is that positive deviation from the average is represented as a positive number and a negative deviation as a negative number.

Answer	Original Value	new Value
Strongly disagree	7	-3
Disagree	6	-2
Somewhat disagree	5	-1
Neighed agree nor disagree	4	0
Somewhat agree	3	1
Agree	2	2
Strongly agree	1	3

Table 2 – Recoded values

In addition to adjusting the values, the outcome of RA, TC^2, CP, MP, NP, TMS, GOC, SI and SCA is reversed so that the valuation of questions corresponds with a positive and negative effect on the hypotheses.

4.2 Reliability analysis

To validate reliability within the constructs, Cronbach alpha is calculated. The correlation coefficient is commonly used in observational studies and developed by Lee Cronbach (1951). A Cronbach alpha value of > .7 is seen as acceptable (Cronbach, 1951; Tavakol & Dennick, 2011). Cronbach Alpha has some limitations on validity because of the number of items used for measurement influence the overall Cronbach alpha score (Sijtsma, 2009; Tang, Cui, & Babenko, 2014). McDonald's ω omega is used as an alternative to validate reliability (McDonald, 1999). In Table 3 the reliability analysis for relative advantage (RA) is shown. In the first test, a negative corrected item-total correlation is found for survey question RA02 with a value of -.064. Cronbach's α is .670.

Item Reliability Statistics

	Corrected Item-Total Correlation	If item dropped	Scale Reliability Statistics
		Cronbach's α	Cronbach's α
RA01	0.558	0.559	
RA02	-0.064	0.801	
RA03	0.480	0.595	0,670
RA04	0.602	0.539	
RA05	0.679	0.510	

Table 3 – Reliability statistics for Relative Advantage

A negatively correlated item-total correlation would mean that the correlation with other variables is weak. As shown in Table 3, Cronbach will improve α to .801 when RA02 is removed. For the above reason, RA02 is removed in the further analysis. The reliability analyses for McDonald's ω omega were more positive (Appendix D – McDonald's ω) and for further analysis, the more conservative Cronbach alpha is used. Table 4 shows the constructions of reliability for Cronbach's alpha after the removal of RA02. All constructs have a Cronbach α > .7 meeting the criteria for reliability. In written text, the reliability analysis shows the following result.

RA was found to be reliable (4 items; α = .80). TC^1 was found to be reliable (5 items; α = .76). TC^2 was found to be reliable (5 items; α = .93). CP was found to be reliable (4 items; α = .92). MP was found to be reliable (5 items; α = .88). NP was found to be reliable (5 items; α = .90). TMS was found to be reliable (5 items; α = .96). GOC was found to be reliable (5 items; α = .88). SI was found to be reliable (5 items; α = .97). SCA was found to be reliable (7 items; α = .82).

As listed, the reliability statistics per construction all meet the minimum value, and the construction as shown in Table 4 will be used for further analysis.

Construct	Question	Item Reliability Statistics		Scale Reliability Statistics
		Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's α > 0.7
Relative Advantage (RA)	RA01	0.402	0.844	0.801
	RA03	0.715	0.703	
	RA04	0.769	0.679	
	RA05	0.625	0.750	
Technical Complexity (TC[1])	TC101	0.413	0.758	0.756
	TC102	0.749	0.649	
	TC103	0.560	0.710	
	TC104	0.654	0.678	
	TC105	0.445	0.773	
Technical Compatibility (TC[2])	TC201	0.884	0.895	0.927
	TC202	0.804	0.915	
	TC203	0.804	0.915	
	TC204	0.951	0.900	
	TC205	0.840	0.926	
Coercive Pressure (CP)	CP01	0.864	0.895	0.924
	CP02	0.859	0.902	
	CP04	0.827	0.904	
	CP04	0.822	0.904	
Mimetic Pressure (MP)	MP01	0.384	0.927	0.883
	MP02	0.639	0.877	
	MP03	0.824	0.833	
	MP04	0.929	0.803	
	MP05	0.866	0.824	
Normative Pressure (NP)	NP01	0.925	0.878	0.902
	NP02	0.841	0.861	
	NP03	0.791	0.884	
	NP04	0.871	0.884	
	NP05	0.908	0.901	
Top Management Support (TMS)	TMS01	0.934	0.944	0.958
	TMS02	0.942	0.942	
	TMS03	0.783	0.963	
	TMS04	0.937	0.941	
	TMS05	0.896	0.947	
Greening Organisation Culture (GOC)	GOC01	0.783	0.839	0.878
	GOC02	0.666	0.866	
	GOC03	0.930	0.809	
	GOC04	0.903	0.832	
	GOC05	0.533	0.921	
Strategic Intent (SI)	SI01	0.960	0.960	0.972
	SI02	0.960	0.960	
	SI03	0.900	0.969	
	SI04	0.866	0.974	
	SI05	0.924	0.966	
Sustainable Competitive Advantage (SCA)	SCA01	0.830	0.767	0.823
	SCA02	0.586	0.797	
	SCA03	0.729	0.793	
	SCA04	0.044	0.866	
	SCA05	0.904	0.726	
	SCA06	0.521	0.807	
	SCA07	0.551	0.804	

Table 4 – Construct reliability statistics

4.3 Hypothesises testing

Hypotheses are tested by performing a one-sample t-test and a Bayesian one-sample t-test. Both tests are used to calculate whether there is a statistically significant reason to accept or reject the null hypothesis per hypothesis. The one-sample t-test supports three alternative hypothesis (CP, NP and SI) while the Bayesian one-sample t-test supports two alternative hypothesises (CP and SI). The conservative results in the Bayesian one-sample t-test are used for further analysis and are presented in section 4.3.1. The results of the one-sample t-test are moved to Appendix E – One-sample T-test.

For hypotheses testing, the average value of the mean per construct is calculated and used for both tests. The mean for the population is set to zero ($\mu = 0$), in accordance with neighed agree nor disagree of the 7-point Likert scale. The descriptive statistics for each construct are shown in Table 5.

Descriptive Statistics

	RA	TC[1]	TC[2]	CP	MP	NP	TMS	GOC	SI	SCA
Valid	8	8	8	8	8	8	8	8	8	8
Missing	0	0	0	0	0	0	0	0	0	0
Mean	0.656	-0.300	0.400	1.188	0.425	1.050	0.125	0.825	1.150	0.054
Std. Error of Mean	0.353	0.309	0.204	0.374	0.381	0.385	0.510	0.386	0.396	0.224
Std. Deviation	0.999	0.875	0.576	1.059	1.077	1.089	1.442	1.093	1.120	0.634
Variance	0.999	0.766	0.331	1.121	1.159	1.186	2.079	1.194	1.254	0.402
Range	3.250	2.600	1.400	3.000	3.000	3.400	5.000	3.000	3.000	2.143
Minimum	-1.000	-1.800	0.000	0.000	-0.800	-0.400	-2.600	0.000	0.000	-1.143
Maximum	2.250	0.800	1.400	3.000	2.200	3.000	2.400	3.000	3.000	1.000

Table 5 – Descriptive statistics per construct

4.3.1 *Bayesian One-Sample T-Test*

Bayesian statistics for testing hypothesis are conducted using a Bayesian one-sample t-test. A two-tailed test is conducted with a type 1 error. Statistical significance is calculated for the base factor supporting the null hypothesis (BF_{01}). The base factor that supports the alternative hypothesis (BF_{10}) is also shown in the results. For clarification of the Bayesian values, the validity scales originating from Jeffreys (1961) and interpreted by Lee & Wagenmakers (2013) are used as shown in Table 6.

Bayes Factor BF_{01}			Interpretation
	>	100	Extreme evidence for H_1
30	-	100	Very strong evidence for H_1
10	-	30	Strong evidence for H_1
3		10	Moderate evidence for H_1
1	-	3	Anecdotal evidence for H_1
	1		No evidence
1/3	-	1	Anecdotal evidence for H_0
1/10	-	1/3	Moderate evidence for H_0
1/30	-	1/10	Strong evidence for H_0
1/100		1/30	Very strong evidence for H_0
	<	1/100	Extreme evidence for H_0

Table 6 – Interpretation categories for the Bayes Factor

The results of the Bayesian one sample t-test are displayed in Table 7. The table is a combination of the support for the null hypothesis (BF_{01}) and the support for the alternative hypothesis (BF_{10}). The accuracy of the base factor is calculated and if the error is not higher than 10% (*error %* < 10%) this is seen as valid (JASP Team, 2018).

Bayesian One-Sample T-Test

	BF_{01}	BF_{10}	error %
RA	0.909	1.100	0.002
TC[1]	2.044	0.489	5.445e -4
TC[2]	0.812	1.232	5.846e -4
CP	0.217	4.605	7.858e -5
MP	1.827	0.547	1.347e -5
NP	0.353	2.830	5.814e -4
TMS	2.899	0.345	0.035
GOC	0.676	1.479	7.090e -4
SI	0.291	3.437	1.241e -4
SCA	2.903	0.344	0.035

Table 7 – Results Bayesian One-Sample T-Test

The results are calculated using sequential analysis are displayed graphically in Appendix F - Bayesian one-sample t-test graphics. In the next sections, the written results of the Bayesian one-sample t-test are reported.

4.3.1.1 *Accepted alternative hypothesis*

The results of the Bayesian one-sample t-test in which the alternative hypotheses are accepted in written text are shown below:

CP was associated with a statistically significant effect, BF_{01} = .28, BF_{10} = 4.60. Thus, CP is associated with a statistically significant effect and moderate support for the alternative hypothesis (H_1) to adopt Green IT.

SI was associated with a statistically insignificant effect, BF_{01} = .29, BF_{10} = 3.44. Thus, SI is associated with a statistically insignificant effect and moderate support for the alternative hypothesis (H_1) to adopt Green IT.

Significant statistical effects are found for CP and SI with a moderate effect. For these two effects, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted.

4.3.1.2 *Accepted null hypothesises*

The results of a Bayesian one-sample t-test in which null hypotheses are accepted in written text are shown below:

RA was associated with a statistically insignificant effect, BF_{01} = .91, BF_{10} = 1.10. Thus, RA is associated with a statistically insignificant effect and only anecdotal support for the alternative hypothesis (H_1) to adopt Green IT.

TC[1] was associated with a statistically insignificant effect, BF_{01} = 2.04, BF_{10} = .50. Thus, TC[1] is associated with a statistically insignificant effect and only anecdotal supporting the null hypothesis (H_0) to adopt Green IT.

TC[2] was associated with a statistically insignificant effect, BF_{01} = .81, BF_{10} = 1.12. Thus, TC[2] is associated with a statistically insignificant effect and only anecdotal support for the alternative hypothesis (H_1) to adopt Green IT.

MP was associated with a statistically insignificant effect, BF_{01} = 1.83, BF_{10} = .55. Thus, MP is associated with a statistically insignificant effect and only anecdotal support for the null hypothesis (H_0) to adopt Green IT.

NP was associated with a statistically insignificant effect, BF_{01} = .35, BF_{10} = 2.83. Thus, NP is associated with a statistically insignificant effect and only anecdotal support for the alternative hypothesis (H_1) to adopt Green IT.

TMS was associated with a statistically insignificant effect, BF_{01} = 2.90, BF_{10} = .35. Thus, TMS is associated with a statistically insignificant effect and only anecdotal support for the null hypothesis (H_0) to adopt Green IT.

GOC was associated with a statistically insignificant effect, BF_{01} = .67, BF_{10} = 1.48. Thus, GOC is associated with a statistically insignificant effect and only anecdotal support for the alternative hypothesis (H_1) to adopt Green IT.

SCA was associated with a statistically insignificant effect, BF_{01} = 2.90, BF_{10} = .34. Thus, SCA is associated with a statistically insignificant effect and only anecdotal support for the null hypothesis (H_0) to adopt Green IT.

Eight insignificant statistical effects are found for RA, TC¹, TC², MP, NP, TMS, GOC and SCA. For these eight effects, the null hypothesis (H_0) cannot be rejected and is accepted.

4.3.2 *Results of hypothesis tests*

Two tests were performed to test the hypotheses, a one-sample t-test and the Bayesian one-sample t-test. Table 8 displays a summary of the findings in the two tests.

Summary of hypothesis tests

	One-Sample T-Test*			Bayesian One-Sample T-Test					Accepted hypothesis
	***P* value**	**Effect**	**H_0**	**BF_{01}**	**BF_{10}**	**Evd. for**	**Strength**	**H_0**	
RA	0.106	Positive	Accepted	0.909	1.100	H_1	Anecdotal	Accepted	**$H_0$1a**
TC¹	0.365	Negative	Accepted	2.044	0.489	H_0	Anecdotal	Accepted	**$H_0$1b**
TC²	0.090	Positive	Accepted	0.812	1.232	H_1	Anecdotal	Accepted	**$H_0$1c**
CP	0.016	Positive	Rejected	0.217	4.605	H_1	Moderate	Rejected	**$H_1$2a**
MP	0.301	Positive	Accepted	1.827	0.547	H_0	Anecdotal	Accepted	**$H_0$2b**
NP	0.029	Positive	Rejected	0.353	2.830	H_1	Anecdotal	Accepted	**$H_0$2c**
TMS	0.813	Positive	Accepted	2.899	0.345	H_0	Anecdotal	Accepted	**$H_0$3a**
GOC	0.070	Positive	Accepted	0.676	1.479	H_1	Anecdotal	Accepted	**$H_0$3b**
SI	0.023	Positive	Rejected	0.291	3.437	H_1	Moderate	Rejected	**$H_1$3c**
SCA	0.818	Positive	Accepted	2.903	0.344	H_0	Anecdotal	Accepted	**$H_0$4a**

* Shown for clarification, results presented in Appendix E – One-sample T-test.

Table 8 – Summary of results for hypothesis tests

The one-sample t-test using the *p*-value approach and the Bayesian one-sample t-test show different results for rejecting the null hypothesis (H_0). For the one-sample t-test, the null hypothesis is rejected for CP, NP, SI and the alternative hypothesis (H_1) is accepted. In the Bayesian one-sample t-test the null hypothesis is rejected for CP, SI and the alternative hypothesis (H_1) is accepted. The Bayesian one-sample t-test for NP (BF_{10} = 2.830) is not statistically significant enough to reject the null hypothesis. In conclusion, the most conservative results are used, and the alternative hypothesis (H_1) is only accepted for CP ($H_1$2a) and SI ($H_1$3c). The last column in Table 8 shows the accepted hypothesis as presented in chapter 3.2.

4.4 Spearman's correlation coefficient of constructs

Spearman's rho (ρ) calculates the strength and direction of the monotonic relationship between your two variables (Spearman, 1904). The Spearman's rho test shows the correlation coefficient between two variables and is the nonparametric version of the Pearson product-moment correlation (Pearson, 1895). The size of correlation can be both positive and negative denoted by Spearman's rho (ρ). For interpretation of the size, or strength, Table 9 is used as a guideline (Hinkle, Wiersma, & Jurs, 2003).

Interpreting the Size of a Correlation Coefficient

Size of Correlation		Interpretation
.90 to 1.00	(-.90 to –1.00)	Very high positive (negative) correlation
.70 to .90	(-.70 to -.90)	High positive (negative) correlation
.50 to .70	(-.50 to -.70)	Moderate positive (negative) correlation
.30 to .50	(-.30 to -.50)	Low positive (negative) correlation
.00 to .30	(.00 to -.30)	Little if any correlation

Table 9 – Strength of Correlation Coefficient ρ

In Table 10 the Spearman's correlation matrix is displayed. The information displayed is based on the mean per construct. Significant relations are flagged in accordance with their *p*-value significance (* $p < .05$, ** $p < .01$, *** $p < .001$).

Spearman Correlations

		SCA Mean	RA Mean	TC[1] Mean	TC[2] Mean	CP Mean	MP Mean	NP Mean	TMS Mean	GOC Mean	SI Mean
SCA	Spearman's rho	—									
	p-value	—									
RA	Spearman's rho	0.530	—								
	p-value	0.177	—								
TC[1]	Spearman's rho	0.090	0.291	—							
	p-value	0.832	0.485	—							
TC[2]	Spearman's rho	0.236	0.274	-0.385	—						
	p-value	0.573	0.511	0.346	—						
CP	Spearman's rho	0.730 *	0.610	0.221	0.291	—					
	p-value	0.040	0.108	0.599	0.485	—					
MP	Spearman's rho	0.748 *	0.898 **	0.265	0.381	0.849 **	—				
	p-value	0.033	0.002	0.526	0.352	0.008	—				
NP	Spearman's rho	0.545	0.647	0.374	0.444	0.849 **	0.762 *	—			
	p-value	0.162	0.083	0.362	0.271	0.008	0.037	—			
TMS	Spearman's rho	0.962 ***	0.638	0.049	0.260	0.832 *	0.854 **	0.586	—		
	p-value	< .001	0.089	0.908	0.534	0.010	0.007	0.127	—		
GOC	Spearman's rho	0.726 *	0.778 *	0.435	0.163	0.850 **	0.921 **	0.675	0.830 *	—	
	p-value	0.041	0.023	0.282	0.699	0.008	0.001	0.066	0.011	—	
SI	Spearman's rho	0.507	0.333	0.579	-0.193	0.791 *	0.590	0.554	0.593	0.795 *	—
	p-value	0.200	0.420	0.132	0.648	0.019	0.123	0.154	0.122	0.018	—

* p < .05, ** p < .01, *** p < .001

Table 10 – Spearman's rho correlation matrix

A Spearman's correlation coefficient was computed to assess the relationship between constructs. In written form, the significant Spearman's correlations shows the following results:

There are some internal motivations (TMS, GOC, SI) and external drivers (CP, MP) are correlated with SCA.

There are significant relationships found for SCA in correlation with TMS, GOC, CP, and MP. There is a very high positive correlation between SCA and TMS (ρ = .96, p = <.001). There is a high positive correlation between SCA and GOC (ρ = .73, p = .04). There is a high positive correlation between SCA and CP (ρ = .73, p = .04). There is a high positive correlation between SCA and MP (ρ = .75, p = .03). Thus, increases in SCA are correlated with increases in CP, MP, TMS and GOC.

There are some correlations found in the constructs internal motivations (TMS, GOC, SI) and external drivers (CP, NP, MP, RA).

There is a significant relationship found for TMS in correlation with GOC, CP and MP. There is a high positive correlation between TMS and GOC (ρ = .83, p = .01). There is a high positive correlation between TMS and CP (ρ = .83, p = .01). There is a high positive correlation between TMS and MP (ρ = .85, p = .01). Thus, increases in TMS are correlated with increases in GOC, CP and MP.

There is a significant relationship found for GOC in correlation with SI, RA, CP and MP. There is a high positive correlation between GOC and SI (ρ = .80, p = .02). There is a high positive correlation between GOC and RA (ρ = .78, p = .02). There is a high positive correlation between GOC and CP (ρ = .85, p = .01). There is a very high positive correlation between GOC and MP (ρ = .92, p = .001). Thus, increases in GOC are correlated with increases in SI, RA, CP and MP.

There is a significant relationship found for SI in correlation with CP. There is a high positive correlation between SI and CP ($\rho = .79$, $p = .02$). Thus, increases in SI are correlated with increases in CP.

There is a significant relationship found for RA in correlation with MP. There is a high positive correlation between RA and MP ($\rho = .90$, $p = .002$). Thus, increases in RA are correlated with increases in MP.

There is a significant relationship found for CP in correlation with MP and NP. There is a high positive correlation between CP and MP ($\rho = .85$, $p = .01$). There is a high positive correlation between CP and NP ($\rho = .85$, $p = .01$). Thus, increases in CP are correlated with increases in MP and NP.

There is a significant relationship found for MP in correlation with NP. There is a high positive correlation between MP and NP ($\rho = .76$, $p = .04$). Thus, increases in MP are correlated with increases in NP.

Above, significant Spearman's correlation coefficients were reported. The results report significant correlations between external pressures and internal motivations to adopt Green IT in correlation with SCA. Also, results report significant correlations between external pressures and internal motivations. The results and findings will be further analysed and discussed in the next chapter.

5 Analysis and Discussion

The OGITA research model applied to find motivational reasons for food-processing organisations in the Netherland to adopt Green IT and also if adoption of Green IT contributes to sustainable competitive advantage. Only eight useful responses to the survey were collected that could be used for the statistics. Because of the small sample size, the reliability of the results decrease, and findings become more exploratory in nature. Although the results lead to a moderate truth finding and conclusions need to be treated with caution, there are still some things that can be learned from the findings of this research. The results will be further analysed and discussed in the following sections. The results indicate that the essential factors for food-processing organisations in the Netherlands to adopt Green IT are coercive pressure (CP) and strategic intent (SI). Also, no evidence is found Green IT contributes to sustainable competitive advantage (SCA). The results do reveal quite strong correlations between institutional pressures and internal motivations, which might indicate there is a relation between them. In the following sections, the results and findings are further analysed and discussed.

5.1 Hypothesis test results

Within the technical context, there is no evidence that RA, TC[1] and TC[2] contribute to the adoption of Green IT. Relative advantage (RA) was found of insignificant importance to adopt Green IT (BF_{01} = .35, BF_{10} = 2.83). This indicates superior technical solutions are not pursued by the use of Green IT, or at least limited. Technical complexity (TC[1]) is not a motivation to adopt Green IT (BF_{01} = 2.04, BF_{10} = .49). This insignificance might be because technical complexity is always present, and this does not change with the use of Green IT. The same seems to apply to technical compatibility (TC[2]), there is insignificant evidence technical compatibility contributes to the adoption of Green IT (BF_{01} = .81, BF_{10} = 1.23). In the originating research performed by Deng & Ji (2015), it is proposed an effect by technical compatibility and complexity is absent (Deng & Ji, 2015), this is in correspondence with the findings in this research. The technical context seems to play a subordinate role within the food-processing organisations and does not constitute an incentive to adopt Green IT. According to some research the main reasons to adopt Green IT is to reduce energy cost (Dedrick, 2010; Molla et al., 2009), from a technical point of view this seems to be supported by the findings in this research. Part of Green IT is lifecycle management. What is arguably a result of the absence of motivations to use Green IT is that the predictions about lifecycle management might be too optimistic (TheElectronicsTakeBackCoalition, 2017). Support for Green IT seems absent, and from a technical point of view, this can result in more e-waste because limited lifecycle management is expected. In conclusion, relative advantage, technical complexity and technological compatibility representing the technical context do not motivate food-processing organisations to adopt Green IT.

Institutional pressures CP, MP and NP are partly responsible for Green IT adoption. Coercive pressure (CP) is a significant motivation to adopt Green IT (BF_{01} = .22, BF_{10} = 4.61). Previous is in line with previous research, in which the conclusion is drawn that coercive pressure is the main motivation for adopting Green IT (Gholami et al., 2013). The latter seems to apply to the Dutch food-processing industry as well. Mimetic pressure (MP) is not a motivation for organisations to adopt Green IT (BF_{01} = 1.83, BF_{10} = 0.547). The absence of mimetic pressure is also in line with the findings in previous research where it is indicated that mimetic pressure is no reason to adopt Green IT (Gholami et al., 2013). Normative pressure (NP) seems to be incredible,

evidence was not strong enough to reject the null hypothesis (BF_{01} = .35, BF_{10} = 2.83). Support for normative pressure in the hypothesis test for the *p*-value did report a significant effect (p = .029). The Bayesian hypothesis test for normative pressure reported an insignificant effect and based on the Bayesian results, the null hypothesis (H_0) is accepted. Normative pressure finds its origin in social acceptance, or in other words acceptable responsible behaviour (Davidsson et al., 2006), and is brought into relation with the public concern (Delmas & Toffel, 2003). From the above, Green IT does not seem to be seen as a means to represent socially accepted behaviour. Coercive pressure is the only institutional pressure that causes food-processing organisations to adopt Green IT, while mimetic pressure and normative pressures do not.

SI is the only internal motivation for organisations to adopt Green IT, while TMS and GOC have an insignificant influence. Top management support (TMS) does not stimulate the adoption of Green IT (BF_{01} = 2.90, BF_{10} = .35) and there could be a relation between the findings by Bertels (2010) and this research. Bertels found that CEO's have difficulty incorporating sustainability in the organisation and this seems in correspondence with the findings of this research (Bertels, 2010). Greening organisation culture (GOC) is not a motivation for organisations to adopt Green IT (BF_{01} = .68, BF_{10} = 1.48). These findings seem to relate to the findings by Corbett, Webster & Jenkin ((2015), they claim there seems to be a mismatch between the green image organisations present and the practices they apply. This indicates organisations think they are in pursuit of corporate social responsibility but in practice fail to incorporate this into their organisation culture (Corbett et al., 2015). Strategic intent (SI) is a motivation for organisations to adopt Green IT (BF_{01} = .29, BF_{10} = 3.44). Strategic intent, or long-term goals, seems to entail a green vision and Green IT seems part of this vision. This could be because organisations envision a sustainable future and IT plays an important role in achieving such goal (Arvidsson et al., 2014). Remarkable in aforementioned is that top management support for adopting Green IT is absent. The absence of top management support in organisations might imply that senior management, consciously or unconsciously, has the ambition to become a market leader and want to display sustainability, but fail to bring the future into current thinking (Mburu & Thuo, 2015). A greening organisation culture appears no motivation to adopt of Green IT, which relates to findings in earlier research. While displaying corporate social responsibility it might imply there is a greening organisation culture, but while displaying sustainability as part of the organisation traits, this does not always have to correspond with daily practice. In this research, strategic intent is the only internal motivation that causes food-organisations in the Netherlands to adopt Green IT, while top management support and greening organisation culture do not.

Overall, Green IT does not seem to be a driver for developing SCA. Green IT has an insignificant effect on developing sustainable competitive advantage (BF_{01} = 2.90, BF_{10} = .34). What is important to mention is that sustainable competitive advantage based on the RBV aims to find the ambition for developing a sustainable competitive advantage. The results are that the measurement for sustainable competitive advantage is somewhat subjective. External drivers and internal motivations give an indicational direction for developing sustainable competitive advantage with the use of Green IT but are not a conditional condition to do so.

With the aforementioned findings in mind, the results lead to the following discussion. There is limited support found in the technical context, institutional pressure and motivations for organisations to adopt Green IT. These findings are in

correspondence with the research performed by Hart & Dowel (2011) in which they argue, the NRBV might offer the opportunity for organisations to develop a unique competitive advantage but opportunities are not practised yet. The research above emphasises the fact that breakthrough strategies are needed if organisations want to adopt the NRBV and become sustainable. In this research, no evidence is found that can reject the claim made by Hart & Dowell (2011). Also, no evidence is found that that food-processing organisations see Green IT as a resource that can build a unique resource to develop sustainable competitive advantage (Barney, 1991). In conclusion, there is no evidence found that food-processing organisations in the Netherland adopt Green IT to obtain a sustainable competitive advantage.

5.2 Correlations with sustainable competitive advantage

The results and findings indicate a correlation between sustainable competitive advantage, coercive pressure, mimetic pressure, top management support and greening organisation culture. Only for coercive pressure, the alternate hypothesis is accepted. The relationships between the factors tested above are related to each other because they show a strong correlation, which means that if one of the factors is positively or negatively stimulated, other correlated factors likely will be influenced by this. The preceding shows there seems a direct relationship between motivations for adopting Green IT and, in its extension, the development of sustainable competitive advantage. In a published research article on the sustainable supply chain in the food industry in Iran, the same tendencies seem to be present, and the relationship between the factors above strongly influences each other (Emamisaleh & Rahmani, 2017). Although the research described in the article does not explicitly target Green IT, it is claiming there is weak support for developing sustainable competitive advantage based on internal motivations and external motivations as used in this research.

5.3 Correlations between internal motivations and external drivers

There are also correlations found between external drivers and internal pressures. Although the results do not answer the primary questions in this study, results reveal some information worth discussing.

In the technical context, there is a correlation between relative advantage (RA), mimetic pressure (MP) and greening organisation culture (GOC). No correlations are found for technological complexity (TC^1) and compatibility (TC^2). Since no alternate hypothesises are accepted for the motivations above this could well indicate the technical context plays a subordinate role when it comes to Green IT adoption. What stands out is the correlation between coercive pressure (CP) and internal motivations (TMS, GOC, SI). Also, coercive pressure is correlated with mimetic pressure (MP) and normative pressure (NP). These findings seem logical because if organisational support is absent, institutional pressures other than coercive pressure are likely ignored. From an organisational point of view, it may be essential to maintain a relationship with the public because of the growing awareness of consumers (Maloni & Brown, 2006). Strategic intent can play an essential role in relation to the preceding and can be used to radiate corporate social responsibility, with an emphasis on opportunities for the future. Top management will largely determine how the organisation deals with all institutional pressures but also formulate the strategic intent. The relationship between strategic intent and coercive pressure could indicate that strategic intent is used to avoid public worries and criticism, this seems in agreement with previous research by Maloni & Brown (2006). Within this research, it

has been demonstrated that institutional pressure on organisations only arises through coercive pressure, and the correlations are linked to internal motivations. This correlation seems to underline that the food-processing organisation are not motivated to adopt Green IT unless this becomes obligatory.

5.4 Implications

From an academic point of view, this research provides a cautious insight into sustainability developments within food-processing organisations in the Netherlands. The OGITA research model (2015) is used to find the external drivers and internal motivations to adopt Green IT and if adoption contributes to developing a sustainable competitive advantage. This research provides a more holistic view of what stimulates organisations to adopt Green IT. In conclusion, food-processing organisations in the Netherland show minimal motivations to adopt Green IT to mitigate environmental impact, only coercive pressure and strategic intent are a driver to adopt Green IT. The aforementioned suggests that the only way to motivate food-processing organisations to adopt Green IT and reduce their environmental impact is via legislation. Support from top management and a greening organisation culture do not stimulate organisations to adopt Green IT. The one internal motivation to adopt Green IT in the future is the strategic intent. Since strategic intent is a long-term vision and goes beyond strategic planning horizon, food-processing organisations do not seem to feel direct urge to become sustainable at this moment. From a technical perspective, Green IT is not recognised as a way to attain an advantage nor a resource to become sustainable. In general, Green IT is not a resource for food-processing organisations in the Netherlands to develop a sustainable competitive advantage. Aforementioned suggests food-processing organisations that display corporate social responsibility only seem to comply with legislation. The motivation to implement sustainable resources that go beyond the necessary legal obligations, like Green IT, seems absent. Also, the support for strategic intent can be explained in two ways. One, organisations are indeed in pursuit of becoming sustainability and want to reduce their environmental impact in the future. Two organisations preach the intention to become sustainable to make a good impression, but in reality, they do not intend to do more than abide by the necessary legislation now and in the future to radiate sustainability.

In practical terms, Green IT offers an opportunity for organisations that are active in the food-processing industry. By adopting Green IT, organisations can create long-term benefits and develop a competitive advantage. Sustainability is becoming of more importance to scholars and practitioners, as frameworks mature and more information about management practices on incentives to become sustainable are available. As managerial practices mature, opportunities might arise for early adopters. Food-processing organisations have the opportunity to positively distinguishing themselves from competitors and develop sustainable competitive advantage as suggested in the RBV and the NRBV (Barney, 1991, 2001; Hart, 1995; Hart & Dowell, 2011). Secondly, while doing so, they can increase financial performance and organisation reputation (Miles & Covin, 2000). Once an organisation fully utilises Green IT, this can become a valuable resource driving sustainable entrepreneurship.

5.5 Limitations

In this research, the following limitations apply. There was limited response to the send survey to collect data, a small sample is collected that could be used to calculate statistics. The latter can result in a small sample size bias, even if conservative statistical results are used for conclusions. The data for this research was collected with

the aid of a survey. When completing a survey, there is always a certain degree of subjectivity because it is not an absolute measure. Random bias is always present but can be limited, but cannot be avoided (Krishna, Maithreyi, & Surapaneni, 2010). Consequently, the random bias will also be of influence on this research. The survey questions are answered based on the 7-point Likert scale, which can lead to avoidance of extreme response creating a central tendency bias (Dawis, 1992). Also, there could be an acquiescence response bias resulting in just agreeing with the statements as presented. Within this research there is also a possibility participant portray their organisation positively in a favourable way, this could lead to a social desirability bias which can affect the results (King & Bruner, 2000). In this research, the motivations for adopting Green IT are sought, and to what extend Green IT contributes to sustainable competitive advantage. An absolute measurement of motivations or sustainable competitive advantage is not possible, and therefore there is always a partial assumption in the answers. If conclusions from this study are used, they will have to be interpreted as indicative.

6 Conclusions

The research specifically aimed to find the motivations that food-processing organisations have to adopt Green IT and whether this contributes to the development of sustainable competitive advantage. Although the data collected for analysis was limited, directly and indirectly, collected evidence shows a corresponding picture that Green IT is not a means to reduce environmental impact. In conclusion, food-processing organisations in the Netherlands are only motivated to adopt Green IT in the long-term, or strategic intent, and by coercive pressure. No evidence is found Green IT is seen as a resource to develop a sustainable competitive advantage. In conclusion, the impression emerges that the climate objectives as proposed by the Dutch government may not be feasible in practice if no further measures are taken.

The Dutch government set the objective to reduce GHG by 20% compared to 1990 by 2020 in accordance with the IPPC ("Klimaatbeleid," n.d.). Since there is no legislation for reducing GHG for organisations that are not under the control of the EU ETS, there is room for interpretation on current environmental performance in the broadest sense (European Union, 2013). From a previous perspective, the stated aim to reduce GHG seems to pose a problem for policymakers and governments because the reduction of GHG in recent years does not seem to be successful and has come to a halt (H.G.J. Kamp & Sharon A.M. Dijksma, 2017).

Within the Dutch food processing organisations, the absence of top management support and greening organisational culture to adopt Green IT seems to underline the current status quo. Governments formally do not need to take action until 2020 to reduce GHG and limited legislation is applied. The strategic intent is evident on a national level, but no further action seems to have been taken to reduce greenhouse gases. Food-processing organisations seem to adopt the same attitude as the Dutch government, the strategic intent is there, but there is no motivation within the top management to do more than abide by current legislation.

Consumer interest in sustainable products is growing, and more people are buying sustainable products (Ministerie van Economische Zaken, 2014). What contradicts above, Dutch consumers are not as motivated to buy sustainable food compared to consumers in other countries (Canada, 2011). The latter could also be an indication why mimetic and normative pressures are absent in food-processing organisations; the Dutch seem indifferent to the issue of sustainable food. Still, the increasing demand for sustainable food, according to the ministry of economics, suggests that attention for sustainable production will increase. If this also increases mimetic and normative pressure enough to motivate food-processing organisations to adopt Green IT in the future, is unknown. Although Green IT can contribute to sustainable production, it seems as if corporate social responsibility is not focused on doing more than what is deemed necessary. The latter can be because Green IT is a facilitating tool that does not directly affect the processing of food. Previous research shows Green IT can become an essential resource for organisations and can make a positive contribution to mitigating environmental impact (Dedrick, 2010; GeSI, 2012). Nevertheless, the proposed benefit resulting from Green IT is not recognised, and the motivation for using it is absent. In retrospect, Hart & Dowell's (2011) conclusions still seem to be valid; there are still no pioneering strategies in which Green IT is adopted to develop a sustainable competitive advantage.

Although results are exploratory, the findings in this research show that food-processing organisations do not appear to be motivated to reduce the environmental impact further than strictly necessary. If aforementioned approaches the truth, this also raises the question whether the proposed government target to reduce 20% GHG is feasible if the current policy is continued. The most obvious answer looking at the indication results in this research is no, current legislation and regulation are inadequate. The strategic intent of food-processing organisations suggests that they intend to do something with Green IT in the future, but the lack of motivations found can also mean that this is only window dressing to radiate sustainability. The cautious conclusion is that coercive pressure must be exerted to encourage food-processing organisations in the Netherlands to contribute to the climate goals as formulated in the Paris Agreement (Collier & Esteban, 2007; European Commission, 2015; UNFCCC, 2015). The extent to which coercive pressure contributes to the use of resources such as Green IT remains to be seen.

6.1 Further research

Based on this research, various research suggestions have been identified that can contribute to a better understanding of sustainability developments within organisations and industries. Before discussing the suggestions for further research, a comment about data collection based on the experiences in this research. In retrospect, it proofed challenging to collect a representative sample using a survey to make substantiated statistical claims. It seems advisable to use a different approach and, for example, to involve organisations in advance, so that it is determined whether they want to cooperate in research. Also, for future research, the General Data Protection Regulation (GDPR) as formulated by the European Union must be taken into account (European Union, 2016). There is a research exemption in the GDPR, but the data collection, transfer and publication of data may differ per country or continent.

The first suggestion is to repeat that this research for reliability purposes. The latter to confirm or decline findings in this research on motivations for food-processing organisations to adopt Green IT and to what extent this contributes to sustainable competitive advantage. A suggestion would be to expand the scope so that it is possible to compare the results per country too, for example, see if the motivations for adopting Green IT vary per country. By expanding research, this will contribute to better understanding and refine research results, thereby increasing reliability. The scope can be expanded to other industries to broaden the perspective and make a comparison between them. Results might offer the opportunity to compare industries or, if the expanded to different countries, compare Green IT adoption per industry per country. Such research provides valuable insight and a more holistic overview of the motivational reasons for the adoption of Green IT across multiple sectors and countries. Research could also target the current implemented Green IT facilities instead of the motivations to do so. Insight into the current adoption grade of Green IT will provide a better understanding and insight into the current status quo and will offer stakeholders the opportunity to evaluate current developments instead of expectations.

Further research is suggested on barriers that prevent management from using green technology such as Green IT. Barriers can arise due to various reasons, but they will likely not surface when looking for motivational or reasons for adopting new green technology. Barriers go beyond the observation of managerial practices in organisations and likely expose specific reasons that prevent management from

adopting sustainability practices such as Green IT. The latter could have a relationship with decision makers and managers who have a particular view on CSR or, for example, restrictions that prevent such development in a financial or technical sense. Knowledge about barriers will provide valuable insights and possibly contribute to further research into how to remove these barriers.

Correlations between institutional pressure and internal motivation were observed in this study. Further research into the way institutional pressure and internal motivation interact would be useful. The correlation found suggests that the willingness to opt for Green IT depends strongly on the type of pressure that an organisation experiences. Findings raise the question of how institutional pressure is linked to internal motivation and in particular support from top management. If top management support is absent and does not feel pressure, this can have a significant impact on how the entire organisation experiences institutional pressure. A better understanding of the mutual forces that reinforce or weaken each other will contribute to the understanding why sustainable technology such as Green IT is applied or not.

The food-processing industry lacks a precise definition, so there is ambiguity about what products sectors within agriculture produce. The absence of a framed composition of products means that for each study a different product composition is often grouped under the food industry, resulting in figures and data that does not provide much detail (European Commission, 2007; Mcarthur, n.d.). More research that leads to an unambiguous definition and a clearly defined composition of products contributes to the unambiguousness of data in future research, contributing to better insight and data quality. The latter to help scholars, practitioners and other interested parties to better compare and interpret research results.

A final suggestion for further research relates to sustainable competitive advantage. Several properties that indicate sustainable competitive advantage are suggested, but they all seem difficult to quantify, leading to a subjective assumption. The suggestion that IT can become a valuable resource contributing to sustainable competitive advantage seems truism. What might be interesting is how IT in general, or Green IT in particular, needs to be applied to contribute to the development of sustainable competitive advantage. Especially when an organisation assesses itself, as in this research via a survey, this can lead to bias because the chances are that subjective truth is expressed and likely by organisational beliefs. If a better understanding is gained of how IT should be applied to develop sustainable competitive advantage and how it can be measured, this will probably help scholars as well as practitioners to interpret research results in the future.

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Appendix A – Used variables

Examples of variables and information requested for data collection.

Sir name : _____
Organisation name : _____
Job function : _____

In which province is your head office located.

- Noord-Holland
- Zuid-Holland
- Utrecht
- Gelderland
- Noord-Brabant
- Overijssel
- Flevoland
- Drenthe
- Friesland
- Groningen
- Limburg
- Zeeland

Nominal variable
No specific order, categorical

Number of employees working in your organisation.

- Less than 25
- 25-50
- 51-75
- 76-100
- 101-150
- 201-250
- 251-500
- 501-1000
- 1001-2000
- 2000 or more

Ordinal variable
Variables have an order like; low, medium, high

Bipolar questions asked to use for statistics will be based on the 7-point Likert scale.

- Strongly disagree
- Disagree
- More or less disagree
- Undecided
- More or less agree
- Agree
- Strongly agree

Ordinal variable
Variables have an order like; low, medium, high

Appendix B – Survey and construct

First, the survey is information is provided, second the construct of survey is provided in Table 11.

Start of Block: General information for participating organisation in this survey.

Thank you for following the link to my survey. This survey aims to collect data about motivations found in your organisation to use of Green IT. Green IT is the practice of designing, manufacturing, using and disposing of computers, servers and associated subsystems efficiently and effectively with minimal or no impact on the environment, and with a strong focus on using information systems to enhance sustainability across the economy. To collect data 52 statements are formulated. Every statement presents a topic, and you are asked to what extent you agree, or disagree, with every statement. Important is to respond from the perspective of your organisation and not your personal opinion or preference.

Info01: What is the name of your organisation?

Info02: How many people work for your organisation?

▼ Less than 25 (1) ... 2000 or more (10)

Info03 Which one of the following best describes your position within your organisation?

▼ Salaried Employee (1) ... Director (5)

Start of Block: Technical Context

Description: In this block statements about technical aspects are made that either stimulate or inhibit the use of Green IT. For example; advantages gained in your organisation, limitations due to complexity or improved compatibility of software and hardware. To what extent do you agree with the following statements?

Relative Advantage (RA)

RA: By the use of Green IT we can:

Q 01. RA01 Reduce our operational costs.
Q 02. RA02 Reduce our energy usage.
Q 03. RA03 Stimulate innovation.
Q 04. RA04 Enable the use of smart technology.
Q 05. RA05 Optimize our production.

Technological Complexity (TC^1)

TC^1: The use of Green IT is inhibited by:

Q 06. TC101 Limited IT knowledge among our employees.
Q 07. TC102 Relatively difficult execution of configuration changes.
Q 08. TC103 High implementation costs.
Q 09. TC104 The extent of time required for replacement of existing systems.
Q 10. TC105 Resistance among our employees to use new technology.

Technological Compatibility (TC^2)

TC^2: The use of Green IT is promoted by:

Q 11. TC201 Hardware compatibility.
Q 12. TC202 Software compatibility.
Q 13. TC203 Limited difficulty in modifying software.
Q 14. TC204 Extended compatibility with external systems.
Q 15. TC205 The ability to optimise lifecycle management.

Start of Block: Institutional Pressures

Description: In this block statements about external pressures are made about what motivations can be found in your organisation to use Green IT. For instance, pressures arising from governmental influence, special interest groups, public opinion or developments in the industry. To what extent do you agree with the following statements.

Coercive Pressure (CP)

CP: The use of Green IT is promoted by:

Q 16. CP01 Environmental legislation.
Q 17. CP02 Climate objectives set by the government.
Q 18. CP03 Expected future legislation.
Q 19. CP04 Regulations, set by food safety organisations, such as "Nederlandse Voedsel- en Warenautoriteit".

Mimetic Pressure (MP)

MP: The use of Green IT enables us to:

Q 20. MP01 Secure our market position.
Q 21. MP02 Prevent our production process from becoming obsolete.
Q 22. MP03 Follow new trends.
Q 23. MP04 Realize essential innovations.
Q 24. MP05 Follow developments in the sector.

Normative Pressure (NP)

NP: The use of Green IT enables us to

Q 25. NP01 Produce in correspondence with greening public opinion.
Q 26. NP02 Produce products that meet the sustainability requirements of our customers.
Q 27. NP03 Economically use of raw materials.
Q 28. NP04 Reduce harmful emissions.
Q 29. NP05 Produce for new market segments.

Start of Block: Internal Motivations

Description: In this block, statements are presented about the extent to which sustainability is part of the organisational culture and in what way this contributes to the use of Green IT. To what extent do you agree with the following statements.

TMS: Our top management will support the use of Green IT by

Q 30. TMS01 Planning in regard to its implementation.
Q 31. TMS02 Decision making regarding its implementation.
Q 32. TMS03 Attracting new staff.
Q 33. TMS04 Investing in new equipment.
Q 34. TMS05 Controlling its implementation process.

GOC: The use of Green IT is stimulated by the fact that:

Q 35. GOC01 Sustainable production is one of the main values among our employees.
Q 36. GOC02 Our management preaches sustainability among all employees.
Q 37. GOC03 Employees show environmentally conscious entrepreneurship.
Q 38. GOC04 Our PR expresses the importance of our sustainable products.
Q 39. GOC05 We strive to become a trendsetter in the field of sustainability.

SI: The use of Green IT is stimulated in the following way:

Q 40. SI01 Sustainability is part of our mission.
Q 41. SI02 The pursuit of sustainability is part of our vision.
Q 42. SI03 Our long-term goals state how we achieve sustainability in the future.
Q 43. SI04 Our operational policy is to improve sustainability continuously.
Q 44. SI05 Throughout the organisation, it is promoted to implement sustainability.

Start of Block: Sustainable competitive advantage

SCA Description: In this last block, statements are made about what your organisation wants or has achieved with the help of Green IT. To what extent do you agree with the following statements.

SCA: The use of Green IT allows us to:

Q 45. SCA01 Increase our potential performance.
Q 46. SCA02 Uniquely distinguish ourselves from competitors.
Q 47. SCA03 Optimize our information systems in a way that cannot be matched by competitors.
Q 48. SCA04 Become a leader in environmentally conscious entrepreneurship.
Q 49. SCA05 Create value in order to explore new market opportunities.
Q 50. SCA06 Develop IT resources, hard to acquire for competitors.
Q 51. SCA07 Develop IT resources difficult to replace by another strategic equivalent (Strategically Irreplaceable (Durable)).

Start of Block: Thank you word

Info04: You answered all questions and helped me with my research, thank you for that. The results will help me to provide valuable insight into the motivations that organisations have to deploy Green IT. Also, it will provide insight into whether Green IT contributes to sustainable competitive advantage. If you would like to receive a summary of the results, please leave your email address below.

Info05: Below is a final comments field where you can post any comments regarding this survey.

Thanks again for your participation.

Yours Sincerely,

Heronimus Friso Jan Akkerman

End of Block: Thank you word

Overview of construct is shown in Table 11

Constructs	Questions part of construct
Relative Advantage (RA)	RA01 RA02 RA03 RA04 RA05
Technical Complexity (TC^1)	TC101 TC102 TC103 TC104 TC105
Technical Compatibility (TC^2)	TC201 TC202 TC203 TC204 TC205
Coercive Pressure (CP)	CP01 CP02 CP04 CP04
Mimetic Pressure (MP)	MP01 MP02 MP03 MP04 MP05
Normative Pressure (NP)	NP01 NP02 NP03 NP04 NP05
Top Management Support (TMS)	TMS01 TMS02 TMS03 TMS04 TMS05
Greening Organisation Culture (GOC)	GOC01 GOC02 GOC03 GOC04 GOC05
Strategic Intent (SI)	SI01 SI02 SI03 SI04 SI05
Sustainable Competitive Advantage (SCA)	SCA01 SCA02 SCA03 SCA04 SCA05 SCA06 SCA07

Table 11 – Construct of survey for measurement

Appendix C – Selection Chamber of Commerce

Selection criteria chamber of commerce retrieved from www.kvk.nl on 31 januari 2018. For privacy reasons details are anonomized.

Appendix D – McDonald's ω omega

The reliability analysis using McDonald's ω omega is shown in Table 12 below.

Construct	Question	Item Reliability Statistics		Scale Reliability Statistics
		Corrected Item-Total Correlation	McDonald's ω if Item Deleted	McDonald's ω omega > 0.7
Relative Advantage (RA)	RA01	0.402	0.858	0.820
	RA03	0.715	0.710	
	RA04	0.769	0.743	
	RA05	0.625	0.799	
Technical Complexity (TC[1])	TC101	0.413	0.827	0.816
	TC102	0.749	0.702	
	TC103	0.560	0.796	
	TC104	0.654	0.733	
	TC105	0.445	0.825	
Technical Compatibility (TC[2])	TC201	0.884	0.936	0.950
	TC202	0.804	0.945	
	TC203	0.804	0.945	
	TC204	0.951	0.926	
	TC205	0.840	0.942	
Coercive Pressure (CP)	CP01	0.864	0.915	0.935
	CP02	0.859	0.909	
	CP04	0.827	0.916	
	CP04	0.822	0.928	
Mimetic Pressure (MP)	MP01	0.384	0.937	0.901
	MP02	0.639	0.904	
	MP03	0.824	0.854	
	MP04	0.929	0.837	
	MP05	0.866	0.845	
Normative Pressure (NP)	NP01	0.925	0.934	0.953
	NP02	0.841	0.949	
	NP03	0.791	0.954	
	NP04	0.871	0.940	
	NP05	0.908	0.935	
Top Management Support (TMS)	TMS01	0.934	0.951	0.965
	TMS02	0.942	0.950	
	TMS03	0.783	0.975	
	TMS04	0.937	0.951	
	TMS05	0.896	0.959	
Greening Organisation Culture (GOC)	GOC01	0.783	0.898	0.920
	GOC02	0.666	0.914	
	GOC03	0.930	0.875	
	GOC04	0.903	0.881	
	GOC05	0.533	0.937	
Strategic Intent (SI)	SI01	0.960	0.961	0.973
	SI02	0.960	0.961	
	SI03	0.900	0.971	
	SI04	0.866	0.975	
	SI05	0.924	0.967	
Sustainable Competitive Advantage (SCA)	SCA01	0.830	0.838	0.881*
	SCA02	0.586	0.865	
	SCA03	0.729	0.853	
	SCA04	0.044	0.916	
	SCA05	0.904	0.831	
	SCA06	0.521	0.873	
	SCA07	0.551	0.870	
* Of the observations, 6 were used, 2 were excluded listwise, and 8 were provided.				

Table 12 – Construct reliability statistics McDonald's ω omega

RA was found to be reliable (4 items; ω = .82). TC[1] was found to be reliable (5 items; ω = .82). TC[2] was found to be reliable (5 items; ω = .95). CP was found to be reliable (4 items; ω = .94). MP was found to be reliable (5 items; ω = .90). NP was found to be reliable (5 items; ω = .95). TMS was found to be reliable (5 items; ω = .97). GOC was found to be reliable (5 items; ω = .92). SI was found to be reliable (5 items; ω = .97). SCA was found to be reliable (7 items; ω = .88).

Appendix E – One-sample T-test

Frequentist statistics for hypothesis testing are performed using the *p*-value approach ($p < .05$). A two-tailed test is used with a type 1 error. If the *p*-value is less than or equal to $a \leq .05$, then the null hypothesis is rejected, and the alternative hypothesis is accepted. If the *p*-value is greater than $a > .05$, the null hypothesis is not rejected and accepted. The test results for the one-sample t-test are shown in Table 13.

One Sample T-Test

					95% CI for Mean Difference	
	t	df	p	Mean Difference	Lower	Upper
RA	1.857	7	0.106	0.656	-0.179	1.492
TC¹	-0.970	7	0.365	-0.300	-1.032	0.432
TC²	1.965	7	0.090	0.400	-0.081	0.881
CP	3.173	7	0.016	1.188	0.303	2.072
MP	1.116	7	0.301	0.425	-0.475	1.325
NP	2.727	7	0.029	1.050	0.140	1.960
TMS	0.245	7	0.813	0.125	-1.081	1.331
GOC	2.136	7	0.070	0.825	-0.088	1.738
SI	2.904	7	0.023	1.150	0.214	2.086
SCA	0.239	7	0.818	0.054	-0.476	0.584

Note. Student's t-test.

Note. For the Student t-test, location parameter is given by mean difference *d* .

Note. For all tests, the alternative hypothesis specifies that the population mean is different from 0.

Table 13 – Results in Two-tailed One-Sample T-Test

Accepted alternative hypothesis

The alterative hypothesis is accepted for CP, NP and SI. The results of the one-sample t-test in written text are:

CP was associated with a statistically significant effect, $t(7) = 3.17$, $p = .02$. Thus, CP is associated with a statistically significant effect and has an effect on the adoption of Green IT ($M = 1.19$, $SD = 1.06$, MD = 1.19).

NP was associated with a statistically significant effect, $t(7) = 2.73$, $p = .03$. Thus, NP is associated with a statistically significant effect and has an effect on the adoption of Green IT ($M = 1.05$, $SD = 1.09$, MD = 1.05).

SI was associated with a statistically significant effect, $t(7) = 2.90$, $p = .02$. Thus, SI is associated with a statistically significant effect and has an effect on the adoption of Green IT ($M = 1.15$, $SD = 1.12$, MD = 1.15).

Accepted null hypothesis

The null hypothesis is accepted for RA, TC¹, TC², MP, TMS, GOC and SCA. The results of the one-sample t-test in written text are:

RA was associated with a statistically insignificant effect, $t(7) = 1.86$, $p = .11$. Thus, RA is associated with a statistically insignificant effect and has no effect on the adoption of Green IT ($M = .66$, $SD = 1.00$, MD = .66).

TC¹ was associated with a statistically insignificant effect, $t(7) = -.97$, $p = .37$. Thus, TC¹ is associated with a statistically insignificant effect and has no effect on the adoption of Green IT ($M = -.30$, $SD = .88$, MD = -.30).

TC² was associated with a statistically insignificant effect, $t(7) = 1.97$, $p = .09$. Thus, TC² is associated with a statistically insignificant effect and has no effect on the adoption of Green IT ($M = .40$, $SD = .58$, MD = .40).

MP was associated with a statistically insignificant effect, $t(7) = 1.12$, $p = .30$. Thus, MP is associated with a statistically insignificant effect and has no effect on the adoption of Green IT ($M = .43$, $SD = 1.08$, MD = .43).

TMS was associated with a statistically insignificant effect, $t(7) = .25$, $p = .81$. Thus, TMS is associated with a statistically insignificant effect and has no effect on the adoption of Green IT ($M = 0.125$, $SD = 1.44$, MD = 0.125).

GOC was associated with a statistically insignificant effect, $t(7) = 2.14$, $p = .07$. Thus, GOC is associated with a statistically insignificant effect and has no effect on the adoption of Green IT ($M = .83$, $SD = 1.09$, MD = .83).

SCA was associated with a statistically insignificant effect, $t(7) = .24$, $p = .82$. Thus, SCA is associated with a statistically insignificant effect and has no effect on the adoption of Green IT ($M = .05$, $SD = .63$, MD = .05).

Three significant statistical effects are present for CP, NP and SI. For these three effects above, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted. Seven insignificant statistical effects are present for RA, TC¹, TC², MP, TMS, GOC and SCA. For these seven effects above the null hypothesis (H_0) cannot be rejected and is accepted.

Appendix F - Bayesian one-sample t-test graphics

A graphical representation sequential analysis using Bayesian one-sample t-test is shown below.

RA

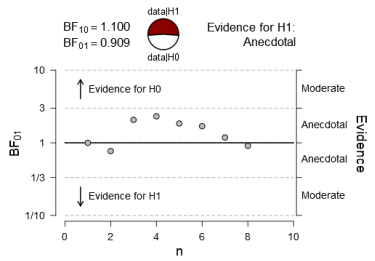

Figure 4 - Sequential Analysis RA

TC[1]

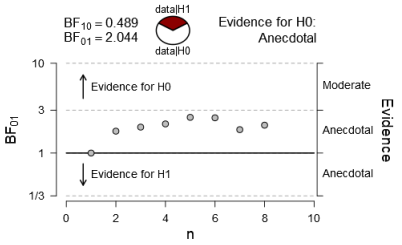

Figure 5 - Sequential Analysis TC[1]

TC[2]

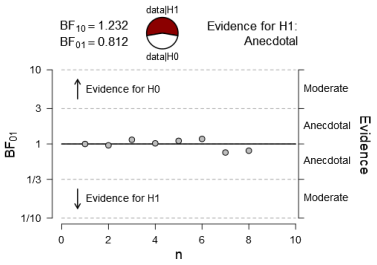

Figure 6 - Sequential Analysis TC[2]

CP

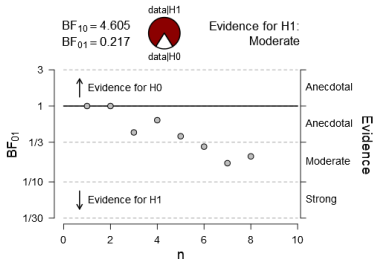

Figure 7 - Sequential Analysis CP

MP

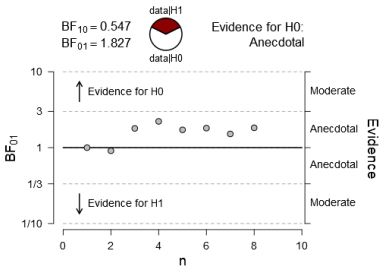

Figure 8 - Sequential Analysis MP

NP

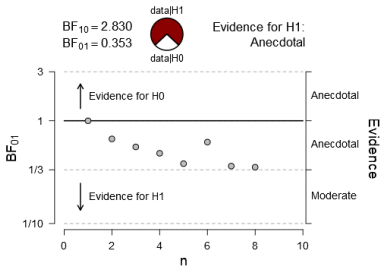

Figure 9 - Sequential Analysis NP

TMS

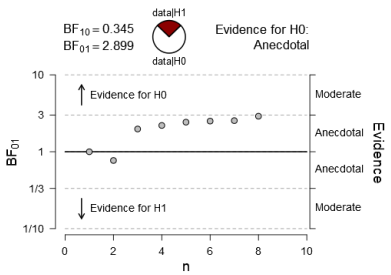

Figure 10 - Sequential Analysis TMS

GOC

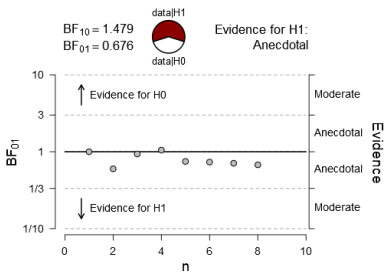

Figure 11 - Sequential Analysis GOC

SI

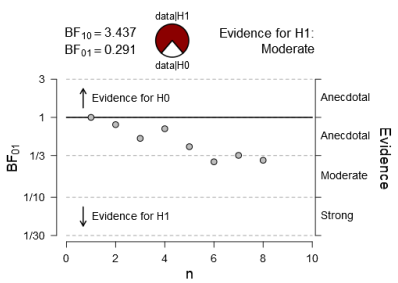

Figure 12 - Sequential Analysis SI

SCA

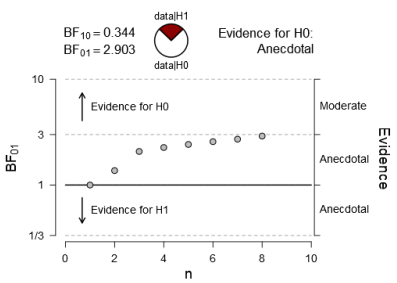

Figure 13 - Sequential Analysis SCA