

# What is new about green innovation

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**Green innovation is a hot topic nowadays. The concerns about the environment are more and more shared among the society. The greenhouse effect, emissions, alternative energy and resource shortage are all connected with green innovation. Because of this, companies are getting more involved into green innovation. Using existing theories based on innovation management, corporate social responsibility and management styles, and the experiences of the practice, new insights are given in this paper. The goal of this paper is to help people understand what green innovation is and how to implement it into the organization. This paper can also be used as a foundation for further research.**

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## **Keywords**

Green innovation, eco-innovation, corporate social responsibility, innovation management, innovation management styles, innovation management practices, environment

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## 1. INTRODUCTION

With all the concerns about the environment, the well-being of the earth, global warming, and the fact that resources given from the earth will run out someday, green innovation is a hot topic. But what is "green" innovation? What are the differences compared with "normal" innovation? And, if there are differences, does it require novel innovation management practices? What is the relationship between green innovation and corporate social responsibility, and when are you involved in green innovation and when in CSR? All questions which are important to fully understand green innovation. And without the understanding of green innovation, recognizing and implementing green innovation in a business is impossible.

Knowledge is stated as one of the key factors of innovation; without knowledge, there is no innovation. And even though there is a lot of technical knowledge of green innovation, the knowledge of implementing these green innovations in a business is still far behind (OECD, 2000).

Porter (1995) and Rennings (1998) already stated that green innovation is different from 'normal' innovation. Green innovation processes face their own problems. Because of this, the normal innovation contexts can't always be transferred to green innovation. New knowledge is needed to make sure what the differences are and what these differences mean for the implementation of green innovation compared to 'normal' innovation.

So, in order to make green innovation more than just a hot topic, knowledge about green innovation and green products is needed. Companies should know more about green innovation than they do now, so that they can implement green innovations in their products, processes and even in their services. This doesn't mean that all companies have a lack of knowledge, but all companies could benefit from more 'green' knowledge. The knowledge this paper wants to provide is about green innovation and innovation management practices. Thus, the main question in this paper is:

*"Does green innovation require novel innovation management practices compared to 'normal' innovation?"*

In order to answer these questions it is necessary to make clear what the differences are between green innovation and "normal" innovation. The same needs to be done with CSR and green innovation. This also means that it is necessary to look at current innovation management styles and practices. Because, after those definitions have been made clear, and the "normal" innovation management styles and practices are defined, it is possible to look at companies who are already involved in green innovations and see the differences in management. In this way it is possible to describe the differences between "normal" innovation management and green innovation management.

When all this information is gathered it is possible to make clear what the differences are between green innovation, CSR and 'normal' innovation, and it provides a starting position to see if green innovation requires novel innovation management practices, so it can later be answered with the help of the practical research.

The rest of the paper is structured as follows: Section 2 comprises the theoretical framework of this study. A review of existing literature regarding green innovation, innovation management styles and principles and CSR will be provided. Section 3 will describe the methodology that is used in this study. The results of this study will be presented in section 4, followed by a brief discussion in section 5 and the conclusion of this paper in section 6.

## 2. LITERATURE REVIEW

To answer the sub questions, a brief literature review is needed. This part of the paper will define key terms, in order to help fully understand the conducted research. Existing literature and theories will be presented to help understand every subject. With the help of this literature and theories, this section will answer the sub questions. The goal of the literature review is to understand green innovation, and to make a model for green innovation based on existing models.

### 2.1 Green Innovation

Green innovation in the current literature is known by different synonyms, namely 'eco', 'environmental' and 'sustainable', as stated by Schiederig, Tietze and Herstatt (2012). And therefore it is necessary to look at all these definitions to find the real definition of green innovation.

Eco-innovation is a new concept. In the MEI project for the European Commission eco-innovation is defined as "the production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organization (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives". Partly building on this definition, eco-innovation is defined in the OECD (2009) report on sustainable manufacturing and eco-innovation as "the creation or implementation of new, or significantly improved, products (goods and services), processes, marketing methods, organizational structures and institutional arrangements which - with or without intent - lead to environmental improvements compared to relevant alternatives" (OECD, 2008 p 19). Both definitions are in line with the Oslo Manual definition of innovation, which includes the implementation of a new technology that was developed by a different firm or institution. For example, following the Oslo Manual, a firm can innovate (or eco-innovate) by purchasing cleaner production technology from a supplier and implementing the technology into its production line. The Oslo Manual is important here because it is the guidebook for the official innovation surveys of almost all OECD countries.

Building on this definition, according to Carrillo-Hermosilla (2012), it is possible to distinguish two different design approaches to innovations in view of the environmental perspective: one is to consider most of the human actions incompatible with the natural environment and to focus on minimizing such impacts to the environment; and the other is to consider incompatible human actions as 'design failures' and to focus on redesigning human-made systems toward biocompatibility and positive impacts to the environment. Biocompatibility refers to the quality of human-made systems, e.g. materials, of not having toxic or otherwise harmful effects on biological systems. For example, materials such as lead and mercury are incompatible, hence harmful for organisms. When the above two perspectives are combined with the perspectives of the incremental or radical nature of produced technological change and the level of impacts to the system, three different approaches can be applied to identify the role and impacts of the eco-innovation (Figure 1).

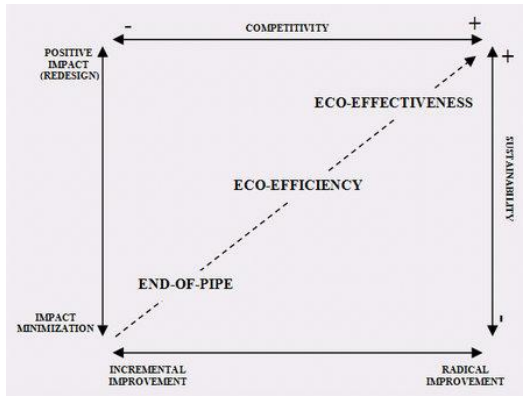


Figure 1. Carrillo-Hermosilla (2012) Eco-innovation types

In Figure 1 it is made clear that there are different kinds of green innovation. It shows the typology of eco-innovations in view of the radical or incremental nature of produced technological change and the level of impacts to the system. Moving from end-of-pipe type and eco-efficiency type of solutions toward eco-effectiveness is likely to provide the highest opportunities in view of enhancing competitiveness and sustainability. Michael Porter and Claas van der Linden also stated that there are different kinds of green innovation, but they distinguish two types of innovation; process innovation and product innovation. For process innovation, enhanced resource productivity could be achieved through technological changes leading to: higher yields, less downtime, material saving, better use of by-products, lower energy and material consumption, reduced storage and handling costs, and conversion of waste into valuable inputs. For product innovation, innovation offsets could include: higher quality and better performance, increased safety, lower-cost, higher resale or scrap value, and lower disposal costs (Porter, van der Linden, 1995). By this, Porter and van der Linden have made clear that there can be a positive relationship between environmental protection and economic performance. For some time, environmental protection has been viewed by many as a brake on economic development. But the so-called "Porter hypothesis" states that environment and competition are not incompatible and that properly designed environmental regulation can act as a trigger to innovation which will in turn make companies more competitive. This ability to simultaneously profit and improve environmental performance has become known as the "double dividend" (OECD, 2000).

This part has made clear that green innovation has several definitions, several synonyms and that there are several kinds of green innovation. Throughout this paper, I will define green innovation as:

"The process to develop new, or significantly improved, products (goods and services) and processes, which provides a significant decrease in environmental impacts compared to relevant alternatives."

In comparison to the definitions of green innovation given by the European Commission and the OECD, the main difference with this definition is that it doesn't take into account the innovations in marketing methods, organizational structures and institutional arrangements. This because those innovation can easily be categorized in product innovation or process innovation.

The definition stated above doesn't imply that green innovation only happens when the intention is to decrease environmental

impacts. Innovations which decrease environmental impacts, without the intention to, are also stated as green innovations.

This gives directly the difference between green innovation and 'normal' innovation. Where 'normal' innovation mostly is defined as the development of a new or significantly improved product (goods and services) or process, green innovation has the addition that the effect of the innovation must be, intended or not, a decrease in environmental impact compared to relevant alternatives. For example, Boeing designs a fuel-saving plane to reduce the fuel costs. This also means less CO2 emissions, but it still adds a lot of CO2. Following the definition of green innovation provided in this paper, the innovation is indeed a green innovation. The product (the plane), however, isn't green or eco.

## 2.2 Relationship CSR and Green Innovation

Furthermore, it is favorable to know the difference between green innovation and corporate social responsibility, CSR. This because both definitions have a lot in common and are easily confused. For example: A company puts solar cells on its roof so it only uses green energy. This makes that the company is "greener" than it was before. But is it due to a green innovation or due to CSR? A short definition of CSR is given by Ness (1992): Corporate social responsibility is a strategic decision whereby an organization undertakes an obligation to society, for example in the form of sponsorship, commitment to local communities, attention to environmental issues and responsible advertising. Going further on this definition, Figure 2 shows the CSR Pyramid by Carrol. This pyramid shows the four levels of CSR. These levels of CSR are important for this paper because it helps understand why certain actions are done by the company, and which needs of the society are fulfilled by these actions.



Figure 2. Crane, A. and Matten, D., 2010. . Carrol's CSR Pyramid.

The economic layer is about the responsibility to provide investors with adequate and attractive returns on their investments. Be profitable, maximize sales, and minimize costs. The legal layer houses the responsibility to obey all laws, adhere to all regulations. This includes environmental and consumer laws, laws protecting employees, fulfilling all contractual obligations and honoring warranties and guarantees. The ethical layer is about what the society expects from the company. This is the obligation to do what is right, just, and fair and to avoid or minimize harm to stakeholders. The philanthropic layer is about what is desired by the society. Business is expected to be a good corporate citizen - to fulfill its philanthropic responsibility to contribute financial and human resources to the community and to improve the quality of life. Provide programs supporting community - education, health, culture and arts, civic. Promote and engage in volunteerism.

This leaves the question if green innovation can be categorized in one of the layers. This can help in defining the relationship and differences between CSR and green innovation.

### 2.2.1 Differences Green Innovation and CSR

Taken into account the definitions and theories of green innovation and corporate social responsibility, green innovation and CSR are two different aspects in management, but they have a great influence in each other, and they overlap each other. Figure 3 shows the relationship between green innovation and CSR.

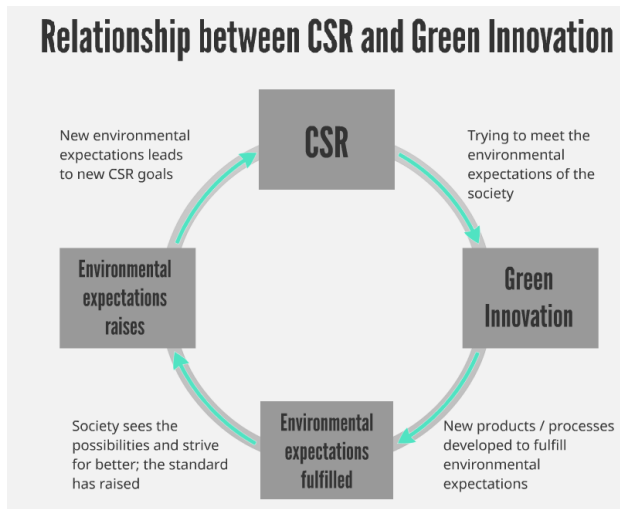


Figure 3. Reuvers, F. (2015) Relationship between Corporate Social Responsibility and Green Innovation.

Figure 3 shows that green innovation and CSR are in a vicious circle with each other. CSR is based on the expectations of society, green innovations help achieve these expectations, society sets a new standard with higher expectations, CSR goals are changed in order to achieve this new standard, etc. This model meets the standards and the vision of the OECD (2000). The OECD states that once the society believes that corporations are the main actors able to influence the future and drive innovations and the development of technology, corporate social responsibility inevitably extends to cover these processes.

Conclusive can be said that CSR is the goal, and green innovation is the way to achieve this goal. This doesn't mean that green innovation only takes place when a company engages in CSR. Green innovation can be used to achieve CSR goals, but can also take place without the existence of CSR.

### 2.3 Innovation Management

Innovation management is controlling, and making decisions about, innovation processes. It refers both to product and organizational innovation. Innovation management allows the organization to respond to external or internal opportunities, and use its creativity to introduce new ideas, processes or products. Tidd and Bessant (2009) have developed a list of 9 core abilities in managing innovation, shown in table 1.

Core abilities in managing innovation	
Basic ability	Contributing routines
Recognizing	Searching the environment for technical and economic clues to trigger the process of change
Aligning	Ensuring a good fit between the overall business strategy and the proposed change - not innovating because it is fashionable or as a knee-jerk response to a competitor
Acquiring	Recognizing the limitations of the company's own technology base and being able to connect to external sources of knowledge, information, equipment, etc.  Transferring technology from various outside sources and connecting it to the relevant internal points in the organization
Generating	Having the ability to create some aspects of technology in-house-through R&D, internal engineering groups, etc.
Choosing	Exploring and selecting the most suitable response to the environmental triggers which fit the strategy and the internal resource base/external technology network
Executing	Managing development projects for new products or processes from initial idea through to final launch.  Monitoring and controlling such projects
Implementing	Managing the introduction of change - technical and otherwise - in the organization to ensure acceptance and effective use of innovation
Learning	Having the ability to evaluate and reflect upon the innovation process and identify lessons for improvement in the management routines
Developing in the organization	Embedding effective routines in place - in structures, processes, underlying behaviours, etc

Table 1. Tidd, J. and Bessant, J. (2009) Core abilities in managing innovation.

In Table 1 not only necessary abilities are giving, also all the possible decisions management can face are given, so this gives a clear view about what innovation management is.

Innovation can take many forms but they can be reduced to four directions of change. (Tidd, J. and Bessant, J., 2009) Choosing the right direction helps to manage the innovation, because it makes clear what the company wants. The four directions are:

1. 'Product innovation' - changes in the things (products/services) which an organization offers.
2. 'Process innovation' - changes in the ways they are created and delivered.
3. 'Position innovation' - changes in the context in which the products/services are introduced.
4. 'Paradigm innovation' - changes in the underlying mental models which frame what the organization does.

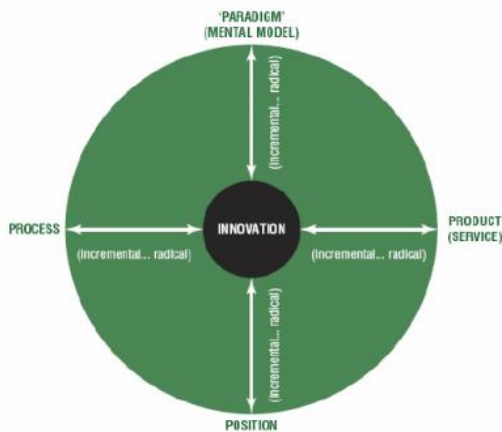


Figure 4. Tidd, J. and Bessant, J. (2009) The 4P's of innovation space.

### 2.3.1 Innovation Management styles

In order to get a good image whether or not green innovation does require novel innovation practices, first the innovation styles need to be explained. This because management styles have a great impact on the firms strategy. When strategy is well adapted in the company, it also means that management styles can have an influence whether or not a company can easily adapt, or create, green innovations. According to William C. Miller (2014) there are four innovation management styles: Visioning, Modifying, Exploring and Experimenting. The four styles are also shown in figure 5. The model of Miller is chosen, because it combines innovation styles with management. The way the innovation takes place is central in this model, which is one of the main topics of this paper. Most of the management style models tend to start with the style of the manager, rather than the innovation.



Figure 5. William C. Miller's (2014) four innovation management styles.

The management styles are based on two dimensions:

1. What stimulates and inspires this style's innovativeness? Those are based on facts, details and analysis, or on intuition, insights and analysis.

2. How does this style approach the innovation process? This can be done focused, well-planned and outcome oriented, or broad, perceptive and learning oriented.

Each innovation style combines these dimensions in a unique way. Figure 5 shows that modifying and visioning styles are more focused, well-planned and outcome oriented, while exploring and experimenting styles are more broad, perceptive and learning oriented. This also shows that visioning and exploring styles primarily use intuition, insights and images to stimulate innovative thinking. Experimenting and modifying styles primarily use facts, details and analysis.

#### 2.3.1.1 Visioning

Companies who have visioning profiles like to imagine an ideal future and let long-term goals be their guide - they envision and idealize. Visioning supports innovation by seeing the "big picture" and providing long-term direction. This also includes inspiring commitment and momentum towards a far-reaching innovation. The results are often bold, far-reaching, imaginative ideas. But visioning can also hinder innovation by resisting options that don't fit into the vision. Plus, visioning focuses on the future and because of that it sometimes neglect important details in the present.

#### 2.3.1.2 Modifying

Companies who have modifying profiles like to refine and improve what has already been done - they refine and optimize. The modifying style does support innovation by building on what others have done, without "reinventing the wheel", by motivating a group to focus on realistic, short-term success, and by being dedicated to keeping change relevant to current needs. But because of being too tied to present circumstances and not seeing less-obvious opportunities, this style can also hinder innovation. Modifying can also hinder innovation by not questioning assumptions and by not being open to radical new possibilities.

#### 2.3.1.3 Exploring

Companies who have exploring profiles like to question assumptions and discover novel possibilities - they challenge and discover. Exploring supports innovation by seeking new and novel breakthroughs. It also supports innovation by challenging assumptions to uncover new perspectives, and by being enthusiastic in the face of uncertainty. But because of being too preoccupied with speculative ideas and by frequently changing their perspectives and direction it can also hinder innovation.

#### 2.3.1.4 Experimenting

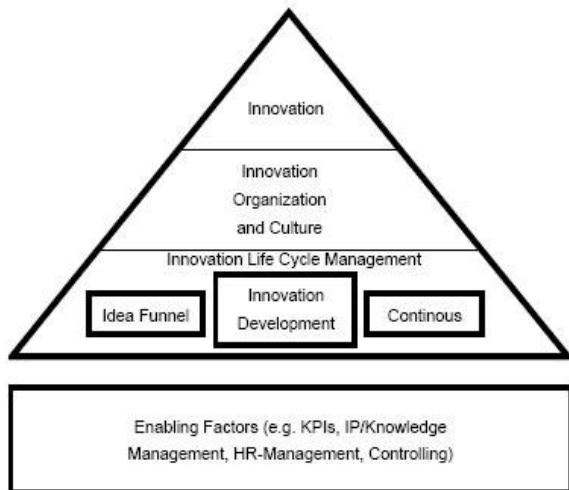
Companies who have experimenting profiles like to test out various combinations of new ideas and learn from the results - they combine and test. The experimenting style supports innovation by finding ways to overcome barriers to progress and by combining the ideas of many people for idea-generation and decision-making. It also supports innovation by being thorough in formulating and testing new ideas and by providing systematic methods to take risks in stages. The downside of this style is that it can hinder innovation by losing perspective on what really matters long-term, by not being bold and imaginative enough, by overemphasizing the process of research and forgetting the goal, and by getting lost in the processes of investigation or implementation.

### 2.3.2 Innovation Management principles

To give a good answer on the question if green innovation does require novel innovation management practices, it is necessary

to know what innovation management practices are, and which practices already exist.

In order to do this, the AT Kearney "Innovation House" model is used. The AT Kearney "Innovation House" model (AT Kearney, 2006) tests innovation practices according to four main foci: innovation strategy, innovation organization and culture, innovation life cycle management, and enabling factors. See figure 6:



**Figure 6. The AT Kearney House of Innovation structures Innovation Management into four dimensions enabling success.**

**Innovation strategy:** This dimension means the highest level of innovative practices, and includes the creation of an innovative vision, the alignment of same with business strategy, communication and dissemination of the strategy at all organizational levels, the existence of mechanisms for competitive analysis (market trends, technologies, and competitors' moves), and objectives' measurement. **Innovation organization and culture:** This area includes all those practices related to the systematization and evaluation of innovation, as well as tolerance to failure and risk propensity. A field of "Innovation life cycle management," explicitly or implicitly present in other models. This area includes creativity processes, product lifecycle and process planning, product and process innovation, and continuous improvement. Finally, a focus of "enabling factors" that includes activities related to technological innovation, support for the product or process innovation, knowledge management, information and communication technology tools, and human resources management.

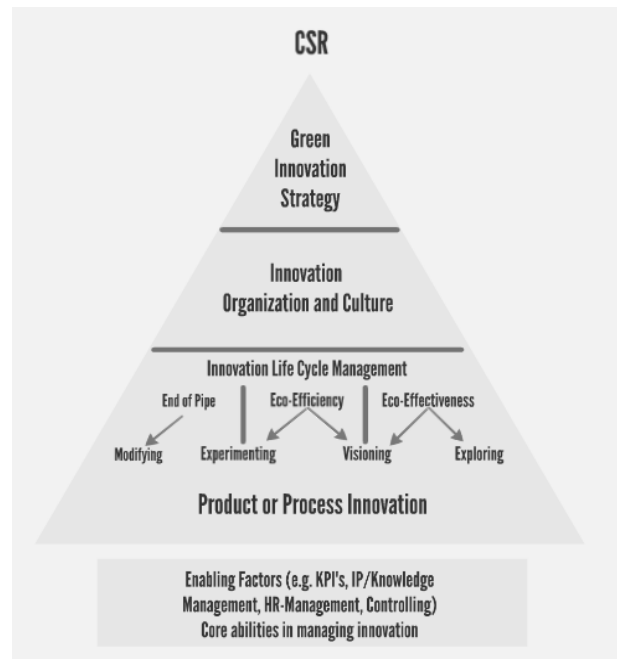
Following this model, innovative management practices can be grouped around the following dimensions to describe the company's practices: innovation strategy, management systems, innovation culture, creativity, project management, product innovation, process innovation, commercial innovation, and technological innovation, both internally and externally.

## 2.4 Green Innovation Management

In the last part several models about innovation management, with their explanation, were given. At first, it seems like there is a lack of coherence and relevance. This part will show that those models are complementary to each other. With the AT Kearney House of Innovation as basis, a new model can be developed. This model has influences from all the other models presented so far. Combining the AT Kearney House of Innovation with Miller's four innovation management styles and the 4P's of innovation space, together with Carrillo-Hermosilla's

typology of eco-innovations gives a model for green innovation management.

The core abilities in managing innovation from Tidd and Bessant are represented in the enabling factors. This is because these core abilities are all important in all of the layers of the model. In other words, it isn't possible to assign these core abilities in one of the three layers, because these abilities are also important in the other layer(s).



**Figure 7. Reuvers, F. (2015) Green Innovation Management**

This model is based on the idea that the company wants to create / improve a product or process so that it is less harmful for the environment. In other words, the company wants to innovate with the intention to decrease environmental impacts. As discussed earlier in this paper, CSR is one of the main drivers for green innovation. But not all green innovations are based on CSR, that's why CSR is placed above the model, and not in it. The green innovation strategy dimension is the same as the innovation strategy dimension in the AT Kearney House of Innovation model, but now with the addition that the innovative vision is green, or environmentally, oriented. The second dimension is a direct copy of the one seen in the AT Kearney House of Innovation model. The third dimension differs the most from the original model. Carrillo-Hermosilla stated that there are three different types of eco-innovation: End-of-pipe, eco-efficiency and eco-effectiveness. Because this model is about green innovation, creativity processes, product lifecycle and process planning, product and process innovation, and continuous improvement should all be based on one of the three types of green innovation.

To manage these three types, the best suitable management style should be chosen. The three green innovation types can be combined with Miller's four innovation management styles, where the above combinations are the most obvious. This doesn't mean that these are the only combinations, but these styles are the most suitable for the different green innovation types, based on the description of the four management styles. End-of-pipe products are based on impact minimization and incremental improvement, this can be done by refining and improving already existing products, as stated by the modifying

style. Eco-effectiveness is more about redesigning a product. Because redesigning can only be done with new imaginative ideas and novel breakthroughs, both the visioning and exploring style are suitable for this type of innovation. Eco-efficiency lays somewhere in between. They are more likely to combine different new ideas, then to re-invent the wheel. Because of this, experimenting and vision styles are suitable. The outcome of the innovation should always be one of the four types distinguished by Tidd and Bessant. They have shown that there are four types of innovation. But following the definition of green innovation: "The process to develop new, or significantly improved, products (goods and services) and processes, which provides a significant decrease in environmental impacts compared to relevant alternatives." The outcome could only be a process or a product. Because of this, the paradigm and position innovation aren't included in the model.

### 3. METHODOLOGY

Because this research is descriptive and comparative, qualitative research is necessary. The literature review already covers a great amount of information, but in this part that information will be checked with the help of an illustrative case study. An illustrative case study is chosen in this research, because this is mainly a descriptive study. Illustrative case studies typically utilize one or two instances of an event to show what a situation is like. Illustrative case studies serve primarily to make the unfamiliar familiar and to give readers a common language about the topic in question. This is precisely the goal of this paper, and so this type of method is most suitable for this paper. One of the data collection methods for an illustrative case study is an interview. Because of this, an in-depth interview has taken place with the deputy director of Raab Karcher. This data collection method is used because, in this particular case, it is the best way of getting the most useful data. This because innovation management, and in particular green innovation management, is a relatively complex subject. Only the right person in the right business has the knowledge about green innovation management. So it was necessary to get to talk with the right person. This person was Gerhard Hospers, deputy director of Raab Karcher. Raab Karcher is also very interesting for this research, because you can split up the company in two: a green part, Greenworks, and a 'normal' part. This means that the normal part of the company can be compared with the green part of the company. Because of this, a reference to another company is not necessary to control the data, because this can be done within Raab Karcher itself. In this case, it is made easy to use the ceteris paribus conditions. This because all the conditions, except for the green focus, are the same. They have the same customers, same buildings, same locations, and even the same employees. In other words, all the differences that can be found between Greenworks and the 'normal' part of Raab Karcher, are there because of green innovation. Because of this, Raab Karcher is the right company to collect the needed data from.

#### 3.1 Raab Karcher

Raab Karcher is chosen because they have developed a green line into their existing business, namely Greenworks. Raab Karcher Netherlands is a subsidiary of Saint-Gobain, the French multinational with offices worldwide. The main pillars of Saint-Gobain are glass, performance materials and building materials. Saint-Gobain has set Raab Karcher the goal to become, and remain, the best provider in the supply of building materials to the professional construction world in the Netherlands. One of the ways to do this is to know everything about materials and their processing. From the foundation to the roof and everything in between. Together with the customers, Raab Karcher works

out the best solutions, where knowledge of materials and their application is important. By closely following what is available and what the needs of the customers are, Raab Karcher strives for every moment and every situation to present the right solutions. These may be new products, including accessory advice, but also logistics services or innovative marketing concepts. The valuable knowledge of Raab Karcher is based on a wealth of experience, dating back to the 19th century. In the Netherlands, Raab Karcher serves its customers with a nationwide sales network managed from the head office in Tilburg. Raab Karcher Netherlands therefore has an extremely flat and decentralized organizational structure where the branches carry the customer service of paramount importance.

#### 3.2 Greenworks

Saint-Gobain has a clear view about CSR in their businesses, which they call "sustainable habitat". Because of this, Raab Karcher also needed to work with these ideas of CSR. Until a few years ago, Raab Karcher didn't pay much attention to these CSR principles. But in 2008 this all changed. Raab Karcher started the conversation with the Dutch government about sustainable building. This led to collaboration between Raab Karcher and the government. Together, with the use Life-Cycle Analysis (LCA), they developed the Greenworksscore. This score makes use of ten specific sustainable characteristics of building materials. Every characteristic can give the product zero, one or two points. More points mean a better sustainable product, with a maximum score of 20 points. In this way, it is possible to easily compare products based on numbers. With the help of the LCA, Raab Karcher launched Greenworks, with co-operation of the government, in 2011. Under the label of Greenworks, Raab Karcher offers a clearly recognizable range of 'green' products that contribute to a sustainable built environment. The selection of Greenworks products is based on the sustainable attributes of a product, the rate the government sailing on sustainability and the environmental performance of the product. From the extraction of raw materials from nature to the processing of waste from the demolition of a building



Figure 8. The ten categories of the Greenworksscore, distinguished by Raab Karcher

### 3.3 Greenworksscore

- Meant by renewable resources are resources that replenish themselves within 100 years. This involves materials whose consumption is not higher than that nature can produce. For example, wood, flax or clay.
- The origin of the raw materials is called local when the distance from the extraction site to plant is less than 50 kilometres.
- With a renewable energy source is meant energy generated by using sources that are renewably or not exhaustible. For example, solar and wind energy.
- To get a good score in recycling production waste, it is necessary to have no production waste. Or the production waste is recycled for 100% in the factory and added back to the process. Recycling can also take place externally.
- If the product is manufactured in the nearby area, the score for product source will be high. With nearby area is meant, within a radius of 200 kilometres of Utrecht, or at latest a radius of 800 kilometres from Utrecht.
- Special environmental gains are innovative products that add particular value to the system when using them. For example products with an air-purifying or anti-bacterial activity. But also the supply of renewable energy or the reduction of energy consumption.
- Is the product maintenance free? Or is periodic maintenance, without the use of environmentally harmful materials sufficient? These questions are asked in the category 'Maintenance during use'.
- To get points in the biodegradable category, it is necessary to deliver a product that is biodegradable. This means that 90% of the material must be demolished within two years.
- Reusing is different from recycling. A product is reused as it is used again, whether or not for any other purpose.
- With recycling, an existing product will be completely transformed into a new product / resource. Recycling can also take place externally.

### 3.4 Greenworks Academy

The first year of Greenworks didn't work out as well as planned. The sales of Greenworks products were very disappointing. These low sales turned out to be caused by a lack of knowledge, for both the salesmen and the buyers. This involves knowledge about the use of the products, the Greenworksscore, and why it is important to use environmental friendly products. Due to this, Raab Karcher started, in cooperation with the suppliers of Raab Karcher, the Greenworks Academy. This academy makes sure that all the parties involved are good informed about sustainable building, and how to do this. The classes are free of charge.

Since the existence of the Greenworks Academy, the turnover of the products with the Greenworks label has increased, and is still increasing. In 2011 with the start of Greenworks, Greenworks product held a percentage of 11% of the total turnover of Raab Karcher. Now, 4 years later, this percentage compared to the total turnover of Raab Karcher is already 36%.

In these 4 years of Greenworks, it has developed itself as a status symbol for green products. Nowadays, suppliers are contacting Raab Karcher with the question if their product can get the Greenworks label. Due to this, Greenworks is developed from a green innovation of Raab Karcher, to a label which promotes green innovation, manages green innovation, and helps the suppliers of building materials to develop green innovations.

## 4. RESULTS

The results of the interview with Gerhard Hospers about managing green innovation, and how the management of green innovation differs from normal innovation, are presented in this part. The conducted interview was based on the model presented in figure 7. I didn't put CSR in the result section, because Raab Karcher's CSR is already explained in part 3.2.

### 4.1 Green Innovation Strategy

For companies who want to engage in green innovation, it is very important to have a great fit between the firm's green vision and their strategy; their green innovation strategy. It is favourable to have a clear strategy on how to accomplish the green vision of the company.

Hospers: "The green strategy is embedded in whole Greenworks, this with the help of mechanisms like the greenworksscore. Goal of the green innovation strategy is to make clear how we want to formalize the green vision."

The main difference with this green innovation strategy, compared to the innovation strategy of Raab Karcher, is the focus of the strategy. Where Greenworks is focused on green innovation and the environment, Raab Karcher is more focused on saving costs and time management. The implementation and communication of this strategy is, at both Greenworks and Raab Karcher, based on the same point: the flat and decentralized structure of the organization.

### 4.2 Innovation Organization and Culture

The layer can be brought back into four categories, namely: vision, control and research, stimulation, and reverse thinking. These four categories are chosen, because during the interview these four topics stood central in the explanation of the differences between Greenworks and the rest of Raab Karcher. The four topics were like a guideline of the interview. These four categories can make the differences between green innovation and normal innovation. When these categories are well-integrated in the company, the company should be able to engage in green innovation.

Hospers: "The main difference between Greenworks and the rest of Raab Karcher is that our focus is on being green. All the decisions we make are based on the environment. To ensure that this is well-integrated in the company, we brought the definition 'green' back to four, more easily to communicate and control, principles. These principles are vision, control & research, stimulation and reverse thinking."

#### 4.2.1 Vision

With vision is meant that there is a clear view on green innovation and green innovation management, and why the company wants to engage in green innovation. This helps in making sure that the whole company is on the same line. This part gives three major questions, which need to be answered and shared with the company by the management:

1. Why do you engage in green innovation?
2. For who do you engage in green innovation?
3. How are you going to create green innovation?

When these points are made clear, management can communicate them with the employees of the company. So a fourth question is possible:

4. How do you communicate the vision with your employees?

The task of the management is to make sure that the vision is widely supported by the rest of the company. This was the fault Greenworks made in their first year. Because the vision and the



intentions were not clear for all employees, turnover was disappointing. After creating the Academy, and training the salesmen, turnover has risen.

Hospers: "The Greenworks Academy has accomplished what management alone could never do; it has opened the eyes of the employees, suppliers and buyers. Everyone could see why green innovation is important, and why this is not only about doing business, but also creating better products with the eye on the future."

#### 4.2.2 Control and Research

Wanting is one, doing is two. Every management can say that they want to engage in green innovation, but really engaging in green innovation is something different. To make sure that the company follows the green intentions of the management, control is necessary. But there can't be any control, without rules or criteria. Management can develop criteria for knowledge of the employees on green innovations, for the suppliers, for emissions, etcetera. By setting these criteria, management can control and steer green innovation.

Hospers: "Without control you can't expect that such a great change, as implementing green innovation in the organization is, will be done correctly and in every layer of the firm. For example, Greenworks has been gone back from over 2000 suppliers, to less than 750 suppliers. This, just because the other suppliers could not meet the new criteria. But the suppliers do still deliver to the non-green part of Raab Karcher, because they make use of other criteria."

Research is also an important point. Without research it is difficult to come up with new ideas to develop green innovations. Research is also necessary for the criteria. For example: The business has set criteria on knowledge. Then it needs investigation if these criteria are satisfied. The same is for emissions. When the criteria for emissions aren't satisfied, research needs to be done why the criteria aren't fulfilled and what needs to be done to fulfil these criteria in the future.

Hospers: "Suppliers come to us with the comment that they have seen that another product has a higher Greenworksscore. Together with that supplier we are going to investigate where, and how, they can score more points, so that their product has equal, or more, points."

#### 4.2.3 Stimulation

Another task of managing green innovation is to stimulate the involved parties to commit themselves towards a more environmental friendly future. These parties can be shareholders, employees, suppliers and even the buyers of your product for example. Employees and suppliers can be stimulated with, for example, conditions in the contract in which a bonus is included when certain green conditions are met. Stimulation of the buyers is a main task of the salesmen of the organization. They need to make sure that the buyer knows why this product is better for the environment compared to relevant alternatives. This can be based on the way the product is produced, or based on the impact the product has on the environment itself.

Hospers: "Choosing for products with a higher price is difficult to stimulate. Most of the 'green' products are more expensive than the non-green options. But in order to sell these products you need to stimulate the employees, suppliers and mainly the buyers. .... Because the salesmen are doing a great job in stimulating the buyers, with the help of the Academy and incentives, the suppliers are getting stimulated by how well their product is sold. The more green products are sold compared

with the non-green alternatives, the more suppliers want to engage in green innovation.

#### 4.2.4 Reverse thinking

One of the main things that need to be changed in the management according to Hospers is that the way of thinking needs to be in a different order. Where, most of the time, the starting position is about prices and how to get these lower, the starting position for green innovation management should be how to be environmental friendlier. The same counts for the salesmen. When the buyers are stimulated in the right direction, the starting position for the sale of the product should be based on the environment, and no longer on the price of the product. This new way of thinking needs to be widely supported throughout the company to create the best green innovations.

Hospers: "Because we, and the government, want to stimulate sustainable building, we need to make sure that we deliver green products. The government does this by setting limits for the environmental impact a building has. Those limits are the starting point for us, not the price of the product, but the impact the product has on the environment."

### 4.3 Innovation Life Cycle Management

The creativity processes, product lifecycle and process planning, product and process innovation, and continuous improvement within Greenworks can all be brought back to end-of-pipe innovation. Greenworks is most involved in refining the products of the suppliers in such a way that the product is less harmful for the environment.

Hospers: "Together with our suppliers we strive to make products more environmental friendly, based on the greenworksscore. We search where improvement is possible, and how to do this. So we're not searching for new extreme solutions, but improving the current ways the product is produced and transported."

### 4.4 Enabling Factors

Asked about the core abilities in managing the green innovations within Greenworks, Hospers replied:

"All the 9 core abilities that are appointed by Tidd and Bessant are equally important, and are notable in every business, so also for Greenworks."

Hospers also stated that these core abilities don't differ much for Greenworks and Raab Karcher, but that, because of the differences in strategy, the focus of these abilities are different. Greenworks is, obviously, more concentrated on the environment compared to Raab Karcher. Also the support for the product is different for Greenworks.

Hospers: "Because environmental friendly products are often higher priced than other alternatives, it is necessary to make you sure that the products are supported by the whole company, and that the extra costs can be explained by extra value."

The other enabling factors such as technological innovation, knowledge management and human resource management are basically the same for Greenworks as for Raab Karcher.

## 5. DISCUSSION

What do these results mean for theory and practice? For theory, this paper can be a great starting point for further research. The results can be compared with other companies who engage in green innovation. Furthermore, it has linked innovation and corporate social responsibility in a way theory didn't show before.

For practice, this paper can help management in implementing green innovation in their organization. Due to this research, they can more easily integrate the right focus of green innovation in their organization, based on the four categories: vision, control & research, stimulation and reverse thinking

But there are also a number of comments that can be made on this research, due to several limitations in this study.

First of all, due to time limitation, the research has only taken place with the help of literature and one company. Although the company, Raab Karcher, suited perfectly with the research, the received data could not be checked, confirmed or compared with other companies. When there was more time available a second company, or even a third, would have been visited to get the possibility of checking and comparing the data of Raab Karcher.

Second, because of the early developmental stage of this topic, there wasn't a lot of data and literature available. At the same time, this means that this paper can have a major contribution in this field. Namely, the theories of the paper can help people understand what green innovation is and what the differences and comparisons are compared to CSR and 'normal' innovation. It also has a practical side; the paper can help management implement green innovation in their organization.

The third point of discussion is based on figure 7. This figure was based on theories only. But based on the results of the interview with Hospers, a few corrections are necessary. Hospers stated for the 'innovation organization and culture'-layer there are four main categories to distinguish: vision, control & research, stimulation and reverse thinking. I could see how these four categories are embedded in the organization, and I believe that they help in managing green innovation. These four categories are different for green innovation compared to regular innovation. With the help of the four categories, it is possible to make sure that the focus of the whole company is on green innovation. As stated before, it is very important to have this focus throughout the whole company to make sure that the process of green innovation can take place at best. Because of this, the model is adjusted. See figure 9.

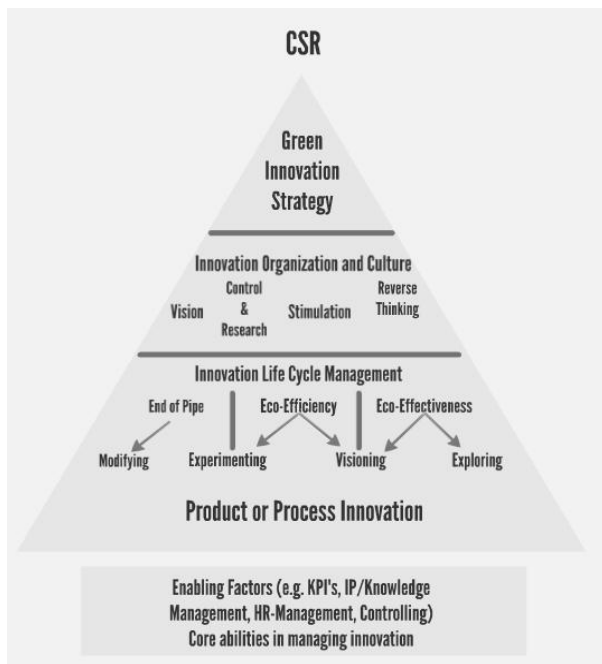


Figure 9. Reuvers, F. (2015) Green Innovation Management (Adjusted)

In the adjusted figure, the four main categories based on the interview with Gerhard Hospers, are added in the 'innovation organization and culture' layer of the model. It is put in this layer, because these categories need to be a part of the organizations culture. When these categories are a part of the culture, then the focus of the company will be on green innovation. With this focus throughout the company, managing green innovation is less difficult. Compared with the old model, figure 7, the 'innovation organization and culture' layer is now concentrated on green innovation. Based on the results of the interview with Gerhard Hospers, these four categories are the main difference between Greenworks and Raab Karcher. In other words, the difference between green innovation and normal innovation is based on these four categories.

Unfortunately the model couldn't be tested completely, because Greenworks only is involved in end-of-pipe innovation. The results did confirm that end-of-pipe innovation is connected with the modifying management style. The other combinations couldn't be tested. In order to do this, I hope that I will get the chance to test the model in other companies who are more involved in eco-efficiency and eco-effectiveness innovation.

## 6. CONCLUSION

With all the information given in this paper, both literature and the interview with Gerhard Hospers, it is possible to answer the main question of this paper:

*"Does green innovation require novel innovation management practices compared to 'normal' innovation?"*

The answer seemed to be yes. At first sight, green innovation seemed to significantly differ from regular innovation. Not only because of the kind of products that are associated with green innovation, also because of the totally different initial position of green innovation compared with normal innovation.

But after gathering the needed information, this isn't completely true. The main difference between green innovation and normal innovation is about the focus on why the innovation is needed. Normal innovation happens because of cost savings, technological breakthroughs, competitive advantages or other reasons purely based on increasing the firms value. In the case of green innovation, this focus is on the environment. Or better formulated, on decreasing the impact of the product or process on the environment. The same can be said about the results of the interview with Gerhard Hospers. Indeed, there is a different starting position for integrating the innovation into the company, and in the management of this innovation. But also here, the differences between this green innovation management and regular innovation management can all be brought back to focus.

For green innovation the same principles and practices count as for all the other forms of innovation. But the focus of the innovation is, most of the time, different from normal innovation. Most of the time, because the focus of an innovation can be based, for example, on cost savings, but the innovation also has positive influences on the environmental impacts of the product or process.

But why is it that companies seem to struggle with the implementation of green innovation? This is mainly explained by the 'innovation organization and culture'-layer of the model. This is also where green innovation management differs most from 'normal' innovation management. Companies struggle with the fact that the value of the product is no longer based on prices, but based on a significant decrease in environmental impacts compared to relevant alternatives. For decades, managing innovation was purely based on cost savings and/or

technological breakthroughs. This way of managing innovation can't be used for managing green innovation. But the results of this research also proved that it is necessary to educate the buyers of your product when you want to engage in green innovation. When the buyers aren't educated about the value the product or process adds to the environment, it won't be sold. This has been made clear by the Greenworks Academy. Since the Academy, sales increased.

So, does green innovation require novel innovation management practices compared to 'normal' innovation? According to the information presented in this paper it doesn't. But if a company really wants to engage in green innovation, it not only needs to change its own focus towards the environment, but also the way of thinking of their buyers. Management can still make use of existing innovation models, but the company needs to have a clear vision about why, what and how to engage in green innovation to make the model work for green innovation. So conclusive can be said that green innovation doesn't require novel innovation practices, but it does require a management that is willing to chance its focus towards the process to develop new, or significantly improved, products (goods and services) and processes, which provides a significant decrease in environmental impacts compared to relevant alternatives.

### 6.1 Contribution and recommendation

The theoretical contribution of this paper can be described as a first step in the right direction. There hasn't been done research about this topic before. This, together with time limitations, are the reasons why the generated model couldn't be tested completely. That is why I see this paper as a first step: extra research needs to be done to confirm/reject the model. When the model is totally tested, then it can be a great contribution to the theory of green innovation management. Also, more research needs to be done how to manage the green focus in a company. This because the focus of the innovation can make it a green innovation or a 'normal' innovation, as stated above.

The practical contribution of this paper can be linked to the theoretical contribution. When the model is tested completely, and all the faults are removed, then it can held great value for practice. At this moment, the moment is only tested on one company, and not all types of green innovations are tested. At this time, only companies who want to engage in end-of-pipe innovation can use the model, but my recommendation for practice is that further research needs to be done before the model should be used.

## 7. REFERENCES

Schiederig, T., Tietze, F. and Herstatt, C., 2012. *Green innovation in technology and innovation management - an exploratory literature review*. Oxford: Blackwell Publishing Ltd.

Carrillo-Hermosilla, J. (2012). *Eco-innovation*. <http://www.eoearth.org/view/article/151923>

Arundel, A. and Kemp, R. (2009) *Measuring eco-innovation*. United Nations University - Maastricht Economic and Social research and Training Centre on Innovation and Technology. Maastricht, UNU-MERIT #2009-017

OECD (2009, forthcoming) *Sustainable manufacturing and eco-innovation* (tentative title), OECD, Paris.

OECD (2000) *Innovation and the environment*, sustainable development, OECD, Paris.

Ness, M.R. (1992) *Corporate Social Responsibility*, British Food Journal

Raab Karcher, GreenWorks  
<http://www.raabkarchergreenworks.nl>

Crane, A. and Matten, D. (2010), *Business ethics: managing corporate citizenship and sustainability in the age of globalization*, Oxford University Press

Tidd, J. and Bessant, J. (2009), *Managing Innovation: Integrating Technological, Market and Organizational Change*, John Wiley & Sons

Tidd, J. (2001), *Innovation management in context: environment, organization and performance*, Blackwell Publishers Ltd, Brighton

Miller, W.C. (2014), *Innovation styles, the success booster*, Dallas, Texas

Technol, J. (2011), *Innovation Management Practices, Strategic Adaptation, and Business Results: Evidence from the Electronics Industry*, Journal of Technology Management & Innovation.

Kearney, A.T., (2006), *Masters of innovation*

Porter, M.E., van der Linde, C., (1995), *Towards a new conception of the environment-competitiveness relationship*. J. Econom. Perspect.

Renning, K., (1998), *Redefining innovation — eco-innovation research and the contribution from ecological economics*. Center for European Economic Research, Mannheim

## 8. APPENDIX

### INTERVIEW PROTOCOL

**Institutions:** Raab Karcher, Greenworks

**Interviewee (Title and Name):** Deputy Director, Gerhard Hospers

**Interviewer:** Frank Reuvers

This interview is an open-based interview. This means that the questions below are just guidelines to be sure that the needed data will be given.

#### **Survey Section Used:**

##### **A: Interview Background**

- Who are you and what do you do within Greenworks?
- Can you tell something about the origin of Raab Karcher and Greenworks?
- Can you tell something about the Greenworks Academy?

##### **B: Green Innovation Strategy**

- How do you see green innovation strategy?
- What are the main differences in innovation strategy between Greenworks and Raab Karcher?

##### **C: Innovation Organization and Culture**

- How do you describe the innovation organization and culture within Greenworks?
- What are the main differences compared to Raab Karcher?

##### **D: Innovation Life Cycle Management**

- How would you describe the creativity processes, product lifecycle and process planning, product and process innovation, and continuous improvement within Greenworks?
- Can this be brought back into one of the three categories:  
End of Pipe | Eco-efficiency | Eco-Effectiveness
- How do you describe Greenworks' management style, and fits this in one of the four types in the model? Modifying | Visioning | Experimenting | Exploring
- What are the main differences of these points compared to Raab Karcher?

##### **E: Enabling Factors**

- Are the core abilities of Greenworks different from Raab Karcher? Why (not)?

**Documents Obtained:** Information guide, information notebook

**Post Interview Comments or Leads:** Hospers has a different view on the Innovation Organization and Culture compared to the model. Because of this, a lot attention during the interview was on this layer.