ERASMUS UNIVERSITEIT ROTTERDAM

Master thesis Department of Business Economics, Section Marketing

# Business models in Eco-Innovations

## An explorative study


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# Acknowledgement

Organizations are increasingly focussed on sustainability. Eco-innovations are a growing field of research. With this research I wanted to examine the developments of business models in this context. In cooperation with research Institute EIM a qualitative research plan was set uo. I especially would like to thank Coen Bertens, account manager at EIM. He offered me the opportunity to conduct this research, do interviews and case studies thereby using the EIM research network and facilities. Especially during the time consuming trajectory of conducting the interviews and case studies, he always took the time and effort to support me with his knowledge and useful feedback.
I would like to thank my coach, Nel Hofstra. Her knowledge, comments and suggestions in the field sustainability, entrepreneurship and conducting scientific research, were very useful and have guided me to this final version.

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Overall, the writing of this thesis has been a great learning experience and has provided me with a satisfying ending of my student career.

Hidde Statema
Den Haag, April 2011

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# Summary

*Introduction*

After studying the issues on market acceptance of eco innovations the question was raised on the business models of eco-innovations. Are they any different from regular innovations and are they successful?. In this study at least the next questions are to be answered:

- In what way are business models of eco innovations different from 'regular' innovations?
- Which factors determine the business model used?
- What kind of business models are distinguished in up scaling eco-innovations?

This strives to provide a tool for managers and policymakers in stimulating eco-innovations. The mechanism behind business models in eco-innovations is exposed and insight is created in the way funders stimulate eco-innovations and what is the role of the business models in this process.
Which policy opportunities are connected with business models for eco innovations? How can governments stimulate these business models?
The research methodology consisted of a qualitative approach with a combination of literature reviews, several expert interviews and case studies. Based on this information the factors determining the choice of business models are described and a first conceptual model on this issue have been developed. These factors and the conceptual model were checked at experts of a number of business organizations and investors. Case studies were held with SME's launching eco-innovations into the Dutch market and/ or foreign markets. However mainly aimed to be illustrations these case studies also functioned as a test on our findings in the earlier parts of the research project. Both the business organizations, the entrepreneurs and the investors were asked about their need for support on the development of the business models. This explorative study entails continuous reflection upon the developed theoretical framework and offers theoretical leads for future research.

*Conclusions*

On the factors determining the business models of eco-innovations little is known from literature. The interviews we held and a number of seminars we visited showed us that important factors are:

- The complexity of the eco-innovation (from end op pipe technology to system innovations)
- The market conditions (the capital available, the risk profile, support from legislation, the available market information etcetera)
- Regulatory factors (existing laws and regulations, support by the government)

Findings emphasize the importance of market development for eco-innovations. Eco-innovations are often focused on new- or niche markets, where factors mentioned above are significantly important in successfully market the eco-innovation.
Basically it all comes down to value creation. In the case of eco innovations profit is not only materialized, but also in (the reduction of) opportunity costs or other posts.

Based upon the literature we found and the experts and entrepreneurs we spoke to, we can now say that only a small part of the eco-innovations launched are

business models seem to be different from 'regular' innovations. Since most customers and financial parties involved in the business model of eco-innovators think and act according to the traditional economic views, the business models of eco-innovators are quite traditional too.
Based upon our expert interviews and case studies cooperation within the chain is important in up scaling eco-innovations as well as information management. This is in line with the theoretical findings combined with the experienced barriers in up scaling eco-innovations revealed in the case studies. Externalities and investment profiles are influential barriers in the up scaling phase.
An interesting new development are the PSS models, where entrepreneurs try to sell services/ performance instead of products. Although we do not know how often this is used, it seems an interesting way of giving back the responsibility concerning sustainability to the suppliers and thereby promising in overcoming the barriers mentioned before. It seems however a method in development. Furthermore there is the issue of business models in cooperation within production chains. These developments are in line with our case study finding of cooperation and the importance of information flows.
Companies seem to be reluctant in working this way, since they can not yet find the appropriate business models.

*Recommendations*

The importance of cooperation and information management is a clear result of this study. Future research is to be aimed in the interaction of these business model components with the influential factors on eco-innovations.
More research needs to be done on these models an the valuation of performances for different product and service groups. In particular one has to examine the interaction of the PSS models with the barriers mentioned before.
An important issue in scaling up eco-innovations is the market development. In case of eco-innovations this is often the biggest challenge. There is either no market yet or the market is dominated by certain interests. The experts and companies we spoke to all underline the importance of market development and the role of the government in this development. Clear and consistent regulations, subsidies and taxes and objectives create markets in which entrepreneurs can develop business models.

# 1 Introduction

*Background*

Sustainable products and services are more and more labeled as quality products. Governments, designers, project developers, producers and suppliers are all getting more and more convinced of their value. Both from a view of urgency as from a view of social responsibility.

Both the supply of and the demand for eco innovations have risen significantly during the last years. These are necessary conditions for new markets. An important issue in marketing the eco-innovations is the business model that is chosen by single companies or cooperating companies to scale up technologically successful innovations. Since business models are an important criteria for funders to provide access to venture capital this session focuses on the financial economic issues of the various business models for eco-innovations.

When entrepreneurs meet and start talking about their business model everyone seems to have a different perception of the business model, according to Alex Osterwalder(2009). New products are made very quickly, lean and efficient production is a challenge from the past (although many managers still manage on this), the network economy challenges companies to create different value proposition for every possible group of clients and experiment on this.

Disruptive innovations bring both winners and losers. The roadmap to business success in a period of change will demand a premium for innovation, collaboration and smart investments to shape a globally prosperous and sustainable future.

*Aims*

In cooperation with EIM we recently started a research project on this issue financed by both the Dutch Ministry of Infrastructure and Environment and Agentschap NL. In this study the next questions are to be answered:

- In what way are business models of eco innovations different from 'regular' innovations?
- Which factors determine the business model used?
- What kind of business models are distinguished in up scaling eco-innovations?

The role of the investors is identified and their interaction and influence on the business model is examined. Furthermore policy opportunities are connected with business models for eco innovations. How can governments stimulate these business models?

We will examine single companies in both business to business markets and business to consumer markets, but also at more complex models of cooperating companies.

*Methodology*

The research methodology consisted of a combination of literature reviews, several expert interviews and a number of case studies. this qualitative approach goes hand in hand with the open ended research question we set. Since this is an explorative research it wasn't suitable to set more conventional hypothesis.
In the first phase of the research project, a number of policy makers, universities and foreign institutes/experts were contacted. Both the desk re-search and the expert interviews were conducted in order to collect relevant data and information concerning business model in eco-innovations. Baxter and Jack (2008) mention the importance of multiple data sources: "This qualitative case study is an approach to research that facilitates exploration of a phenomenon within its context using a variety of data sources. This ensures that the issue is not explored through one lens, but rather a variety of lenses which allows for multiple facets of the phenomenon to be revealed and understood".

Based on this information the factors determining the choice of business models are described and a first conceptual model on this issue have been developed. These factors and the conceptual model were checked at experts of a number of business organizations and investors.

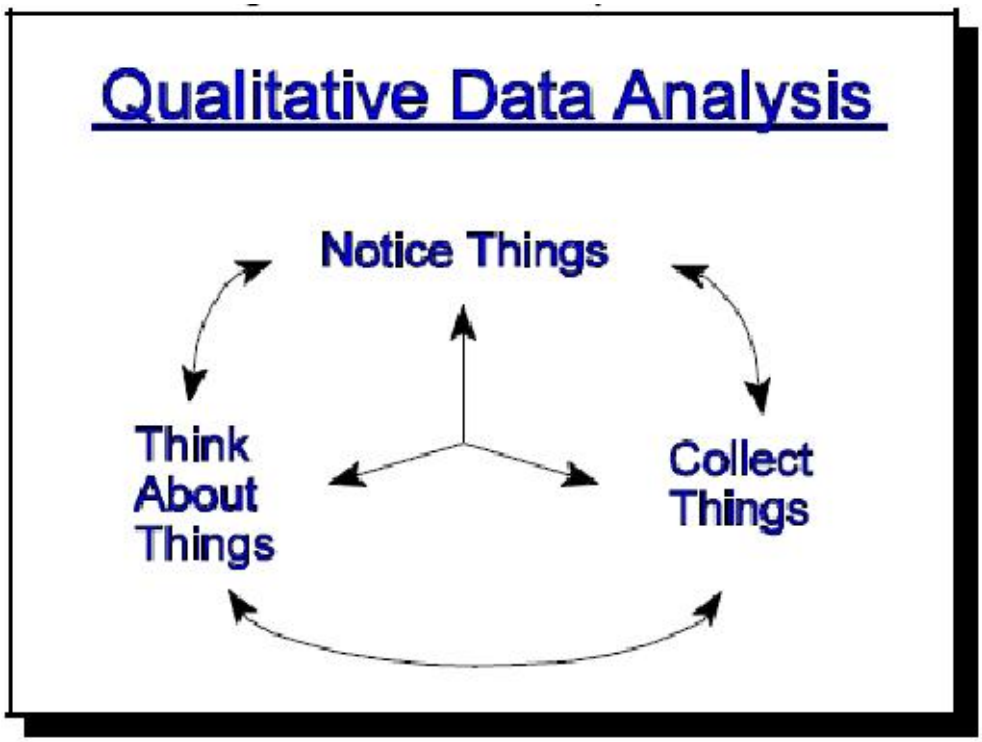
The need for support on the development of the business models was based upon interviews with scientist from the eco-innovative field of research, experts in business models, financing and commercial parties active in eco-innovative sectors, completed with the information gathered at the 2010 ETAP conference on financing eco-innovative SME's.

At last seven case studies were held with SME's launching eco-innovations into the Dutch market and/ or foreign markets. Case studies were chosen because the phenomena of the business model has to be seen in the context of eco-innovation. A case study is able to investigate this phenomena and the context it function in, and makes use of multiple sources of information. We conducted a qualitative intensive interview, combined with internet sources and articles. However mainly aimed to be illustrations these case studies also functioned as a test on our findings in the earlier parts of the research project.
This type of exploratory case study is used to explore those situations in which the intervention being evaluated has no clear, single set of outcomes (Yin, 2003). Yin (2003) states that a case study should be used when the focus of the research is to the reason why a certain phenomenon takes place and the way it takes place. Boundaries are vague, forcing the researcher to examine the phenomenon in its context.

Seidel, J.V. (1998) designed a three step qualitative research model. Noticing, collecting and thinking about the research subject. According to Seidel qualitative data analysis is iterative and Progressive for the reason that it keeps repeating itself. Since this is a new field of research, there is a need to continuously reflect upon findings to improve the theoratical framework. It is a constant process.
The process is recursive since the collection of data can suggest new areas of research. So collecting, analyzing and noticing one thing can lead you to the need to collect more data.

The process is holographic because when you are noticing when collecting and analyzing data, you are already thinking about the things noticing and the way to analyze that.

Figure 1 The data analysis proces




*Source: Seidel, J.V. (1998)*

### *Structure of the report*

The first part of this paper consists of a literature review. An overview of available literature concerning the characteristics of eco-innovations and an overview of a business model wit all its components.
The second part describes are conducted interviews with scientist, policymakers, managers and consultants in the field of eco-innovations. These views by the experts are presented within the framework of our conducted literature research to be able to explore the interaction between the defined components of our business model and the factors influencing eco-innovation.
The third part of this study gives an description of seven case studies. The seven cases are motivated and a short description of our research aim is presented. Finally conclusions and recommendations are being presented. A conceptual model is being presented to illustrate the factors determining the business model in eco-innovations. The role to be played by government institutions and financing institutes is stated as well as room for improvement.

# 2 Characteristics of eco-innovations

## 2.1 Definitions and categories

The interdisciplinary project "Innovation Impacts of Environmental Policy Instruments" has introduced the term environmental innovation (short: eco-innovation) and defined it very broadly as follows (FIU, 1998):
*"eco-innovations are all measures of relevant actors (firms, politicians, unions, associations, churches, private households) which:*

- *develop new ideas, behavior, products and processes, apply or introduce them;*
- *contribute to a reduction of environmental burdens or to ecologically specified sustainability targets."*

In 2007 a new European program was initiated aimed at facilitating access to finance for innovative small and medium sized enterprises (SME's): the Competitiveness and Innovation Framework Program (CIP). CIP defines eco-innovation as followed:
*"eco-innovation is any form of innovation aiming at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment or achieving a more efficient and responsible use of natural resources, including energy".*
The program divides eco-innovations in roughly two categories, namely:

1 Activities of traditional eco-industries, i.e. products and services whose main purpose relates to pollution prevention and management, or natural resources management. In this case, any innovation related to their core activities can be considered eco-innovation.
2 Other activities where eco-innovation can reduce pollution and/or optimize resources use. In this case, an innovation can be considered to be an eco-innovation if the expected benefit for the environment is clearly identified (measurable as far as possible) and substantial (going beyond gains in resources efficiency generally resulting from process improvements). A life-cycle approach should ensure that the environmental impact is not shifted from one part of the life-cycle to another (for example from production to use or disposal).

Next to CIP/ EIP, the Environmental Technologies Action Plan (ETAP) exists. ETAP is a cooperative initiative between the European Commission, Member States and industry adopted in 2004 and intended to overcome the barriers that hinder the development of environmental technologies. This is being achieved through a series of measures to promote eco-innovation and the take-up of environmental technologies. Priority is given to:

- Getting inventions from the research laboratories to markets;
- Improving market conditions, particularly by providing positive incentives such as a supportive regulatory framework and access to finance;
- Acting globally with actions supporting developing countries and promoting foreign investment.

On the road to a sustainable society, Fagerberg, J. (2005) distinguished three phases. The innovations in these phases differ in complexity and scope: short term (<10 years), midterm (10-40 years) and the long term (>40 years).

*Short term*

In the first phase technologies can be used mainly for 'good housekeeping' and 'end-of-pipe' measures. Good Housekeeping entails all actions within the organization to prevent waste of material and energy. A more efficient organization and communication in the production process is often sufficient to prevent unnecessary emissions. This goes hand-in-hand with cost reductions and support is therefore easily found. End-of-Pipe measures are intended to counter attack polluting emissions. This technology does not alter the production process dramatically and is therefore relatively easy to install and implement. Companies most of the times do not implement this technology unless it is compulsory by regulation.

*Mid term*

Contrary to end-of pipe measures that counter attack the emissions, process innovations prevent emissions. Environmental Process Innovations are aimed at the prevention of unnecessary emissions in the productions process. Environmental Product Innovations aimed to the development of new products with the characteristics to minimize the use of resources, minimize the use of energy, minimize emissions and upgrade the quality, life cycle and the ability to be repaired and taken apart of the ultimate product.

Integral Supply chain Management contains a broader scope than production within one company, but instead examines the entire supply chain as a whole. It examines environmental load in four phases, the use of resources, production, use of the product and the disposal phase. The goal is to develop products and services designed to their entire life cycle. To close the material and energy cycles. This can be done by designing products or services that are easily recycled for example. The promising these types of innovations appear, there is a remark to be made. The risk of these types of innovations is that the focus lies within known framework of production processes. By focusing on integral supply chain management one builds upon processes that itself are in essence not environmental friendly and thereby possibly restraining the development 'real' eco-innovations.

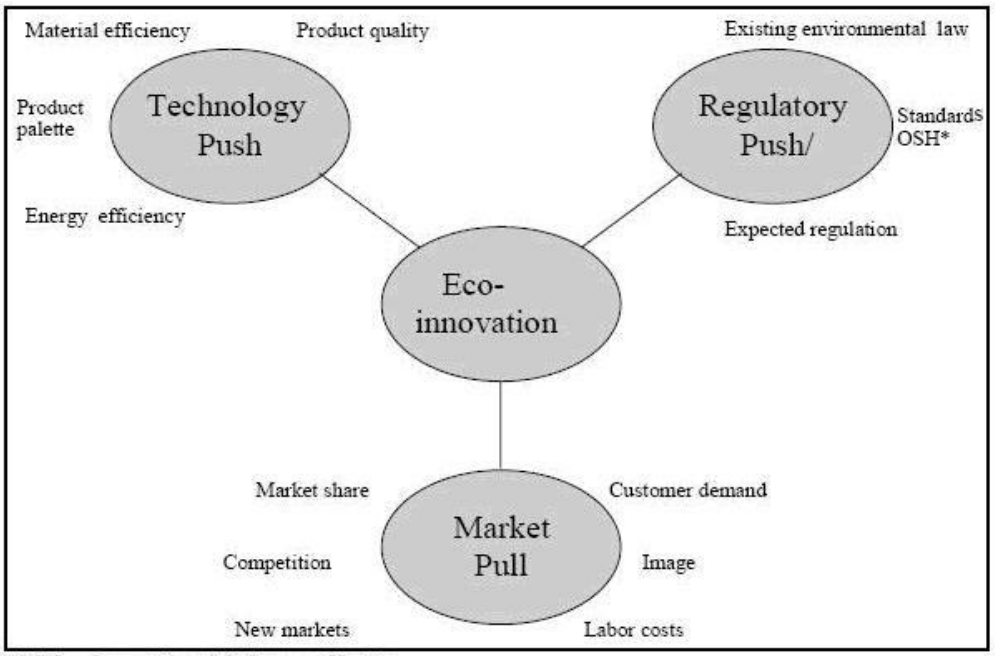
*Long term*

System Innovations are fundamental changes in the way demand is met (and markets arise or are created). Innovative solutions to reach a more sustainable society can only be reached by changing vested interests and processes (transitions), creating new products and services to fulfill demand. The question is not how we can make cars more environmental friendly, but the question is, how to fulfill the demand for transport in a sustainable fashion.

## 2.2 Determinants of Eco-innovations

Significant eco-innovations have occurred in the energy sector but only a small share has been implemented and been scaled up. Higher initial costs are one of the major barriers for eco-innovations (Kempton et al. 1991; Jaffe and Stavins 1994; Kaenzig and Wustenhagen 2008). Together with information asymmetries this prevents the market diffusion of eco-innovations. Information asymmetries are based upon the general impression of 'green and expensive' versus ' brown and cheap'. Enkvist et al. (2007) recently suggested in research on energy efficient products breaking down the costs of eco-innovations into two dimensions, namely initial costs and operating costs. This in order to clarify that a wide range of eco-innovations has a different investment profile, higher initial costs versus lower operating costs.

Figure 2 Determinants of Eco-innovations




*Source: Rennings, K. (2000)*

*Market pull factors*

A supportive basis form the demand side is vital for sustainable up scaling of our long term eco-innovation. Customer support has several known barriers that can occur while up scaling the innovation.

Long term systematic innovation demands a broad social basis in which customer support plays a vital role for long term transition in a systematic scope.

Kenzig and Wüstenhagen (2010) name four barriers influencing the market pull factors: “Customer investment decisions regarding eco-innovations are characterized by:

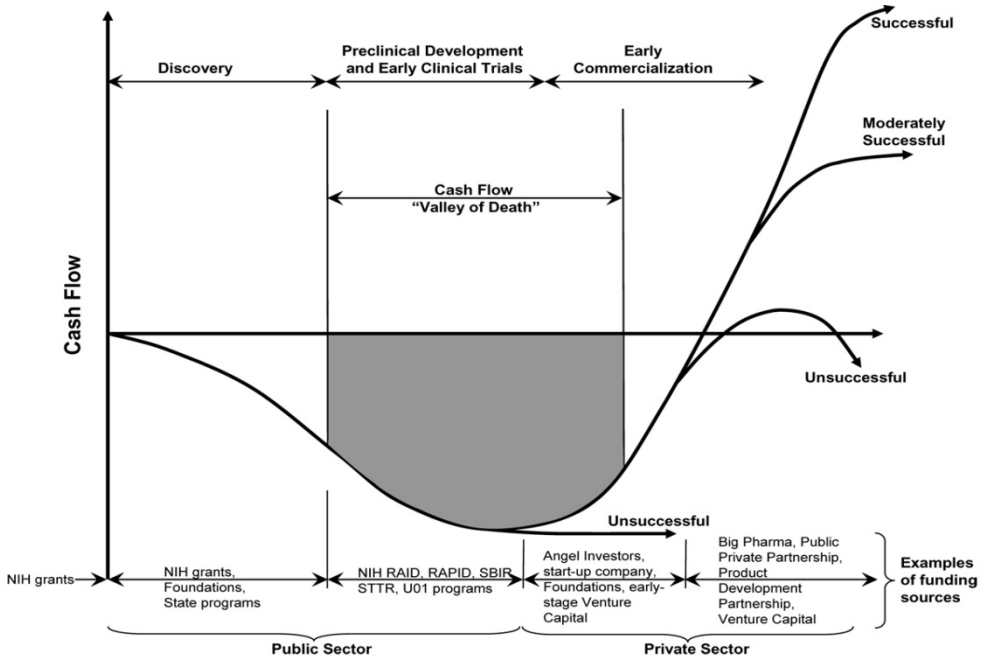
1 Different investment profiles over time – that is, often higher initial costs (purchase price and set-up costs) and lower operating costs (maintenance and running costs).
2 Information asymmetries due to search experience, and credence attributes (Nelson 1970; Darby and Karni 1973) of eco-innovations.
3 Externalities (e.g. environmentally sound alternatives imply a higher collective benefit but lower or equal private benefits than conventional alternatives; Kaas 1992; Rennings 2000). Environmental benefits have the characteristics of a public good and therefore underlie double externality and enhanced quality does not benefit solely the innovator (Rennings, 2000).
4 Infrequent decisions that require the consumer to engage in an extensive decision-making process (Blackwell et al. 2005; Esch et al. 2007), which implies high involvement, high cognitive effort, and a substantial need for information due to limited experience). “

This study focuses on the up-scaling phase of eco-innovators in entering the niche-markets. Every niche markets exhibits several or all of the mentioned barriers above. Aside from the barrier of infrequent decision making, it is to be believed that the barriers in the business to consumer market are equal to the barriers in the business to business market, so called customer barriers.

*Technology push factors*

Often when firms fail to commercialize their product or innovation it is perceived as a failure in their vision or management. However in reality there seems to be a gap in what is demanded from investors and what investors are willing to provide. Public funding is aimed at the early innovation phases and decreases rapidly when the innovation reaches market introduction. Private investors and angel investors have to take over. In this phase the demand for capital is high but the availability is rather low (or very expensive). This is called the ‘Valley of Death’ (figure 2).

Figure 3 Valley of Death




*Source: Steinmetz, K.L. and Spack, E.G. (2009)*

Eco-innovations in niche markets can experience serious barriers in the access to capital, as niche markets are often small and/or immature markets. Investors tend to be careful in providing capital given the uncertainty concerning up scaling a niche markets.

Eco-innovations experience the problem of the unknown. Investors are often not familiar with the eco-innovative technology. This combined with the barrier discussed in our literature review, asymmetric information, that eco-innovations have to coop with the 'green=expensive' label, fosters the gap between investors and the eco-innovation. Investors often use the tool of credit rating to make the judgment whether or not to make the investment. However these ratings are designed for traditional innovations and do not capture all feature of an attractive eco-investment. There seems to be a mislink. The current focus is still on conventional innovations and the characteristics they display. This conventional method of analysis is embedded in fiscal policies. Depreciation of economic assets is determined within fiscal policy. The number of years one is allowed to depreciate its assets is the base of the conventional investment analysis. There is clearly a demand for more awareness of the need for eco-innovations. People tend to be skeptical about ongoing changes in our climate. This skepticism blinds the eyes for societal demand that is rising. Investors need to be familiarized in the field of eco-innovations and new tool need to be developed to address the new characteristics of these investment opportunities.

*Regulatory push factors*

An innovation can be supported by the government in several ways. Government institutes can function as early adaptors, the so called launching customers. In the Netherlands there are several programs to facilitate this functioning with eco-innovations like 'Duurzaam Inkopen' en 'Innovatief Aanbesteden' . This way

government institutions can set an example an thereby create a market (launching customer). Innovation and environment together demand for a sustainable marriage between policymakers.
Taxations and substitutions can however also be a barrier for eco-innovations. These policy instruments are often based upon existing knowledge about resources and methods. This forces innovators to innovate within an existing framework (box) of resources an production methods.
By stepping back and facilitating an innovative platform which can be supported but less regulated, the government can support eco-innovations with less involvement. The situation in the United States is a good example where government let commercial organizations be the driver of innovations by simply giving them space to innovate.
Government institutes can act as a partner or facilitator in this up scaling phase, the so called Public Private Partnerships (PPP). EIM research (2009) has shown us that a consistent policy is expected to stimulate this acceptance. Entrepreneurs and organizations ask for a consistent governmental policy to ensure them a calm and consistent entrepreneurial climate.

# 3 Business Models of eco-innovations

## 3.1 Definitions and categories

Every business organization has a business model or a business concept. This is a growing field of research initiated around the dot.com boom. Schmidt et al. (2001) state that there is little explicit reference to business models and its key elements. Business model is a often used term in various contexts. There are many used definitions of a business model. This paper gives a short overview of these definitions to show their similarities and differences.

We can divide definitions used in two categories based upon their point of view:

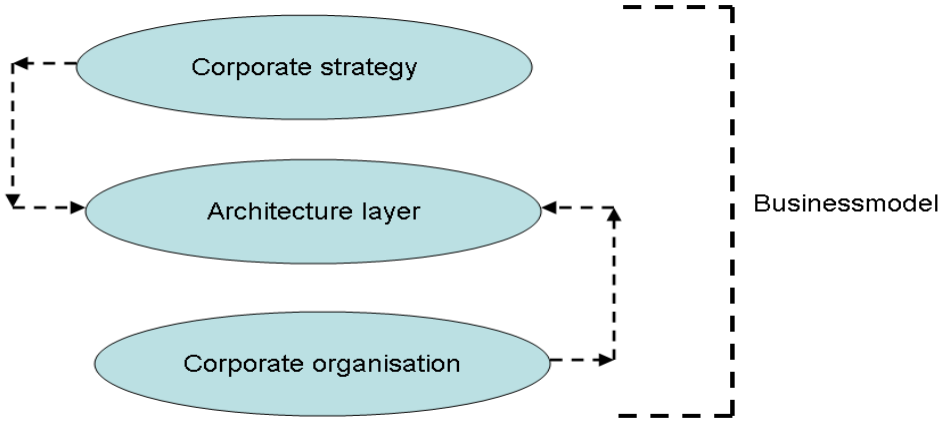
1 The first category is characterized by the aim of value creation. Rappa (2001) and Turban (2002) define a business model as the method of doing business by which a company can generate value to sustain itself. Linder and Cantrell (2000) describe the business model as the organizations core logic to create value.

2 The second category is characterized by a more organizational point of view. A broad definition is provided by Weil and Vitale (2001), they define a business model as a description of roles and relationships among firms consumers, customers, allies and suppliers that identifies the major flows of product, information, money and the major benefits to participants. Amit and Zott (2001) give a transaction-based definition of a business model: "a business model depicts the content, structure, and governance of transactions designed as to create value through the explosion of business opportunities. A business model includes the design of: transaction content (goods/services; re-sources/capabilities), transaction structure (parties involved; linkages; sequencing; exchange mechanisms), transaction governance (flow control). A business model describes the steps that are performed in order to complete transactions."

Timmers (1998) gives us a general understanding of what a business model seems to be, its key elements, dimensions and frameworks:

> *"a business model is an architecture for the product, service and information flows. It gives an description of the various business actors and their roles, the potential benefits for the various actors and the sources of revenues".*

Figure 4 Business Model




*Source: Businessmodellen – Focus en samenhang in organisaties, D. Houtgraaf and M. Bekkers, 2010*

It illustrates that a business model describes how strategy can be put in practice in a way that an organization organizes her values and makes her mission and vision ready for use and thereby creating value.

## 3.2 Components of the business model

In our literature study we found many descriptions of a business model and its components. In time the work became more and more comprehensive and more components were added and analyzed. C. Hager (2006) gave a comparison of the most cited authors and their components of business models.

Figure 5 Comparing Components

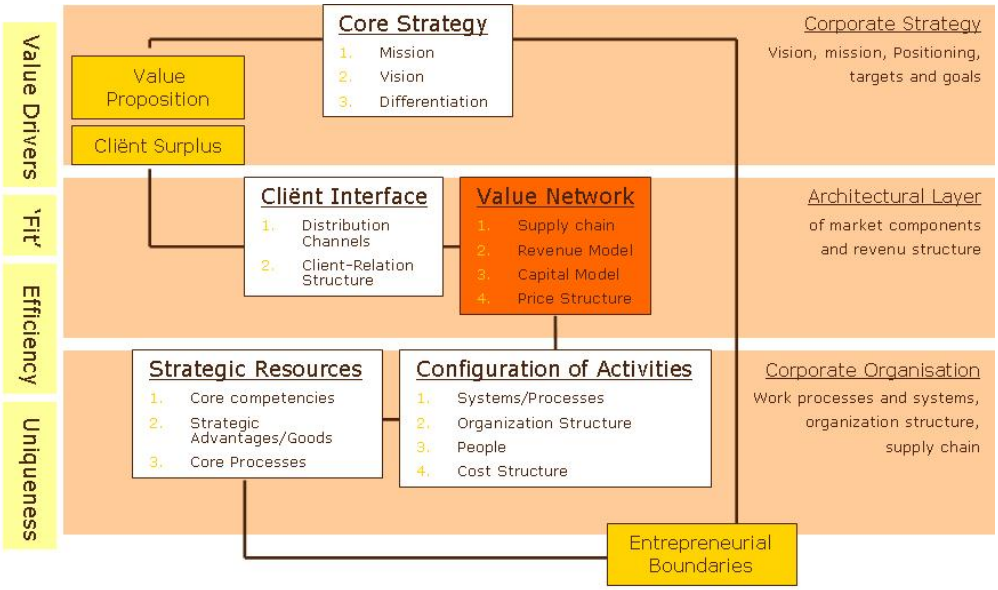
| Chesbrough and Rosenbloom (2002) | Afuah and Tucci (2001) | Osterwalder and Pigneur (2002) |
|---|---|---|
| – *Value Proposition*<br>– *Market segment*<br>– *Revenue Mechanism*<br>– *Value chain*<br>– *Cost Structure*<br>– *Value Network*<br>– *Competitive Strategy* | – *Customer Value*<br>– *Scope*<br>– *Revenue Source*<br>– *Implementation*<br>– *Pricing*<br>– *Connected Activities*<br>– *Sustainability*<br>– *Capabilities* | – *Value Proposition*<br>– *Target Customer*<br>– *Revenue model*<br>– *Value Configuration*<br>– *Cost Structure*<br>– *Partner Network*<br>– *Core Capabilities*<br>– *Customer Relationship*<br>– *Distribution Channel* |

*Source: C. Hager (2006), Determining degree of innovation in business models by applying product innovation theory, Thesis, Centre for entrepreneurship, University of Oslo*

### *3.2.1 The architectural layer and the value network*

In this research project we use a model by Houtgraaf and Bekkers (2010) because they explicitly enhanced the architectural layer. This model is derived from their book 'Businessmodellen, focus en samenhang in organisaties'. In itself this model is based on the ideas of Osterwalder, but the aspects underlying the value proposition are made more explicit.

Figure 6 Business Model Components




*Source:Houtgraaf, D. and Bekkers, M.( 2010), Businessmodellen – Focus en samenhang in organisaties*

Looking at figure 6 the business model contains three major layers:

1 The layer of corporate strategy containing the mission and vision of the company: the way a company positions itself and the targets they set. The business model operationalises this corporate strategy and implements it in the corporate structure.

2 The architectural layer that is the connecting layer and is therefore focused on in this research. It connects corporate strategy with corporate structure and entails many key-components of the business model like a model of revenues, distribution model, user model and a network model.

3 The layer of the structure of an organization: the corporate organization, imposes limits on the playing field. It describes work processes, supply chains, and organization structure where the strategy is to be operationalised.

Mentioned below we identify in more detail the important components of the architectural layer as this contains the most valuable information regarding our research project.

*Distribution*

This concerns the distribution channels through which the organization offers its products or services to the buyers, as well as the way buyers and the organization stay in contact. The most common distribution channel through which products or services are offered, is the physical supply in stores. Internet is a fast growing channel, but the degree of implementation differs depending on the kind of products and services. It can however be stated that nowadays hardly any products can sustain without any internet use at all. Companies have contact with their buyers increasingly by internet and call centers. These combinations are not always fully successful as they operate in terms of systems and protocols, which are not perfectly matched with our working and thinking patterns.

*Client Relation*

The component Client Relation looks at the types of clients, types of relations between organizations and clients and moreover the cooperation between organization and the several client groups. It entails the degree of service a company provides, the level of information supply. Moreover it refers to the gathering and use of the client information. This is a component of the business model that is getting more and more important due to the use of internet. Prices are becoming increasingly transparent and thereby creating a distinction between quality and service providers on the one hand and the more price and transaction focused organizations on the other hand.

In the case of eco-innovations the client relation is important in dealing with information asymmetry and the fact that consumers have an extensive decision-making process due to infrequent decision-making. A high service level and a constant and complete information stream facilitates investment decision making by the consumer. Moreover it provides the supplier or producer with detailed information about the demands and behavior of the client in order to target their wishes more precisely and efficient. Together with price setting and distribution components, information is transferred to the client. If these components are used in ways to ensure a good fit between client expectations and experiences and a companies strengths and ambitions (strategy and organizational layer of a business model) it helps to overcome the barriers of asymmetric information, differences in investment profiles and the barrier of infrequent decision making.

In this research project we focus on the value network, the financial-economic aspects, in the up scaling of eco-innovations. This network consists of the next components.

*Price Setting*

Setting your price compared to the competition. Good price setting enforces the client relation and benefits profitability. A low price setting in the entire branch indicates a bottom level is reached (efficiency strategies opposite value strategies).

*Revenue Model*

The revue model is a description of future flows of revenues and the structure of these flows towards the corporation. To understand investment choices and thereby the accessibility of capital for eco-innovation, this component underlines the

importance of cash flows, the return on investments and the way to model this within a corporate strategy. Table 1 shows a list of regular revenue models.

Table 1 Regular revenue models

| Type of Revenue Model | Examples | Description |
|---|---|---|
| Subscription System | Magazines, phone companies, newspapers, memberships, etc. | Different sorts varying from products to services and memberships. With a fixed price or a basic price with or without a premium. |
| User Model | Water, gas. | Based upon offsetting measured use. The opposite of a subscription system. |
| Vendor Lock-in (Razor and blade) | Razorblades, mobile phones, printers, Playstation, software updates. | Luring users with extremely cheap starting models and relatively high costs related to the use of the product. |
| Freemium Model | Skype | Product or service which in itself is extremely cheap or even for free, but the attractive upgrades or expanded versions do cost extra money. |
| Tied Selling | Often illegal, a toned down version relates to sets of magazines. | A popular product is tied to a less popular product, that way customers are 'forced' to buy both. |
| Service Model | Car industry | Product itself is sold for a price which equals production costs, earnings are derived from financing the sale or supplying support and maintenance services. |
| Advertising Model | Google Ads, Search engines. | Banners or links on websites that attract bulk or specialized visitors on the web through content or service. Earning models: sponsorships, price-per-click or auctioning. |
| Brokerage Model | Christies, PayPal, Real estate brokers, EBay, Fairs, Expedia, etc. | Brokers connecting buyers and sellers and facilitating transactions. For example: auctions, fairs, search agents, impresarios, model agencies. Promising when search/locate and transaction costs are high. Several models of earnings possible. |
| Market data Broker System | Nielsen, DoubleClick, vergelijk.nl | Earning revenues through the supply of data to organisations, concerning internet surf-, search- and buy behaviour of consumers. Possible through direct sales or assistance on providing market insights. |
| Yield Management | Hotel, car rentals, Aviation industry. | Price of the service varies and is changing and adapting to demand and the available supply of a temporary available good. |

*Source:Houtgraaf, D. and Bekkers, M.( 2010), Businessmodellen – Focus en samenhang in organisaties*

The main barriers of client acceptance identified in scaling up eco-innovations are information asymmetry, differences in investment profiles, externalities and infrequent decision making. For a long time traditional revenue and capital models were not suitable for eco-innovations as greater initial investments were often demanded. In the design of the business model, revenues have to be modeled in such way that the stream of future earnings is altered compared to traditional business model that generate revenues merely by selling its products or service. One can think of leasing contracts, subscriptions, licensing, etc. These revenue models have a different stream of future earnings and thereby provide the opportunity to present attractive investment opportunities and overcome the barrier of differences in investment profiles.

*Supply Chain*

Description of the value for all participants in the supply chain necessary or useful for developing and exploitation of the final value for the customers. This component is especially important in this research as we focus on the up scaling phase of the innovation. This component is driven by transaction/switching cost and deals with the bilateral dependency between supplier and producer. The bilateral dependency increases with the asset specificity of the concerned product, service of or material. Knowledge is transferred among partners in the network and thereby increasing the importance of partnerships in the chain to maximize value en overcome externalities optimally.

The Supply Chain component of the business model describes what parts of value added is provided by external partners. Strategic alliances, joint ventures are becoming increasingly important in analyzing risk and revenue, since business environment is becoming more and more competitive (Dussauge and Garrette, 1999). These forms of cooperation and partnerships flourish in a healthy business environment. Such an environment can be provided and sustained by government institutions and policies. Literature on business modeling development indicates that there is a rising importance for cooperation and partnerships; this indicates a link with the barrier of externalities on eco-innovations. By identifying value adding moments in the chain and ensure a better fit and collaboration between partners in de chain, it is expected to ensure higher gains for the supply chain as a whole and thereby its individual partners.

*Capital Model*

The capital model describes the way a company is funded; the capital is used and returned to investors. This component is important for the roles of different types of investors, intermediaries and institutions with a strong focus on the up scaling phase. The access to capital is one of the major barriers for innovators, eco-innovators in particular, and is therefore very important in our research. Access to capital is extremely important in scaling up. This can be private money or public money or both. The capital model also includes the issue of the use of this capital. Investors seem to stimulate innovators to lend a lot of money.

## 3.3 Interesting business models for eco-innovations

We all live in a economic system with still a lot of traditional values and traditional business models. Therefore it is not surprising that a large part of the product and services offered, meet up with the traditional business models (see 3.4). Since eco-innovative companies often work with traditional market parties (both financing parties, other companies and customers), it is to be expected that many eco-innovations will have the traditional business models. Nevertheless we see that a number of models seem to be more suitable to cope with the barriers of eco-innovations mentioned earlier.

*Value creation by cooperation and the importance of information flows*

According to Voelpel, Leibold and Tekie (2004), taking in account the barriers eco-innovators face in up scaling their innovations, two main approaches are suggested to create new business models:

- Govindarajan and Gupta (2001) come up with Extended Value Chain Management. This approach includes redesign of the end-to-end value chain architecture to enhance value, transformation of the value customers receive providing comprehensive new customer solutions, and redefinition of the customer base by discovering and serving previously hidden customer segments.
- Amit and Zott (2001) propose four sources of value creation to enhance the value creation potential of a business. Namely; Efficiency (e.g. increased information flows and reduced information asymmetries between buyers and seller); complementaries of product/services as an integrated bundle of product/services; Lock-in incentives to create high switching costs for customers and strategic partners; and novelty of the product/service as unique and recognized to be pioneering, thus using previously unrecognized value.

These two approaches underline the importance of value chain and client relation as useful components of a business model in our study. It indicates the value of information flows and the significant attention on value adding moments in the network. The barriers information asymmetry and externalities are emphasized as areas with value potential and are approached using several components within the architectural layer of the business model. Literature underlines the importance of aligning these components in the architectural layer of the business model with the strategy components of the model like a company's mission and vision. This organizational environment is important for the success of the company's business model.

Increasing attention is being paid to several alterations in the revenue components of the business model. With Total Cost of Ownership as a main focus, organizations are trying to overcome the barriers by introducing new revenue models. Product Service systems (PSS) for example are an alteration on our known lease constructions.
PSS sells a service instead of the actual product. The difference with leasing is that leasing contract have a certain contract period, after that they have to be renewed. PSS contracts do not have a specific time span, but are bounded by the service they provide. For example instead of selling a real chair, it sells 5000 sitting hours.
It originated from the idea that product design should comprehend more than just the user's phase of the product. It should comprehend the entire life cycle of the product. That way the incentive to reduce materials and waste lies with the designer and producer of the product, so called Sustainable Product Development (SPD).

### *Sustainable Product Development*

A produced product is designed to be distributed and sold. Its purpose is to fulfill our demand and the focus is on the product itself, its interaction with its users, easy to use, productivity issues, working conditions, yield, failure, availability, etc. The period considered here, is the so called product service period, the period were the product is able to serve its users. However the total product life cycle form raw material to disposal continues. Leading to recycling or primitive disposal. This ultimate phase in the product life cycle is a consequence of the design, therefore caused by the designer.
There is demand for a more broaden view. The time domain of focus needs to be expanded from the traditional product service phase to a domain that captures the entire product life cycle. Researchers argue that it is necessary to adapt the product to a more designed life cycle.

“For sustainable product development, it is essential, to first design total product life cycle in order to make reuse/recycling activities, more visible and controllable, and then to design products appropriate, to be embedded in the life cycle” (Kimura and Suzuki 1996).

Feldmann has argued that it is necessary to look beyond the traditional life cycle economic product aspects en also consider the environmental product aspects. “The solely economical assessment of products must change into a well balanced valuation of economical en ecological issues. To fulfill these requirements an optimized cooperation of technological development, legislation measures, and the social way of acting is essential” (Feldman 1994).

### *Product Service Systems*

A product-service system (PSS), also known as a function-oriented business model, is a business model that is aimed at providing sustainability of both consumption and production. Put simply, we talk about Product Service Systems when a firm offers a mix of both products and services, in comparison to the traditional focus on products. As defined by van Halen, te Riele, Goedkoop "a marketable set of products and services capable of jointly fulfilling a user's needs". PSSes can be realized by smart products. The initial move to PSS was largely motivated by the need on the part of traditionally oriented manufacturing firms to cope with changing market forces and the recognition that services in combination with products could provide higher profits than products alone. Faced with shrinking markets and increased commoditization of their products, these firms saw service provision as a new path towards profits and growth.

While not all product service systems result in the reduction of material consumption, they are more widely being recognized as an important part of a firm's environmental strategy. In fact, some researchers have redefined PSS as necessarily including improved environmental improvement. Mont elaborates her definition as follows: A PSS is pre-designed system of products, service, supporting infrastructures, and necessary networks that is a so-called dematerialized solution to consumer preferences and needs. It has also been defined as a "self-learning" system, one of whose goals is continual improvement. This view of PSS is similar to other concepts commonly seen in the environmental management literature, such as "dematerialization" and "servicizing."

The PSS models differ from traditional business models by a shift in focus. They shift away from product orientation to a focus on the use of the product and the service provided to ensure the desired results. For example, instead of selling pesticides, a company may sell a maximum level of harvest loss.
Tukker 2004, makes a distinction between three main types of PSS:

- Product Oriented PSS: this is a PSS where ownership of the tangible product is transferred to the consumer, but additional services, such as maintenance contracts, are provided.
- Use Oriented PSS: this is a PSS where ownership of the tangible product is retained by the service provider, who sells the functions of the product, via modified distribution and payment systems, such as sharing, pooling, and leasing.
- Result Oriented PSS: this is a PSS where products are replaced by services, such as, for example, voicemail replacing answering machines.

PSS design and development broadens the time frame by acknowledging multiple product lives for multiple users. PSS models contain multiple interrelated life phases during the product service period (time domain). In the social domain it captures responsibilities in an environmental system order.
The traditional view of the company's interest in producing the product, followed by the user's interest in the service period, ultimately followed by the undefined period of disposal, is now replaced by a joint interest. A company's business interest combined with the users utilization interest, and their joint interest together with the society in terms of disposal.

In this study we use a definition for product service systems developed in a consulting report from PricewaterhouseCoopers N.V. (M.J. Goedkoop, C.J.G. van Halen, H.R.M. te Riele and P.J.M. Rommens, 1999):
*"A system of products, services, supporting networks and infrastructure that is designed to be: competitive, satisfy customer needs and have a lower environmental impact than traditional business models".*
This definition clearly shows the link between environmental impact en the drive to be competitive, which is viable for companies in order to survive. PSS concept strives to provide a system where companies are able to fulfill customer needs in the most efficient way economically as well as environmentally.

The component Client Relation fulfills an important role in a PSS- model. There is a high service level and level of information supply from the client to the producer and visa versa. The use of product or service is monitored and used to design a product or service that is even more aligned with consumer preferences. Service and information is incorporated and is used to fulfill customer needs. These findings underline the importance of the architectural layer in the business model in dealing with the experienced barriers in up scaling eco-innovations. This layer will be the basis for our case studies and expert interviews with the organizational and strategic layers of the business model providing the framework and boundaries of our analysis.

# 4 Views from the experts

## 4.1 Methodology

Stakeholder support is important in scaling up eco-innovations. An important question is how and to what extent relevant stakeholders are able to support the business models of eco-innovations. In this chapter we look at the support by investors, government and trade organizations in particular.

The information below is mainly based upon interviews with experts in eco-business, financing and commercial parties active in eco-innovative sectors, completed with information from recently published reports and information gathered at the 2010 ETAP conference on financing eco-innovative SME's.

The conducted interviews as part of our qualitative research approach enables us to provide strong contextual information. Our research questions are open-ended, meaning they provide room for exploration and interpretation which is in line with our research set up. We selected various experts in the field of eco-innovations. In the first phase of our interviews we approached policymakers and scientist. This to strengenth our own knowledge and theoretical findings. In the second phase we approached financing institutes to examine and expose thresholds in the access to finance for eco-innovations initiated by our 'death valley' model.
In the appendix u find a list of experts interviewed.

## 4.2 Interview results

*Characteristics of eco-innovations*

The reactions of a number of Dutch commercial parties that represent and/or advice eco-innovators to this question is clear. They do not see a real difference with the exception of systematic innovations:

- Eco-innovations are almost 'common business'. An innovation process without attention to sustainability effects is difficult nowadays.
- Most eco-innovations just have a better footprint and do not serve a different purpose/ are developed for different needs.
- Innovation is just a means to a goal. How can we satisfy the needs of customers? Sustainability objectives actually give a direction to innovation. It leads to a better environment and to a better social climate. Nowadays more and more customers, both businesses and consumers look at sustainability, not anymore because they feel they ought to (ethics), but because they can (plenty of opportunities) and because entrepreneurs simply want it this way (business)
- In the case of system innovations there is a paradigm shift. Systems are changing and the innovation process is different from regular innovations, since system innovations need to be pushed.
- The difference between energy innovations and other eco-innovations is that the former have to fit in with the existing infrastructure dominated by the big traditional utilities.
- The main differences with normal innovations are the reasons why organizations start to innovate (goal, idealism etcetera) and the fact that they often

investigate a new product/service in a new market with unfamiliar materials used. Therefore the risks for entrepreneurs are regarded as higher.
- Eco-innovations are often also social innovations.

*Business models of eco-innovations according to experts*

In this research project we asked a large number of experts in eco-innovation (both Dutch as some international experts). Most of them see no dramatically new, only slightly different new business models in the field of eco-innovation. According to the experts there are no business models unique to the sustainability field, only the use of non-standard models is more frequent in this sector:
- Building companies are asked to take care of the maintenance as well. Therefore they invest in sustainable energy and high quality. This seems to create new business models in the cooperation between building companies.
- There are already a number of large companies (e. g. Xerox, Michelin, Ellis, Caterpillar) which are moving away from simply selling products to selling performance and services."
- Most customers in the markets in which eco-innovations are sold, ask for traditional business models
- Depending on the kind of eco innovations are - when done right - just innovations on (the right) materials. So far, the most common way companies attack sustainability is by making a pure operations business plan, identifying cost savings in cutting down on waste and improving on energy use. It's what lots of sustainability people call the early win, the low-hanging fruit that every company could gain from doing. Therefore ordinary business models of normal innovations are perfectly fit for management with this mindset. However it gets more complicated for eco-innovations which entail different usage objectives (for instance involving recycling of the product) and for which consequently other materials or services are used (design thinking) and executed by different partners too (co-creation). When you boil it down to this point of view: eco innovations are solutions to material problems, that often need a new approach to doing business and involve other business models and supply chain configurations. This will increase risks, at first sight not in the revenue model, but in the risk paragraph. But not only the risk paragraph changes, also the revenue side is different than before. In contrast to non eco innovations, one will use new business models such as:
  - Find new financing mechanisms. These could include forward purchase agreements for suppliers to allow them to experiment with new production methods, match funding arrangements with government bodies and a sustainable innovation or investment fund, which could be used to kick-start sustainable innovations.
  - Also new in eco business models is the aim for profitability. Organizations often did not view a sustainability program as a cost, but rather as an investment that will yield financial benefits to the business. As an example, Marks & Spencer's Plan A program generated 60 million euro net profit from resource efficiencies and new product developments in year three of the five-year program.
  - The Integration of sustainability thinking into the business. This can include incorporating sustainability performance into cash bonus schemes and embarking on comprehensive change management programs, leading to a different revenue model.
  - Not only direct financial gains are included. Eco innovations carry other benefits with them too, which can be considered as reduced opportunity costs for marketing, pr, client relationships costs, sales costs, first mover

advantages etc. This trade off does not lead to direct cash inflow but reduces the costs/increases the positive impact of other posts.

An intriguing view on this subject is the one that says that the problems entrepreneurs come across are mainly difficulties with innovation influencing the acceptance of the eco business models negatively (market development). Next to the search for solutions to material problems which is enormous, you will find the process of innovation itself changed considerably these past few years. These days new models around open en continuous innovation are researched. This shift causes a transition of cultural problems for organizations as there is never a completely finalized product or service anymore. The culture within a company has to be adjusted to these new ways of continues improvements, that entail a different approach of management but also the focus towards customers and other stakeholders. This deserves special attention. Furthermore there is the lack of funding and eco expertise at external parties and the difficult quest for the right partners to innovate. Eco-innovations based on business models old style therefore have a quicker acceptance rate, but generate less innovation than business models new style.

*Financial stakeholders*

Scaling eco-innovations up depends on direct stimulation of sales and lowering barriers to the market. All three groups discussed here play a role, the government for lowering barriers, the entrepreneur and management team for stimulating sales by creating a good business model, and the fund managers by helping find strategic partners, providing capital and giving management support.

According to fund managers success is dependent on the presence of an entrepreneur or management team with a strong commercial drive combined with commitment for sustainability. Up scaling of an eco-innovative product therefore, mostly depends on the qualities of the entrepreneur, quality of the product or service, and sufficient time to implement production and marketing.

*Eco-innovations are still not recognized as interesting, new investments markets*

According to fund managers of clean tech funds there is a clear rationale for investing in eco-innovative businesses, even though this is not recognized by mainstream financiers and banks. Eco-innovations may cause a completely new market to form. Another attractive feature is the price of oil which has been increasing enormously in the past decades, even a small further increase will boost the attractiveness of investments in sustainable sources of energy significantly. New sources of energy are also attractive when a stable supply of energy can be guaranteed, ensuring future revenues. Mainstream investors are simply not familiar with eco innovations.

*Traditional credit rating*

Investors often use the tool of credit rating to make a judgment whether or not to make the investment. However these ratings are designed for traditional innovations and businesses and do not capture the specific features of an attractive eco-investment. In general credit ratings are pessimistic on revenues from eco-innovations (because of the expectations on the opportunity costs). The current focus is still on conventional innovations and the characteristics they display. Actually no one can blame this on the banks with the restrictions they got/ created after the recent credit crisis.

*Traditional market analyses*

There clearly is a demand for more awareness of the need for eco-innovations. People tend to be skeptical about ongoing changes in our climate. This skepticism blinds the eyes for societal demand that is rising. Investors need to be familiarized with the field of eco-innovations and new tools need to be developed to address the new characteristics of these investment opportunities. Eco-innovations have the possibility of creating new markets. This is why investors who tend to look at the past and who focus on characteristics like market growth and market size, miss important opportunities. Eco-innovations and sustainability as a whole contains a wider scope with a focus on transition, the future and change. Literature suggests a possible role for (new) business models in aligning these paradigms, and assuring the support of investors.

*Availability of risk capital to eco-innovators is still limited*

Private equity and venture capital funds are an important source of financing of eco-innovative businesses, but fund managers notice that there still is a structural shortage of capital for these businesses. There still is more demand than there's supply. More capital could help scaling up eco-innovations.

*Find new financing mechanisms*

Experience in helping to set up eco-innovative businesses has led to the recognition that these types of businesses have to deal with specific barriers and conditions leading to a longer start up period up to 6 years and in general a higher needed investment than anticipated. An important lesson learned is that the testing and development phase often needs more money, time and effort before the eco-innovation can be put in production. This also has consequences for the revenue model.

New financing mechanisms could include forward purchase agreements for suppliers to allow them to experiment with new production methods, match funding arrangements with government bodies and a sustainable innovation or investment fund, which could be used to kick-start sustainable innovations. Total Cost of Ownership (TCO) is considered to be a good tool for cost analysis, but in reality problems occur with highly innovative projects or products because the total cost simply cannot be proven yet before extensive experience with and testing of the product has been done; making this a more appropriate model for mature products and markets then for eco/innovative businesses. Crowd sourcing and/or financing are modern ways to finance new business.

*Some venture capitalists and PEFs (can) support the business model*

Specific venture capital and private equity funds provide more than just capital. Funds like for example; e2cleantech, Start Green fund take up a very active supporting role. They have for example specific knowledge of project financing which often is needed in the sector for clean energy, and take it even further by actually helping to develop projects. Added value comes from specific knowledge fund managers have of the targeted markets, their network and contacts, and experience in investing and coaching entrepreneurs. They actively contribute tot business development, sales leads, strategic alliances, organization advice, HRM and international expansion. Fund managers are very actively involved and may even help with bringing focus in strategy.

*Creating strategic alliances with other companies…*

A key part of the work they do is creating strategic alliances between their protégées and organizations/firms that can play a major role in market-entry. In their experience eco-innovations often concern disruptive innovations which threaten existing products/services, and thus come into conflict with 'existing interests'. Therefore much attention is given to partners who can overcome barriers (resistance) caused by major incumbents or institutions.

The strategic partners they seek for the enterprises in their portfolio are mostly selected on their ability to counter existing market forces. These forces also explain some of the differences in acceptance of eco-innovations. In some sectors, like water and energy there are many existing institutions, often based on decades of government support. New eco-innovative enterprises have to compete with these institutions and incumbents who can profit from infrastructure laid down by the government, an infrastructure which often doesn't fit the requirements of eco-innovations. Eco-innovations in the ICT-sector for example can much easier be implemented due to a lack of powerful pre-existing infrastructure. The role of existing interests and institutions creates a strong need for strategic alliances for eco-innovative enterprises

*… even in international markets*

The networks of fund managers often also extend to foreign markets. There are cases where cooperation with foreign private equity funds is sought to obtain not just extra capital, but also to gain access to these foreign markets and networks.

*Create platform to share the necessary information*

Fund managers need to have specific knowledge of the sector they are active in, only than can good support be given. This means that fund managers need to update there knowledge, expertise and network constantly. Part of this knowledge concerns information about EU-regulation, initiatives, networks and funding are which are lacking. Easy access to this kind of information could support fund managers in their job to support eco-innovative businesses. A good platform for exchanging experiences, best practices, and to cooperate jointly on lowering institutional and market barriers could also have a positive impact on supporting eco-innovative businesses. Knowledge on Intellectual Property rights (IPR) and how to protect technology on an international level is also necessary.

*Support eco-innovators in their business models*

When it is true that eco-innovations are using many traditional business models traditional investors should be willing to support eco-innovators in the development of their business models.

Eco-innovative businesses often concern themselves first with their capital model, in practice many of the capital intensive businesses are financed with a combination of finance-forms. Next to venture capital, many of these enterprises also apply for subsidies or make use of guaranteed loan facilities. Being approved by a private equity fund and receiving their venture capital means recognition of the value of the developed business plan, this creates leverage for the starting enterprises and enhances their chance of getting additional financing from other financiers.

Even though investment funds do not seem to select businesses based on the uniqueness of their earning model, they do look for strong (positive) characteristics like innovations of a disruptive nature (also high risk), presence of a good management team, and scalability of the innovation (fit to produce for a larger market). And they analyze potential barriers and how these may be overcome. By choosing the right revenue model, entrepreneurs may be able to increase scalability and overcome barriers.

*Support by the government*

From a business model view these are the most important ways national and regional government can support the business model.

*Help to create the market conditions for eco-innovators: lowering barriers and create a level playing field*

The government can help to create the right conditions for entrepreneurship and sustainability to thrive in. First of all governments can create markets by setting a clear frame work or objectives and by setting clear standards.
An important aspect is the creation of a level playing field for eco-innovations to compete with incumbents. This is not the case at the moment: a level playing field could be created if environmental costs are truly taken into account in prices of products. According to fund managers of private equity and venture capital funds, the foremost role of the government should be to create a level playing field for eco-innovative businesses and start ups. This can be done most efficiently by introducing regulation, preferably on EU-level, and by stopping subsidies for polluting industries and fossil based energy.
Another important condition which the government can take care off is the provision of a feed-in system, similar as in Germany. This will create a more equal position with incumbent energy businesses who have had decades of government support which has created the efficient (subsidized) system they have today. Main benefits of a feed-in system are that it is a transparent and fair system for all users, and there's no need for a long procedure to get (arbitrarily) funded. Head runners window are often mentioned as a good practice to support eco-innovators and support the market conditions.

*Act as launching customers*

Governments can contribute to eco-innovations by buying sustainable products, processes and services themselves and do so. The lack of sustainability expertise within (local) governments and the way tenders are valued is a thorn in the flesh of many eco-innovators. It is not clear to what extent the governments support the business models of eco-innovations. It is said that this kind of expertise (business models and business financing) is totally unknown to governments.

*Support the eco-business models by showing the finance opportunities*

In contrast to what many entrepreneurs claim, they search for finance opportunities from governments. Many companies, but also organizations like Energyvalley, initiate project in areas where there is quick access to money, often from local governments. Either as a subsidy or by a (semi personalized) tender. These opportunities should (local) governments should market more (internationally).

*Support the social basis: the public opinion needs trust*

The public opinion and a sense or lack of urgency may have an impact on the speed of adoption of eco-innovations. The government can be influential here by educating the public and enforcing a sense of urgency. By supporting certain

projects in the form of grants or subsidies the government can also give a signal about the importance and relevance of certain techniques.

*Spread knowledge/ experience on business models of eco-innovations*
Although the business models of eco-innovations might not be unique, it is useful to spread knowledge of their workings, as well as the specific ecological details and implementations, in order to stimulate their use in ecologically innovative business.

*Consistent policy*
An important draw back (barrier) for investors and entrepreneurs is lack of a consistent government policy. Chance of cancellation of subsidies and stimulation policy increases financial risks for investors. Knowing for sure that the government will invest (and support) in eco-innovation for a set number of years can lower risks. In many ways governments can make of break a business model of an eco-innovator .

*Accelerate eco-innovation by using clear instruments*
Provision of equity seems to be a better instrument then providing subsidies. The Technopartner program in the Netherlands, for example, is a very good and simple to use instrument. But since it is mainly used by smaller intrinsically motivated funds, it is relatively more expensive compared to bigger funds. Scaling up these funds would drive costs down, and speed up market introduction of eco-innovations.
Besides the need for equity financing, there is also a need for small scale financing and business Angel co-financing. Venture capital alone will not meet all needs of eco/innovative businesses, but banks are often not easy to attract and public funding is often too complex. More can be done by the government to increase the attractiveness for investments made by business angels.
Instruments like IPC and SBIR are mentioned as important instruments.
(Local) governments should improve continuous innovation by organizations not only through their own business operations but also by usage of their governmental instruments. And last eco-innovations are often also social innovation. Governments can play a huge stimulating role here.

## 4.3 Schematic overview

| Research questions | Interview results |
|---|---|
| Eco-innovations vs 'Normal' innovations | • Eco-innovations are common innovations<br>• Eco-innovations have better footprints<br>• System-innovations=paradigm shift<br>• Energy innovations require a fit with existing infrastructure and vested interests<br>• They differ in reasons to innovate<br>• Eco-innovations are often social innovations |
| Business models in eco-innovations | • Non-ordinary business models are more frequent used in eco-innovations<br>• Shift towards selling performance<br>• More cooperation in the value chain<br>• Higher importance of information flows<br>• Eco-innovations are solutions to material problems that often need a new approach to doing business with other business models<br>• Eco-innovations create the need to incorporate sustainability in the business model |
| Role of investors | • Eco-innovations still not recognized as interesting, new investment markets<br>• Traditional credit rating<br>• Traditional market analysis<br>• Limited availability of risk capital to eco-innovators<br>• Need for new financing mechanisms<br>• Need for strategic alliances<br>• Need for a knowledge platform<br>• Need for support of eco-innovators in their business model |
| Rle of the government | • Help to create market conditions for eco-innovations<br>• Act as a launching customer<br>• Supporting eco-innovators by showing the finance opportunities<br>• Support the social basis: the public opinion needs trust<br>• Spread knowledge/ experience on business models of eco-innovations<br>• Consistent policy<br>• Accelerate eco-innovation by using clear instruments |

## 4.4 Analysis

The overall opinion of the experts whether eco-innovations differ from ‘regular’ innovations is inconclusive. However the use of different and more complex business models does seem to occur more frequently in the sphere of eco-innovations.

Eco-innovations create the need to incorporate sustainability in the business model. Sustainability is an evolutionary term with the characteristics of open models and the emphasis on value adding moments, while business models are originated in traditional economic thinking with closed systems, production factors and cost analysis. To combine these two seems unrealistic since they differ in grounding principles. Eco-innovations are valued differently compared to traditional innovations. Not all added value seems to be captured by our traditional business model. This rises the barrier of externalities, the innovation entails high collective benefits, but often lower private benefits compared to conventional alternatives. Investors still use these traditional analyzing tools and do not capture the evolutionary characteristics of sustainability which value the eco-innovations. This causes a mislink between innovators and investors and even government.

Moreover eco-innovations often create a (niche) market. In creating a market allot of barriers are opposed as seen in our literature study. Eco-innovations are often unknown and capture an unproven technology or service. Market is not yet created; therefore actors in the field are unfamiliar in the decision making process and often lack information. This underlines the importance of information flows.

Government institutions can help create market conditions to overcome these barriers. By acting as a launching customer they can create a level playing field. Consistent policy and providing a link between bank and innovator by introducing new pathways and finance schemes can help overcome traditional barriers in the access to finance for eco-innovators.

Sustainability has an open characteristic with high importance of information flows, government institutions can help in creating a platform for the sharing of knowledge and experiences concerning eco-innovations.

# 5 Case Studies

## 5.1 Methodology

Case study research enable the researcher to examine a phenomena in his context, in this case business models in a sustainable and environmental context. It allows the researcher to explore individuals or organizations, simple through complex interventions, relationships, communities, or programs (Yin, 2003). Stake (1995) defines three types of case studies; intrinsic, instrumental, and collective. Intrinsic and instrumental case studies examines a unique phenomenon or situation. This type of case study is limited in its explanatory power and serves to create understanding.
Collective case studies simply implies the investigation of multiple cases, which is used in this research. This to enlarge explanatory power.
In this chapter eight case studies on the business models of Dutch eco innovations are described. The criteria used to find the companies selected, are:

- SME
- issues on sustainable energy, environmental technology or mobility
- working in (relative) niche market
- business to business (or business to consumer)
- export (potential)

The next companies were visited:

1 Greenfox: Energy efficiency
2 AllGreenVehicles: Clectric cars
3 Carhopper: City distribution
4 DonQi: Urban windmills
5 Pharmafilter: Water and waste management
6 ZND: Sustainable roofs and frontages
7 Turntoo: Performance based building solutions

The cases described, include a short description of the barriers concerned. Appendix 2 shows the questionnaire used in the interviews.

## 5.2 Case study results

A number of criteria were derived from literature study and interview findings. First we identified the experienced barriers of the entrepreneurs in up scaling their eco-innovation. Secondly we examined the business models used in the up scaling phase:

- Investment profile (high initial costs and a long lifespan)
- Information asymmetries (green=expensive stigma)
- Externalities (split incentives)
- Infrequent decision making (unknown)
- Access to finance (valley of death)
- Regulations (the need for standardization, or not open for innovations)

A number of specific elements and trends in business models for eco-innovation were derived from literature study and conducted interviews:

- The shift towards selling performance instead of a product or service
- More and intensive (chain)cooperation
- A higher emphasis on information flows

– Extraordinary business models (new or innovative models)

Ultimately we asked the entrepreneurs their need for support, either from investors or government institutions.

*Greenfox*

Greenfox still copes with the green=expensive stigma, although the return on investment of the product short and investment is low. Because of the market the product is active in (fluorescent light) the product commitment is low and therefore Greenfox faces the barrier of infrequent decision making. People or not familiar with the product and most of the time they don't even know what type of lighting they currently posses, especially in large office spaces.

Important for Greenfox is the cooperation with Osram as the supplier of the lamps and Roteb the social workplace where greenfox is produced and installed.

In general Greenfox has a very healthy business model. The challenge however lies within the long term strategy. A possible role is to be played here by the Dutch ' koplopersloket' or other government agencies in providing advice on this matter and introducing marketing parties that are skilled in these organizational issues.

*All Green Vehicles*

All Green Vehicles is an example of an eco-innovation which faces allot of barriers. All barriers derived from literature are acknowledged by AGV. AGV produces and installs electric engines for vehicles. These engine entail high investment costs, forcing AGV to focus on niche markets like exclusive sport cars and the transport industry, due to the scope of the orders. Investment profiles, information asymmetries and externalities are barriers that are significantly present for AGV. Because of the role of innovator in this segment, information flows are very important for AGV to stay ahead. Cooperation with suppliers from battery systems for example, ensures AGV constantly of the most up to date technology.

High capital risk and vested interests force AGV currently to install the engine in vehicles they first acquire on the market. After installation and testing, the vehicle is soled back. The market is not yet willing to take the risk. Ultimately AGV wants to position itself as a supplier of electric engines to car producers and be able to focus on the production and development of electric engines only.

Eco-innovations entail market creation, this is underlined by the demand the market for electric engines faces in standardization. Currently there are too many different types' connectors, adaptors, etc, a possible role is to be played here by the national or European government.

The Netherlands is a trading county, not used to making risky investments and being innovative. An investment where the first two years aren't profitable is not likely to pass the analysis a bank conducts when analyzing an investment opportunity. National or local government can mediate between these parties and bring them closer together. This way more eco-innovations are being explored and exploited.

There is a gap between the parties that have been granted government subsidies and the parties that bear the risk. For example transporters are granted subsidy for an innovative projects, but when doing so and engaging in a business deal with AGV they try to put the risk on the table of AGV. In granting the subsidy, more focus should be on this issue.

Societal support is needed to create a mindset for electric engines. Where people are used to charging their battery, to ensure carefully implemented electric engines in the future.

*Cargohopper*

Cargohopper acknowledges the trend towards sustainability and has invested in eco-friendly city distribution. Market pressure forces Cargohopper to maintain traditional prices wile investments in the vehicles are significantly higher. Access to finance therefore is a main barrier experienced by cargohopper. The solution is expected to come from internalizing and valuating external benefits, but currently these externalities are still a barrier.

Since the Cargohopper vehicles are CO2 neutral and have a very low sound level, they are very suitable for inner-city distribution. The city of Utrecht has an interest in promoting these types of vehicles in the inner-city and could therefore support Cargohopper by introducing strict regulation concerning city distribution. Regulations on the amount of crill and CO2 emissions or special zones where only silent vehicles are allowed for example. This way positive incentives and externalities, that are currently in the interest of the municipal, are internalized in the business model

Besides inner-city regulations, access of capital has proven to be a great barrier. The transport industry is an industry that requires large investments and an innovative and unproven concept like Cargohopper therefore does not meet the demands set by the banks in granting a loan. A possible role is to be played by the government in providing guarantees for the bank loan for example.

*DonQi*

DonQi currently faces the challenge of choosing its strategy. Compared to other energy sources, the mill entails relatively high initial costs and its revenue depends highly on the surroundings the mill is placed in. DonQi needs to internalize and value external values to outperform the traditional alternatives.

People are not used to making these purchase decisions as current supply of energy fulfils the demand. More and more the DonQi mills are used as a tool for establishing a green image as they are an eye catcher by the possibility to dress them with advertisement.

There is a need for marketing assistance and market research in developing a healthy business model and setting out a long term strategy to ensure existence over the long run.

*Pharmafilter*

Over the last 5 years Pharmafilter has invested heavily in the development of their concept together with strategic partners. The concept demanded high initial costs en also here the challenge is to internalize en value the external benefits. Scattered and vague regulations are a major barrier for Pharmafilter, which they try to overcome by close cooperation with government institutions.

There is a demand for national policy on the area of waste management, currently it is scattered among the Dutch municipalities.

Sustainability is defined by the government by regulations and descriptions. Innovative concepts like Pharmafilter are new and current policy often does not capture the characteristics of these innovations. Therefore there is a need for an open policy on innovation.

*ZND*

ZND often faces the barrier of the unknown as they try to achieve a first mover advantage. Little knowledge in the market and infrequent decision making has driven them to provide a platform and knowledge centre for eco-innovative roofing solutions. This open model of shared knowledge is a good example of market

development, the importance of information flows and a shift towards a more evolutionary economy.
There is a demand for a national policy on subsidies for green roofs. Currently there is a scattered scheme, which differs per municipality. This slows down market development an creates uncertainty among the market players. A national policy would stimulate the market and gives incentives for more innovations.

*Turntoo*

Turntoo is an example of a PSS system. Their business case evolves around selling performance. However the concept has not yet proven itself on the market. High investments have been made, but also in this case there is a need to internalize and value external benefits. Selling performance promises to be a good step in that direction, by its ability to change capital flows, the incentive towards producers to think about the material waste issues and the drive to valuate performance of products and services.
Turntoo acknowledges therefore the opportunities in the research area. More research is needed on all the different product groups to analyze their ability to consume performance based. This analysis should indicate the valuation of the performance for each product group.
The government more as a launching customer to initiate performance based projects to stimulate the use of the concept and thereby prove the concept on the market.
Governments should connect regulations in the area of sustainability to innovation policy. In California for example, it is obligatory for producers to name all resources used in the production of the product. This is a costly and sometimes ugly thing to do, since producers are not always willing to mention all used resources and ingredients. If they cooperate with the Californian institute for product development, they are excused from the obligation to mention al resources on the product.

## 5.3 Schematic overview

| Experienced barriers | GF | AGV | CH | DQ | PF | ZND | TT |
|---|---|---|---|---|---|---|---|
| Investment profiles | | X | X | X | X | | X |
| Information asymmetries | X | X | | X | | | |
| Externalities | X | X | X | X | X | | X |
| Infrequent decisions | X | X | | X | | X | X |
| Access to finance | | X | X | | | | |
| Regulations | | X | | | X | X | X |
| | | | | | | | |
| **Business model** | | | | | | | |
| Selling performance | | | | | | | X |
| (Chain)cooperation | X | X | X | X | X | X | X |
| Importance of information flows | | X | | | X | X | X |
| Innovative business model | | | | | | | |
| Other…. | X | X | | X | X | | |
| | | | | | | | |
| **Possibilities for support** | | | | | | | |
| Support with their Business model/marketing | X | | | X | | | |
| Introducing strategic partners | X | | | | | | |
| Launching customer | | | X | | | | X |
| Regulations (standardization) | | X | X | | | | X |
| Consistent national policy | | | | | X | X | |
| Open innovation policy | | | | | X | | X |
| Guarantees by the government for bank loans (mediate) | | X | X | | | | |
| Societal support (mindset) | | X | | | | | |
| More research | | | | | | | X |

## 5.4 Analysis

Investment profiles, externalities and infrequent decision making are the most experienced barriers in our case studies in up scaling eco-innovations. This suggests that the examined eco-innovations often entail high initial costs, organizations are not able to quantify and internalize overall benefits and markets, products and services are still relatively unknown and the market is not used to decide on purchasing the product or service. Especially internalizing and valuating external benefits is proven to be a constant reoccurring challenge in our examined cases. Although selling performance in the case of Turntoo had not yet fully proven its value. The results were promising and suggest the solution for internalizing and valuating external benefits as well as altering capital flows by the ability to shift the risk towards the producers of the products or services.
It is surprising that the access to finance wasn't mentioned as a barrier in up scaling the eco-innovation as much as one would expect from our literature findings.

Cooperation seems to be an important element in our examined business models. It is difficult to state whether this is typical for eco-innovations. Selling performance was mentioned in literature as a promising new business model, the so called PSS systems. In our case studies only one organization was active in this field. This can be explained by the fact that these schemes are relatively new and markets often are not fit to serve these systems.
The importance of information flows was underlined by our findings. This suggests development to the service systems in the future and goes hand in hand with the high level of cooperation that was present in our cases.

The need for support was widely spread among our categories. There clearly is need for support from investors and government institutes, but the findings insinuate the need is context related. Depending on the market the innovator is active in, strategic partners and available funding.

# 6 Conclusions and Recommendations

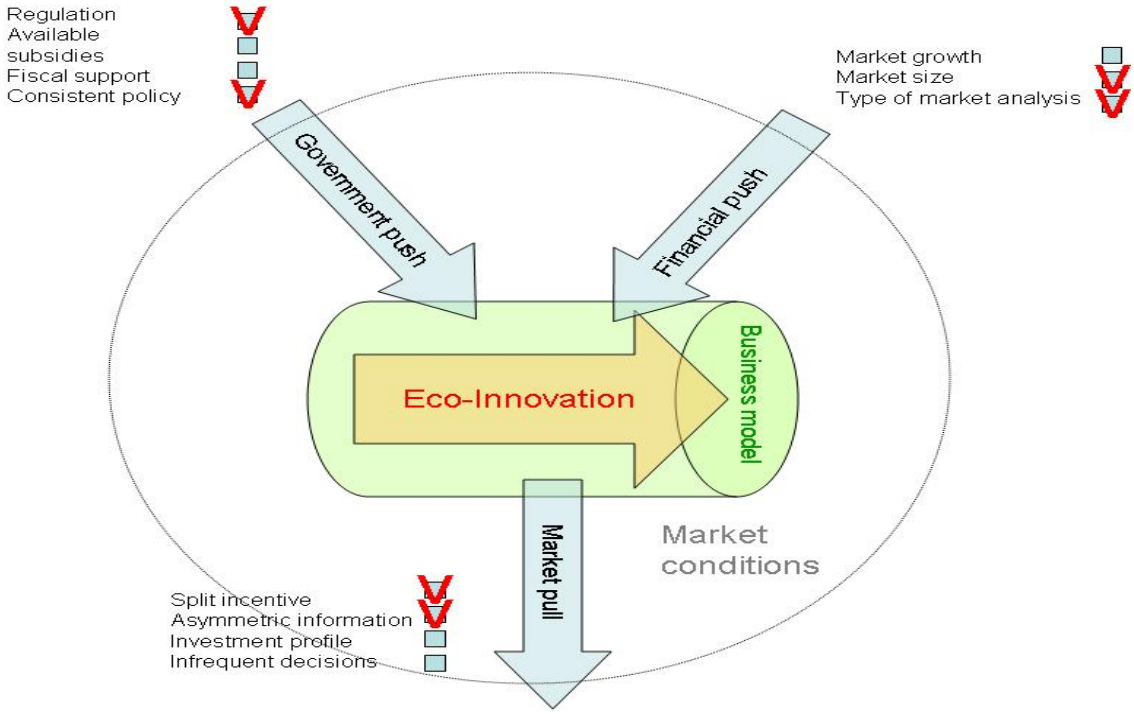
## 6.1 Conclusions and answers to the research questions

*Factors determining the business models of eco-innovations*

An important question is by which factors the choice of business models or earning models is determined. Based upon both literature and views of financial, policy and market experts, a number of factors can be addressed. These factors can be roughly divided into characteristics of the innovation itself and relevant market characteristics:

- The complexity of the innovation: the (expected) time scope of the innovation in relation to the question whether or not the innovation is disruptive.
- Regulatory factors: Existing laws and regulations, support by the government.
- The market conditions: market characteristics such as competition, customer demand, the risk profile, the available market information (difficult in general, but often lacking in the cases where system innovations are introduced).

Figure 7 Factors determining the business models of eco-innovations




*Source: EIM (2011)*

These factors are categorized according to our literature findings concerning the factors influencing eco-innovation. All factors are interrelated. In case of disruptive innovations for example a market is created. This new- or niche-market entails high uncertainty and risk, which one would expect to cause a lack of fund-

ing. Also the aspect of infrequent decision making occurs because of the fact people are not familiar with the innovation.

*Tailor made and dynamic*

Business models are tailor made and dynamic. They are tailor made because of the characteristics of the product or service, the value the entrepreneur wishes to create, the market conditions etcetera. The business model also needs to be dynamic. It needs to be adjustable to changes in market conditions. The prices of fuel and commodities change daily, but so does government support, customer needs/ preferences and the actions of competitors.
Eco-innovations often capture the characteristic of market creation. Because they focus on new- or niche-markets. The business model reacts on these influencing factors and architects the path to market the eco-innovation. When done correctly, the model incorporates all factors and is designed in such a way that the components are set and linked to overcome possible barriers.

*Performance-based contracts and chain cooperation*

Eco-innovations that are often disruptive (market creation), unknown, entail split incentives, suffer from the green=expensive stigma and have high initial costs, seem to overcome these disadvantages in their business model.
During our interviews and case studies a shift was illustrated from selling products and services to a performance-based scheme (PSS). Such a business model overcomes these high initial; costs and alters capital flows making it easier to access capital and market the product.
Within the framework of the identified components of the business model, cooperation seems to be important in marketing an eco-innovation. Most case studies show intensive cooperation in the chain in order to be able to deliver a total solution, the product is related to its context and performance, making it necessary to work with strategic partners. This is good for market stability, overcomes (partly) split incentives and differences in investment profile.

*Netherlands as a trading country, not an innovative country*

Interviews with experts in combination with our case studies identified the Netherlands as a trade nation over the years. Given our geographic location, an open delta location, the Netherlands functions as a trade organization. “Branches and markets where the Netherlands flourishes all capture a characteristic of organizational excellence, like horticulture for example” (H. Te Riele, 2011).
This observed characteristic of the Netherlands is emphasized in our case studies. Entrepreneurs experience barriers in the attitude of banks towards eco-innovation. They are not willing to take the risk and an innovation has to be a proven technique before banks are willing to invest in the organization.

*Eco-innovation depending on financial independency*

Almost all case studies show entrepreneurs investing heavily in their eco-innovation with little or no external capital available. This is only possible when the innovator in question has alternative sources of income to provide financial independence en create room for entrepreneurial and innovative behavior. After a period of development and testing, the concept or technique has to proven before funding is available to upscale the innovation and banks and other investors are willing to come a board.

## 6.2 Recommendations

*Recommendations for future research*

Barriers of investment profiles, externalities and infrequent decision making have proven to be important factors influencing business models in eco-innovations. Future research is to be done on the interaction of these barriers specifically with business models.

PSS models are promising in theory to overcome these barriers but little evidence has been found in our interviews and case studies. More research needs to be done on these models an the valuation of performances for different product and service groups. In particular one has to examine the interaction of the PSS models with the barriers mentioned before.

Business models originated from traditional economic thinking in closed systems. Sustainability as a characteristic of eco-innovations are thought to capture evolutionary economic thinking, with open models and the sharing of knowledge. More research is need to examine this shift in economics and the consequences for business models in this new economic setting. It is to be expected that this shift in economic thinking is necessary to incorporate sustainability in a business model and probably redesign the business model as a whole.

*Recommendations for managers*

(Chain)Cooperation has proven to be important in up-scaling eco-innovations. Strategic alliances as well as information management are increasingly important. Managers are advised to investigate the opportunities in this field as well as the promising development of selling performances, the so called PSS systems.

In some cases business models are thought to follow op on the use of the product or service. Entrepreneurs strive to create a platform for the use of the product or service first and expect the value network of their business model to follow up on this development. Little evidence however is found to support these expectations and banks are not likely to be investing in these schemes of entrepreneurship.

*Recommendations for policy makers*

An important issue in scaling up eco-innovations is the market development. After a successful product development that can be supported by subsidies, the product needs to create a market. In the case of eco-innovations this is often the biggest challenge. There is either no market yet or the market is dominated by certain interests. The experts and companies we spoke to all underline the importance of market development. Clear and consistent regulations, subsidies and taxes and objectives create markets in which entrepreneurs can develop business models. Knowing this, it is clear that the governments can (and actually do) make or break sustainable markets and the success of business model of eco-innovations. The example of Germany on solar energy is well known.

Cooperation and information management are important factors in the business model for up scaling the eco-innovation. Government policy should target these factors by creating good conditions for strategic partnerships. Introducing parties and guiding them in the cooperation process. Information should be collected and shared among parties active in eco-innovations, platforms can be established where knowledge is shared and information flows are optimized.

# References


Afuah, A. and Tucci, C., (2001), Internet Business Models and Strategies. *McGraw Hill*, International Editions, New York.

Amit, R. and Zott, C. (2001), Value creation in e-business, *Strategic Management journal*, 22, 493-520.

Baxter, P. and Jack, S. (2008), Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers, *The Qualitative Report,* 13, 544-559.

Blackwell, R. D., Miniard, P.W. and Engel, J.F. (2005), Consumer behavior, *10th edition, Mason* , OH: South-Western College .

Chesbrough, H. and Rosenbloom, R.S. (2002), "The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies." *Industrial and Corporate Change*, 11, 3, 529-555.

Darby, M. and Karni, E. (1973), Free competition and the optimal amount of fraud, *Journal of Law and Economics,* 16, 67–88.

Dussauge, P. and Garrette, B.(1999), Cooperative Strategy: Competing Successfully Through Alliances, *Chichester: John Wiley and Sons*.

Enkvist, P.,Naucler, T. and Rosander, J. (2007), A Cost curve for Greenhouse Gas Reduction, *The McKinsey Quarterly,* 1.

Fagerberg, J. (2005), „Innovation – A guide to the literature", The Oxford Handbook of Innovation. *Oxford University Press*.

Feldman, M.P. (1994), Knowledge Complementarity and Innovation, *Small Business Economics,* 6, 363-372.

FIU - Forschungsverbund innovative Wirkungen umweltpolitischer Instrumente (Joint Project on Innovation Impacts of Environmental Policy Instruments), 1998. Innovation Impacts of Environmental Policy Instruments. Synthesis Report of a project commissioned by the German Ministry of Research and Technology (BMBF), Volume III. Analytica-Verlag, Berlin. In Preparation.

Goedkoop, M.J. ,Van Halen, C.J.G., Te Riele H.R.M. and Rommens, P.J.M. (1999), Product Service Systems, Ecological and Economic Basis, PricewaterhouseCoopers N.V., *Pi!MC, Storrm C.S.,* Pre consultants.

Govindarajan, V., and Gupta, A.K. (2001), Strategic innovation: A conceptual road-map, *Business Horizons*, 44, 4: 3-12.

Hager, C. (2006), Determining degree of innovation in business models by applying product innovation theory, *Thesis, Centre for entrepreneurship*, University of Oslo.

Hollegien, B., Bertens, C. and Tiggeloove, N. (2009), Marktacceptatie van Eco-innovaties, *EIM.*

Houtgraaf, D. and Bekkers, M. (2010), Businessmodellen – Focus en samenhang in organisaties, *book*.

Jaffe, A.B. and Stavins, R.N. (1994), The Energy Paradox and the Diffusion of Conservation Technology, *Resource and Energy Economics,* Elsevier Science B.V.

Jaffe, A.B.,Peterson, S.,Portney, P. and Stavins, R.N. (1995), 'Environmental Regu-lation and the Competitiveness of US Manufacturing: What Does the Evidence Tell Us?', *Journal of Economic Literature,* 33, 132-163.

Kaas, K.P. (1992), Marketing für umweltfreundliche Produkte: Ein Ausweg aus den Dilemmata der Umweltpolitik?, [Marketing for environmentally sound products: A way out of the dilemma of environmental policy?], *Die Betriebswirtschaft,* 52, 473–488.

Kaenzig, J., Friot, D., Saadé, M., Margni, M., and Jolliet, O. (2010), Using Life Cycle Approaches to Enhance the Value of Corporate Environmental Disclosures, *Business Strategy and the Environment(Early View),* 1-1.

Kaenzig, J., and Wüstenhagen, R. (2008), Understanding the Green Energy Consumer, *Marketing Review St.Gallen*, 4, 12-16.

Kaenzig, J., and Wüstenhagen, R. (2010), The Effect of Life Cycle Cost Information on Consumer Investment Decisions Regarding Eco-Innovation, *Journal of Indus-trial Ecology*, 14, 121-136.

Kempton, W., (1991), 'Lay Perspectives on Global Climate Change', *Global Environ. Change,* 1, 183–208.

Kimura F. and Suzuki, H. (1996), “Design of right quality products for total life cycle support”, *Proceedings of 3rd International Seminar on Life Cycle Engineering, ‘Eco-Performance ’96’, Zürich, Switzerland*, 127-133, 199

Linder, J.C. and Cantrell, S. (2000), Changing Business Models: Surveying the Landscape, *Institute for Strategic Change*, Accenture.

Mont, O. (2001), Introducing and developing a Product-Service System concept in Sweden, *The international institute for industrial environmental economics*, Lund University Sweden

Nelson, P. (1970), Information and consumer behavior, *Journal of Political Economy,* 78, 311–329.

Osterwalder, A., Lagha, S.B. and Pigneur, Y. (2002), An Ontology for developing e-Business Models, *viewed 20,* August 2004.

Osterwalder, A. and Pigneur, Y., (2009) Business model generation, *Book.*

Rappa, M. (2001), Managing the digital enterprise, *North Caroline State University.*

Rennings, K. (1998), 'Towards a Theory and Policy of Eco-Innovation - Neoclassical and (Co-)Evolutionary Perspectives', *in ZEW Discussion Paper* 98-24, Mannheim: Center for Economic Research (ZEW).

Rennings K. (2000), Redefining Innovation — Eco-Innovation Research and the Contribution from Ecological Economics, *Ecological Economics,* 32, 319-332.

Schmid, B., Zimmermann, R. A, H. and Buchet, B. (2001), Anniversary Edition: Business Models, *electronic Markets* 11, 3-9.

Seidel, J.V. (1998), Qualitative Data Analysis, *Qualis Research*, www.qualisresearch.com

Stake, R. E. (1995). The art of case study research. *Thousand Oaks*, CA: Sage.

Steinmetz, K.L. and Spack, E.G. (2009), The basics of preclinical drug development for neurodegenerative disease indications*, BMC Neurology*, 9.

Timmer, M. (1998), Business Models for Electronic Markets, *EM Ð Electronic Markets*, 8.

Tomiyama, T. (2001), “Service engineering to intensify service contents in product life cycles”, *Proceedings of EcoDesign*, 2nd International Symposium On Environmentally Conscious Design And Inverse Manufacturing, Tokyo International Exhibition Center, Tokyo, Japan.

Tukker A (2004), Eight types of product service system: eight ways to sustainability? Experiences from suspronet, *Bus. Strat. Environ.*, 13, 246-260.

Turban, E. (2002), Introduction to E-Commerce, *Prentice Hall.*

Voelpel, S., Leibold, M., and Tekie, E. (2004), The wheel of business model reinvention: How to reshape your business model leapfrog competitors, *Journal of Change Management*, 4, 259-276.

Weill, P. and Vitale, R. (2001), Place to space: Migrating to e-business models, *Harvard Business School Press.*

Yin, R.K. (2003), Case study research: Design and Methods (3rd ed.), *Thousand Oaks*, CA: Sage.

# ANNEX I Questionnaire case studies

We identified specific financial-economic components of the business model as the main focus of our research. The questions used in our case studies were developed in cooperation with Marleen Bekkers, to specifically target the known essential components of our business model. We used these questions as the basis for our case studies.

*To clarify the situation/position of the organization*

- How do you define the product or service?
- Who are your customers? Who is your target? What drives your customers?
- What are competitive alternatives?
- In what way does the product or service distinguishes itself (not only technical, but also possible partners, or added value for the customer)?

*Current market situation*

- In what way disrupts your product or service the current market situation and vested interests?
- How do you want to achieve that?
- What kind of help (from partners) have you got to do that?

*Price setting*

- What factors determine your market price?
- How does your market price compare itself to the competition?
- How does your mark-up compare itself to the competition?
- What is the future earning value of your product or service?

*Capital*

- What kind of capital do you use?
- What is your risk-capital resource?
- Under what conditions this risk-capital is used? What is agreement on refunding this capital?
- Does some kind of capital cooperation exists within the chain?

*Revenue*

- For what activity does the organization get paid?
- Is it a traditional revenue model or a new type of revenue model (revenue model innovation?)?
- What commercial parties are involved in the revenue model?
- What financial parties are involved in the revenue model?
- What kind of government institutes are involved in the revenue model and in what way?
- What are the perceived limitations in the revenue model?
- In what way en till what level can the government assist in taking away the perceived limitations?
- What are the expectations in relation to the revenue model in case the product or service becomes successful?

*Current or possible partners*

- Which extern parties are necessary to make the product or service a success? (special knowledge, distribution channels, client relations, etc.)
- Do these parties differ along the several stages of development the organization is in? (Development, prototype, up scaling, etc.)
- Is there a difference between commercial and non-commercial partners?
- Is it our natural habit to seek for cooperation?
- Is the government a necessary partner for success? The NGO's?
- Do you have famous ambassadors?

# ANNEX II Interviews and case studies

Interviews:

- Mevr. M. Bekkers (ICSB)
- Dhr. B. Hellings (Koplopersloket, EZ)
- Mevr. L.L. de Nijs-Vergeest (Agentschap NL)
- Mevr. A. Bor (Agentschap NL)
- Dhr. F. Tessema (Wuppertal Institute)
- Dhr. H. te Riele (http://societaltransitionsnl.ning.com/)
- Dhr. C. de Vries (Start Green Venture Capital)
- Dhr. M. Hendriks (http://www.e2cleantech.com/)
- Dhr. M. van Haren (Cleantech)
- Dhr. M. Delavieter (Energyvalley)

Case studies:

- Dhr. T. Visser (DonQi)
- Dhr. R. Deurloo (Greenfox)
- Dhr. J. van der Linden (Cargohopper)
- ? (Cargohopper)
- ? (All Green Vehilcles)
- Dhr. M. Batelaan (Pharmafilter)
- Dhr. D.J. Joustra (Turntoo)

# ANNEX III Case studies

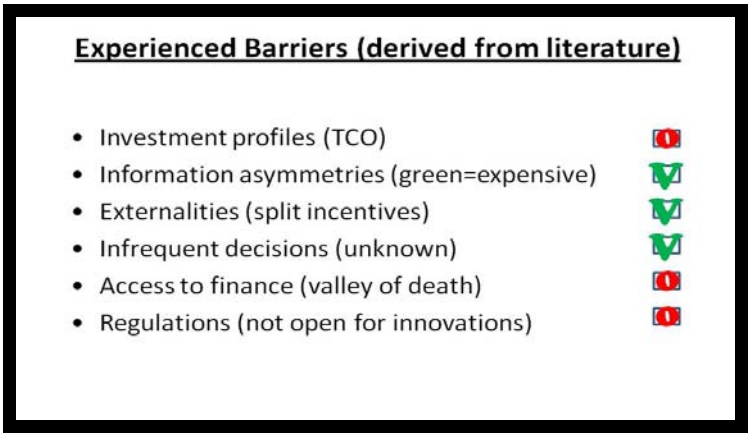

“GreenFox is the Dutch specialist in energy efficiency of existing fluorescent lighting. They rebuild fixtures so energy-efficient bulbs (using a patented attachment) fit into existing fluorescent fixtures. Through this conversion process, we provide an essential contribution to CO2 reduction and thus the climate. Converting existing luminaries is done in a social workplace. Using this method GreenFox keeps the production costs low and involving people with low opportunities back on the labor market.
During this conversion process they follow the 'cradle to cradle principle, they make maximum use of existing materials. The new lamps from are supplied by Osram or Philips Electronics, and then the fixtures are installed, their lifespan is extended by three times longer the traditional one, and thereby saving, depending on the situation, up to 52% on energy.
This way GreenFox is investing in sustainability and corporate social responsibility”.

**Corporate strategy**

The goal is to be the leading market player in converting existing fluorescent light into energy efficient fluorescent light. They are aiming to grow to the level, that they can provide work to roughly a 1000 Fte in the social workplace. Currently there are about 100 Fte working for Greenfox.

**Case**

Greenfox faces the challenge to ensure their existence on the long run, by choosing a long term strategy. Currently it is rebuilding T8 fluorescent light so that a more energy efficient T5 light bulb fits into the existing fixture. In the future this is also possible with LED-lightning for example, although there is skeptics whether this development of LED-lightning will last as it isn’t a proven technology yet. Another possible development to examine, is the technological development of T2. Its is expected to be launched in a time span of 30-40 years.




**Strategic Partners**

The Dutch 'koplopersloket' and in particular Mr. Nelson Verheul has been of great support. In de role of ambassador he has opened allot of doors, varying from potential clients to cooperation partners.

Other partners are:

- Osram
  - A strategic partner. Produces the lamps that the unique device of Greenfox is built for.
- Roteb
  - Social workplace Rotterdam supplies the workforce to produce, install and maintain the lightning. A education plan has been set up, to train and guide the people with less possibilities on the labor market, to reconnect, educate and finally function autonomously on the labor market.
- ABN AMRO
  - This banks supplied the initial loans to startup the company
- Municipals
  - Served as a platform to launch the product, they were the initial customers.

**Key Resources and activities**

Technique and knowledge in transforming (old) T8 lamps into more energy efficient T5 lamps without the need to change the entire fixture. Working with the social workplace Rotterdam (Roteb) also serves as a key resource, since it creates a demand from the government as a partner to effectuate social responsibility goals that are set.

The partnership with Osram, allows the product to be developed even further in cooperation with the producer of the lamp, to ensure an optimal result.

Key Activities are:

- Rebuilding fixtures so energy-efficient bulbs (using a patented attachment) fit into existing fluorescent fixtures with the Greenfox extender..
- Providing a tool for a sustainable and green image and effectuating social and environmental goals set.

**Value Proposition**

The patented Greenfox extender enables rebuilding T8 fixtures so that energy efficient T5 lamp bulbs fit into the existing fixture. Depending on the situation, it can save up to 52% in energy costs, lowering CO2 emission, thereby serving the environment. Both the T5 lamp bulbs as the Greenfox extender have a long lifespan thereby reducing maintenance and replacement costs.

They provide a tool for municipals, companies and various government institutes to effectively target the social and environmental goals that they have set. This is emphasized by the fact that they cooperate with Roteb in the production, in-

stallation and maintenance of the lamps. Hereby it is possible for municipals to reach their social responsibility targets by choosing the Greenfox product.

**Customer Relationship and segment**

Greenfox has no long term relationships with its customers. Because of its short return on investment time (2 years approximately) the market does not demand for any financing or maintenance schemes.
Greenfox targets institutions and companies with large amounts of T8 lightning present. A big client for example is the RAI in Amsterdam. A big conference facility with allot of square meters of traditional lightning that Greenfox is converting form T8 to T5.
Currently customer segmentation consist of 2/3 commercial parties and 1/3 government institutes.
Philips can be seen as a competitor as it serves the same market, but supplies the entire package, new lamp bulbs and a new fixture. Investments are higher.

**Distribution Channels**

Distribution is through cooperation with selected resellers or directly.

**Costs and Revenues**

The production, installation and maintenance of the lamps and the Greenfox extender is relatively labor intensive. Labor therefore accounts for the biggest share in costs.
Prices vary from 50 Euro up to 65 Euro. In combination with the expected energy savings, average rate of return is 2,5 to 3 years. Because of this short rate of return, the revenue model is relatively simple. There is no need for long term maintenance or finance contracts. In the case of large required investment, because of the scale of the project, there is cooperation with ABN AMRO to function as a financing company. This does not serve as an extra source of revenue however.
Also there is no demand for providing the service (light) instead of the product (the lamp), because of the low rate of investment required in general.
At this moment they exist about 1,5 years and have doubled their turnover every month up to 1 mln Euros over the last year.

**Possibilities for support**

In general Greenfox has a very healthy business model. The challenge however lies within the long term strategy. A possible role is to be played here by the Dutch ‘ koplopersloket’ or other government agencies in providing advice on this matter and introducing marketing parties that are skilled in these organizational issues.

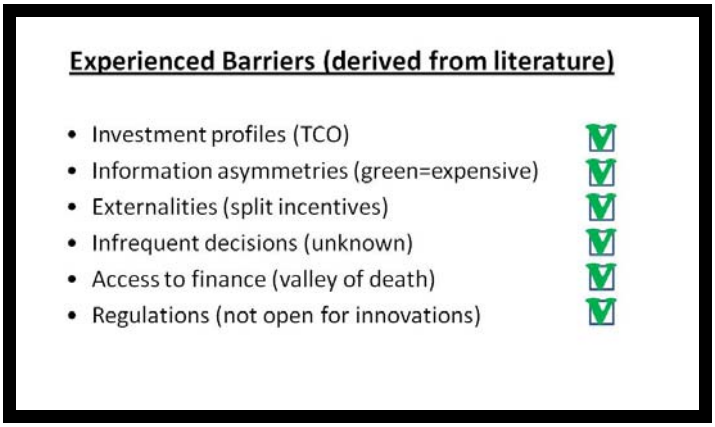

“Started in 2007 from Maasland All Green Vehicles was the importer of the electric car manufacturer Miles for the Benelux. Besides this brand AGV represents a number of high quality electric vehicle manufacturers and is closely involved in the development of some new models. The knowledge gained is also used again when converting conventional vehicles to electric powered models, including models for manufacturers such as Volvo and Ford, but also for government agencies and commercial parks. Partly because of these developments and their own R & D activities AGV has become a leader in the field of electric transport in the Benelux”.

**Corporate strategy**

AGV strives to develop the electric driven car/engine that provides a realistic alternative to the traditional fuel driven vehicles. They believe strongly in the potential and future possibilities of electric transportation and strives to a business model where the design of the cars produced is tuned for the electric engine of AGV and risk is shared among stakeholders.

**Case**

Currently AGV bears a great deal of the risk. When a vehicle is ordered, AGV needs to buy the traditional model and take it into their possession. After that the car is adjusted and the traditional engine is replaced by the electric one. When finished and tested, the car is soled back to the producer or client. This business model requires large investments and is mainly driven by problems with the guarantees. Regular chassis are not directly suited to host an electric engine. A market needs to be created for producing and selling electric engines instead of transforming traditional vehicles into electric vehicles.
The electric engine itself is currently quite costly, therefore AGV aims for niche markets where customizing is essential, like the distribution sector and high end sporting vehicles. Also the battery management system provides a challenge since this requires some handling to ensure a full and working battery.




**Strategic Partners**

BOM, a regional investment agency initiated by the government, is shareholder of the company. Other government institutes serve as customers of AGV.
AGV works with roughly between the 50 and 100 suppliers of parts for the engine. To make a customized electric engine differs per project, therefore allot of parts are moderated and produced by AGV.
The goal is to create a network of dealers and car/truck producers that are able to install the electric engine AGV produces. This network should complement each other in that manner that the trucks are designed and suited for implementation of the electric engine. This way also the distribution channels of the car/truck producer are used to launch the AGV engines on the market.
A shift is desired from transforming vehicles into electric vehicles to a production driven organization that produces electric engines.
Currently there is little or no chain cooperation and there is a demand from AGV for strategic partners on the distribution side.
There is a strategic partnership with the producer of the battery parts, to ensure AGV is in possession of the most innovative techniques in the field of battery engineering.

**Key Resources and activities**

The technique en knowledge concerning the design and production of electric engines is well secured and a great asset of AGV. Also the strategic partnerships and support by local and national government is an important resource in the success and existence of AGV.
Currently the key activity consists of transforming traditional vehicles into electric driven vehicles. However, as stated before, AGV strives to make a shift to the production of electric engines only since this entails their key resources and strengths.

**Value Proposition**

AGV has an unique product by the composition of the engine. Every engine is customized to the model of the car en is put together at AGV facility. Most components of the engine are produced or altered by AGV. AGV posses allot of technological knowledge and experience in producing and altering electric engines and is thereby able to deliver tailored solution for every electric engine project. With their cooperation with an important battery supplier, they are able to guarantee the most technological advanced techniques used in constructing the battery used for the electric engine.

The fact that AGV has the most advanced knowledge and testing centre in the Benelux, serves as a great advantage. Most testing concerning electric vehicles in the Netherlands is done at the AGV facilities.

**Customer Relationship and segment**

AGV serves the distribution segment and the high-end sport car segment. Both are niche markets and thereby extremely suitable for customized solutions AGV is offering. Currently they are working with Spira on the development of an high-end sport scar with an electric engine. Connex is a client in the distribution segment. With Connex it entails larger volumes, enabling AGV to produce more efficient and thereby offering the transformation for a price that is more market conform.

A stable client relationship is established with the government, which provides AGV with good feedback. Government institutes are the early adaptors in this case but are less careful in implementing the use of electric vehicles among their staff. Due to this, battery management becomes a challenge, since battery require careful charging every night.

Commercial parties are a little slower in adopting the product, but when adopting, they implement the product more carefully

**Distribution Channels**

There is a need for better infrastructure. To ensure a more production driven organization in the future, partners have to be found in possession of a well established distribution network. Currently there are little distribution lines.

**Costs and Revenues**

At this moment large investments are being made and not every project yields a positive turnover. Market needs to be created and a network needs to be set up. AGV focuses on niche markets partly because of the high initial costs related to the electric engine. For example; when transforming a traditional Opel into an electric driven Opel, the price of the car would rise approximately form 20.000 Euros up to 50.000. This means there is currently no market for these transformations. An high-end sport car however, would rise for example from 100.000 Euros to 130.000 Euros.

The electric engine has very little maintenance since it is no combustion engine, the lifespan depends on the charging cycle of the battery. Maintenance costs therefore will drastically diminish.

Revenues are being made due to increased efficiency. Technicians are more and more experienced, and projects in the distribution segment are increasing in volume.

**Possibilities for support**

Eco-innovations entail market creation, this is underlined by the demand the market for electric engines faces in standardization. Currently there are to many different types connectors, adaptors, etc, a possible role is to be played here by the national or European government.

The Netherlands is a trading county, not used to making risky investments and being innovative. An investment where the first two years aren't profitable is not likely to pass the analysis a bank conducts when analyzing an investment opportunity. National or local government can mediate between these parties and bring them closer together. This way more eco-innovations are being explored and exploited.

There is a gap between the parties that have been granted government subsidies and the parties that bear the risk. For example transporters are granted subsidy for an innovative projects, but when doing so and engaging in a business deal with AGV they try to put the risk on the table of AGV. In granting the subsidy, more focus should be on this issue.
Societal support is needed to create a mindset for electric engines. Where people are used to charging their battery, to ensure carefully implemented electric engines in the future.

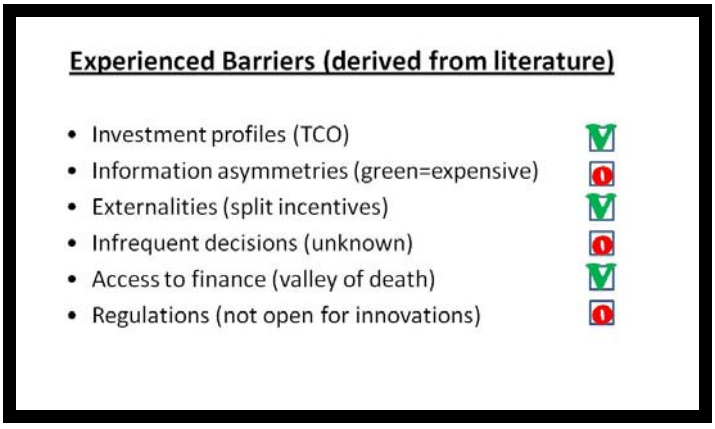
“Generally CargoHopper is seen as a fun vehicle that delivers small parcels in the city of Utrecht. But Cargo Hopper is more than that, it's a complete logistics system that deals with the problems connected to the distribution in the inner-city of Utrecht. Shipments intended for the city are collected in the logistic center of Hoek Transport, founder of Cargo Hopper at the Utrecht industrial area Lage Weide, than it is transported with a large trailer to the Cargo Hopper location, situated on the borders of the inner-city. From there the goods will be delivered by the Cargo Hopper in the center.
Cargo Hopper is an open system, meaning that it can be used by fellow carriers or retailers with own transport, we see recently a remarkable increase in the number of shipments. More and more colleagues found their way to us, and make use of the facilities that the City Distribution Center offers”.

**Corporate strategy**

Cargohopper strives to offer a national concept for inner-city distribution, by using an social and environmentally efficient concept. Placing a Cargohopper centre at the border of each inner-city and transporting shipments electric and solar driven vehicles to their destination within the inner-city. The current trend within the transport industry is clustering. More and more cooperation are being set-up and Cargohopper anticipates a grow in the future due to this trend as they are investing in a network and infrastructure which serves the transport industry.

**Case**

Currently allot of investments have been made in the belief in the concept. Unfortunately the access to finance is a problem since this concept still has to prove its value. The social and environmental benefits are not yet captured in revenues and earnings, although it has got allot of attention nation wide.
The concept needs a national platform to present itself and show its value, therefore investments have to be made and partners within the network need to adopt the concept to create value for the concept. Capital is needed to create value, but to ensure access to capital value needs to be created. This is the vicious circle Cargohopper finds itself.



**Strategic Partners**

In the development of the vehicles, several partners have cooperated:

- Solarcar → Has developed the roof with solar panels for the new vehicle that is being operationalised in June.
- Divaco → The importer of the vehicle
- Velthuijsen → Has developed the chassis and trailer
- Alke → Has developed the tractor

Hoek transport is the founder of Cargohopper and is part of an international network of transport companies. Hoek transport is currently talking to several partners in this network to adopt the concept of Cargohopper in other cities and thereby creating more value within the concept.

As stated before, one of the problems Cargohopper faces, is the access to finance. Banks are not keen on investing in the transport industry, and the innovative concept of Cargohopper is unknown an has not yet proven it's value. Currently there are no financial parties willing to support and finance the concept.

**Key resources and activities**

Key resources are the technological knowledge as well as the investments made, concerning the environmental friendly inner-city distribution vehicle and the inner-city distribution infrastructure. Hoek Transport, as the founder of Cargohopper, is part of the international network of transporters. This serves as a possible platform to launch Cargohopper on a national level.

Their key activities consist of inner-city distribution and the (co)development of environmental friendly transport vehicles.

**Value Proposition**

Cargohopper has a CDC (City Distribution Center) status, which entails that they are allowed to function as an inner-city distributor and therefore are relieved from the inner-city restrictions that are applicable on other forms of transportations, like special delivery times, environmental zones, etc. For the last two years Cargohopper invested in the concept of city distribution, by developing special vehicles with a green and sustainable mode of transportation, and the development of the infrastructure by setting up the Cargohopper centre at the borders of the inner-city. Cargohopper has created a green and friendly image, which functions as an excellent marketing tool. These investments created an advantage on the competition given the trend of clustering in the transport sector and the shifting focus to a more sustainable and environmentally mode of transportation, especially in the inner-cities.

**Customer Relationship and segment**

Cargohopper serves the inner-city distribution market and have a market share of about 15%. Competitors are TNT, GLS and DHL, but none of them invest in 'green' distribution.

Most of the customers of Cargohopper are other transport companies in search for the ideal access to the inner-city of Utrecht, and only a small part of the customers consists of retailers. Transport companies are only looking at the best and most efficient way to serve the inner-city, therefore the price Cargohopper calculates has to be mark conform other city-distributors.

The environmental mode of transportations functions mostly as a marketing tool in the inner-city. By its friendly appearance it attracts possible clients in the re-

tail sector. HEMA is a good example of a Dutch retailer who noticed Cargohopper in the city of Utrecht and thereby was triggered into doing business with Cargohopper. The environmental mode of transportation can serve as a tool for retailers to achieve their social en environmental goals, like a reduction of CO2 emission.

**Costs and Revenues**

Large investments have been made in the development of the first inner-city distribution vehicle. In this first period, Cargohopper was granted a price, given by the province, to support their initiative. This price money enabled Cargohopper to develop their second and improved vehicle. Since no investments needed to be made, this new vehicles guarantees Cargohopper a positive return.
In general Cargohopper does not yet yield enough return. However it does create allot of attention and thereby positive spin-offs for Hoek Transport. Taken the spin-offs into account, Cargohopper yields a positive return, and with the new vehicle to be operationalised in June yield is expected to increase even more since depreciations are zero.
Besides depreciations (normally around 10%), costs consist of personnel costs (25%), transport costs (30%), Rental costs for the Cargohopper Centre (20%), indirect costs (15%).
This entails that during the lifespan of the new vehicle, mark-up rises with roughly 10%.

**Possibilities for support**

Since the Cargohopper vehicles are CO2 neutral and have a very low sound level, they are very suitable for inner-city distribution. The city of Utrecht has an interest in promoting these types of vehicles in the inner-city and could therefore support Cargohopper by introducing strict regulation concerning city distribution. Regulations on the amount of crill and CO2 emissions or special zones where only silent vehicles are allowed for example. This way positive incentives and externalities, that are currently in the interest of the municipal, are internalized in the business model
Besides inner-city regulations, access of capital has proven to be a great barrier. The transport industry is an industry that requires large investments and an innovative and unproven concept like Cargohopper therefore does not meet the demands set by the banks in granting a loan. A possible role is to be played by the government in providing guarantees for the bank loan for example.

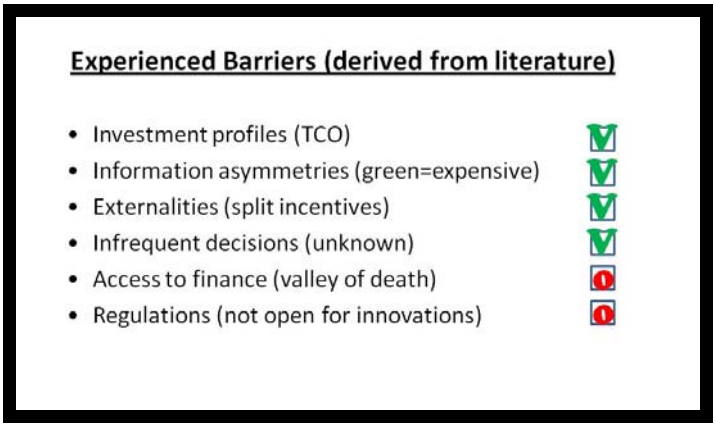

“DonQi Urban Windmill is a compact, silent wind turbine. This unique wind turbine is developed in cooperation with the Dutch National Air and Space laboratory, and can function with wind speeds up to 65 knots and is strong enough to survive storms with wind speeds up to 200 km/h.
An ideal energy source for an inventive land as the Netherlands. Depending on the average speed of the wind and your use of energy, the donQi urban windmill can provide up to 75% of your energy demand. All energy that is not being used is easily soled back to your energy supplier.
With the donQi Urban Windmill on your roof, you also present yourself as an societal and environmental friendly entrepreneur. Free publicity as the mill is stickered depending on the clients wishes, with logos commercial lines or full color images. This way donQi is not only creating sustainable energy, but also underlines a company’s sustainable image in an original fashion”.

**Corporate strategy**

The goal is to provide more profitable decentralized and sustainable energy technologies, which will increase the reliability of the energy supply and enable consumers to also act as producers. Besides wind turbines donQi will also be operating in the field of integrated energy solutions with the application of a combination of wind power, solar energy and heat pumps in the near future.

**Case**

DonQi now faces the challenge of choosing its strategy. Experience has learned that donQi serves as an excellent tool for organizations to underline their green and sustainable image. Allot of sales are driven by this selling point but this entails oh short term focus.
To optimally function as a green energy supplier, a long term focus, it is depending on several aspects in an urban environment, like building environment, geographic location, etc. this creates a demand for technological improvement. The venturi of the windmill is a unique piece of technique and enables the donQi to outperform competition in the supply of energy in relation to the size of the mill surface. This serves as a platform for further technological development to ensure this as the value adding component of the windmill.




**Strategic Partners**

DonQi has a wide network of business partners in various fields, varying from technological development to distribution lines.

- Roteb, social workplace Rotterdam
  - Roteb is an important partner for DonQi in the provision of labor for production. Moreover DonQi is located in the same building as Roteb. This enables both parties to give feedback on the production process and thereby constantly keep improving this process.
- Government in providing permits
  - Cooperation with the government is essential in the field of permits and licensing.
- TU-Delft and TU-Eindhoven technological partnerships
  - Both parties are important parties in the technological development of the mill.
- Agentschap NL, providing guarantees for the bank loans
  - A bank loan was granted by the Rabo Bank. This was made possible by the guarantee Senter Novem granted.
- Startgreen is an investor
  - Startgreen invested in the corporation and assists with market research

**Key Resources and activities**

Technique and knowledge. Because of the unique design, the mill is small and does not require a permit. The Venturi is part of the unique design which enables the mill to outperform competition in the supply of energy in relation to the size of the mill surface.

Key Activities:

- Production of a compact, quiet, urban windmill for decentralized energy supply
- Providing a tool for a sustainable and green image.

**Value Proposition**

The unique technological features of the mill, enable the mill to function as a clean and quiet energy source, which can supply up to 75% of your energy demand.

It delivers a unique level of energy in relation to the surface of the wings of the mill.

A great advantage is the lifespan of 15 years with limited maintenance. This is in favor of the rate of return since costs will diminish in the future.

Also it is an unique eye catcher, to underline a company's sustainable image in an original fashion.

**Customer Relationship and segment**

Donqi has no long term relationships with its customers. However it does deliver several services in relation to delivering the urban windmill. Before buying the

mill, DonQi will measure the wind on location. This to ensure optimal placing of the mill.
Donqi will assist you in obtaining an building permit. Environmental permits are not necseary since the rotor blades have a diameter under 2 meters.
The customer segment Donqi is operating in, contains mostly commercial organizations, dealers and installers. DonQi does not target consumers.
DonQi is active on the market for decentralized energy provision. There are no other urban windmill producers. Competition can be thought to be organizations like Skystream, Air Dolphin and Montara, due to their technological knowledge, but their mills are roughly three times in size. And other suppliers of decentralized energy sources. A Niche market on the crossroads of wind- and eye-catcher.

**Distribution Channels**

Distribution is through cooperation with selected dealers, which roughly account for 50% of the margin.

- Greenfocus
- Synorga
- Vredenburg

**Costs and Revenues**

Costs entail high costs in developing en producing the urban windmill. Initial investments are made in cooperation with the RABO Bank, Startgreen and equity. Direct sales from delivering and installing the urban windmill and if wanted, stickering the mill with advertisement. Currently 160 mills are active in the Netherlands and sales amount approximately 40-50 per month. Prices vary from 7000 Euro up to 12000 Euro, depending on the height of the mast and desired personalization. Only the mill amounts for approximately 4500 Euro with a total of 2200 Euro in production costs.

**Possibilities for support**

DonQi currently faces the challenge of choosing its strategy. There is a need for marketing assistance and market research in developing a healthy business model and setting out a long term strategy to ensure existence over the long run.


“Pharmafilter is an integral concept for the healthcare, treatment of waste and purification of wastewater for hospitals, nursing homes and other care institutions. By using crunchers for all waste materials en transporting the waste through the pipe systems to be filtered, no waste remains in the hospital.

- With large benefits for the nursing staff;
- More efficiency and hygiene in handling the hospital waste;
- Local reduction of solids waste and purification of the wastewater;
- Removal of pharmaceuticals, contrast media and endocrine disrupting substances.

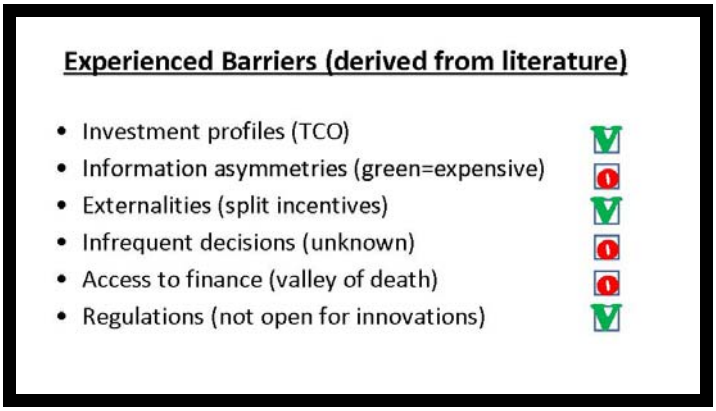
As a result the treated water is very clean and can be discharged on surface water or reused for example as toilet flushing water, biogas for production of energy, remaining waste (sludge from the digester) will be recycled and/or used for energy generation”.

**Corporate strategy**

Over the last 5 years Pharmafilter invested heavily in developing the concept with no return. Currently it is a proven concept and market pricing is set at 2,5 Savings in wastewater, water use, waste costs and waste logistics
Have already been quantified and can be presented to potential clients. In cooperation with strategic partners the concept is ready to be marketed in the Benelux first, then Europe will follow. But also for developing countries like India for example, the concepts shows great value.
Further development is necessary to make the concept applicable for airports for example, or other closed system organizations.

**Case**

Pharmafilter is currently at the start of the scale up phase. The concept has been proven and tested and is ready to be market.
Pharmafilter entails several benefits in terms of efficiency and hygiene, but it also creates room for process improvement by creating a completely new waste infrastructure. These advantages are difficult to quantify to underline the importance and the value of pharmafilter as a concept.
There is a need for new projects to serve as a platform to display these advantages in practice.




**Strategic Partners**

Pharmafilter is developed in cooperation with several partners:

- STOWA (investor)
- European Union (subsidies)
- Reinier de Graaf Group (cost of staff and cost for the foundation)
- TU Eindhoven (knowledge exchange)
- Hoogheemraadschap Delfland, Several Dutch Ministries and the city of Delft (advise and assistance)
- Van Gansewinkel Group (waste management)
- People on the Move
- Mirel (producer of the crunchers)
- And several others in the area of advise and counseling

**Key Resources and activities**

Key activity is offering an integral concept for waste management in hospitals. Crunchers to crunch all waste in the hospital and a purifying installation to capture the crunched waste before in enters the public sewer, to filter the wastewater, producing pure water and gas for heating.

Key resources consist of knowledge concerning filtering and crunching waste, collected during the five years of development and the borad network of partners facilitating the development of the concept. Government support and the cooperation with the Reinier de Graf Group is especially important in this phase.

**Value Proposition**

Currently about 7% of the patients in hospitals gets infected in the hospital with an average cost of 10.000 euro per infection. Many protocol are handled in the hospital where it is necessary to wash your hands, only 25% of these hand wash protocol are followed correctly. Pharmafilter eliminates waste flows through the hospital and is able to cut down process steps with their disposals division. Hereby eliminating the chance on infections by aerosols and cross-contamination. Pharmafilter reduces the cost of (waste) water, waste costs and waste logistics, but moreover it entails large benefits for the nursing staff, enables more efficiency and hygiene in handling the hospital waste and creates possibilities for process innovations by creating a completely new waste infrastructure.

**Customer Relationship and segment**

In this phase of development Pharmafilter has only one client, The Reinier de Graaf Group. This is a cooperation with bilateral dependence and feedback. The

Reinier de Graaf Group enabled Pharmafilter to develop their concept and use them as a test case.
Since the concept as increasingly proven its value, more and more hospital are interested, national and international but now relationship has yet been established.
They are currently focusing on Dutch Hospital or hospital in the Benelux, but when the infrastructure of the organization has further developed, Pharmafilter can be marketed internationally.
Besides hospital, airports are considered to be an interesting market, since this also entails a closed group system where waste management is an important target in process innovations.

**Distribution Channels**

The contact with the Reinier de Graaf Group is direct, since they are more involved in the development of the concept as well. Buying the Pharmafilter concept entails the crunchers, filtering installations but also maintenance contracts. Pharmafilter is able to serve the Dutch and the German market itself, but is planning on working with agents outside these countries. These agents will be trained to serve and maintain the installation and can act as a representative in these countries.

**Costs and Revenues**

The Pharmafilter concept consist of the crunchers, filtering installation and the disposables. The crunchers are developed in cooperation with Mirel the producer, who financed this development. The crunchers are priced at a competitive market level since they are under the pressure of competition. The disposable are priced at their cost price plus a small mark-up. The biggest challenge however lies in pricing the filtering installation. Currently the price is set at 2,5 mln Euros for the entire concept. This is based on the value it creates for the hospital en thereby estimating a return on investment.
It is estimated to save 125.00 Euros on deductions on the installation per year, and roughly about 300.000 Euros on (waste)water, waste logistics and waste costs per year.
Other benefits as mentioned in the value proposition have not ben specified and quantified.

**Possibilities for support**

There is a demand for national policy on the area of waste management, currently it is scattered among the Dutch municipalities.
Sustainability is defined by the government by regulations and descriptions. Innovative concepts like Pharmafilter are new and current policy often does not capture the characteristics of these innovations. Therefore there is a need for an open policy on innovation.

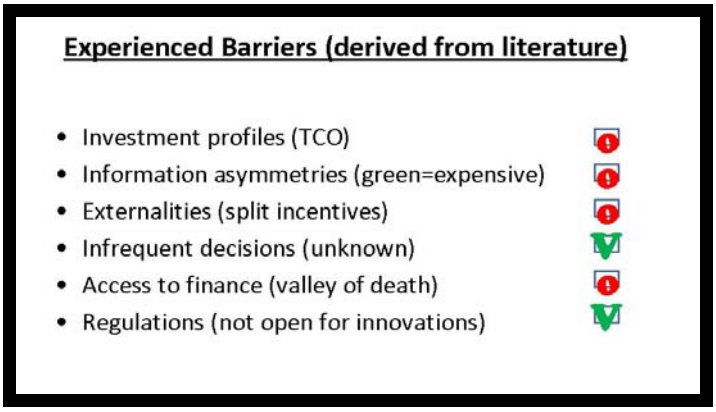
"ZND is driven by innovation. With a strong focus on roofs, roof management, environmental solutions and innovation they strive to ensure their existence over the long run. With high expertise concerning the latest techniques, applications and materials, architects and construction firms consider ZND as a valued partner. Cost estimations and building physical calculations are part of the full service scheme. Moreover, as a member of the national Synthion group, they are part of a national network of roof management experts".

**Corporate strategy**

With a strong focus on innovation and knowledge, ZND strives to be a leading player in green and sustainable solutions for roofs. Facilitating a platform for green solutions and knowledge, the strategy of ZND is open and innovative with strong and long term relationships with suppliers and clients. Building an network of suppliers, knowledge and clients and so ensuring existence on the long run.

**Case**

Dutch municipals often have subsidies for the placement of green roofs. Unfortunately this differs per municipal, thereby creating confusion on the market. It is a costly and time-consuming effort to explore the possibilities per municipal and moreover subsidy schemes are likely to be altered frequently, thereby creating a market that is careful and waiting.




**Strategic Partners**

Nedicom is a related company that is specialized the frontage of a building. Together ZND is able to deliver solutions for the entire exterior of a building. ZND is one of the preferred suppliers of BAM, a big building organization in the Netherlands. Together with BAM, large projects are undertaken. BAM has little knowledge concerning sustainable roofs and frontages, therefore ZND is an ideal partner on these matters. Besides BAM ZND works with more corporations, but the cooperation with BAM is most intensive.

To deliver the optimal solution for green roofs, ZND cooperates with Van Helvoirt, a green supplier. It is an open collaboration, entailing the opportunity to work separately. There is a mutual understanding in the effort to involve both parties in the undertaking of a project. This enables ZND to deliver green solutions for a competitive market price an offer clients a total solution with the ad-

vantage of clear schemes concerning guarantees. When offering the total solution for a green roof together with Van Helvoirt, they often participate in the design and planning of the project, making it possible to deliver customized solutions with less pressure on pricing due to competition.

**Key Resources and activities**

ZND has developed into an innovative and sustainable pioneer, with a high ability to provide innovative solutions for new and existing buildings. They provide a platform for knowledge and technological solutions and with their open model are willing and able to diffuse this knowledge, thereby simulating market development.

**Value Proposition**

ZND strives to offer innovative green solutions for roofs on existing and new buildings. In their expertise and knowledge on these technical solutions lies a big part of their strength and value.
ZND cooperates with a couple strategic partners like Van Helvoirt, to optimize the ability to offer the total solution customized to every market demand. Acting as a preferred supplier of BAM gives additional value in turnover and strengthened their market position and existence on the long run.

**Customer Relationship and segment**

They are active in the building sector on new buildings (50%) and in the renovation of existing buildings (50%). Contractors are (semi)governments (50%) and commercial parties and VVE's (50%). No consumers since it is equally costly to design a plan and write an offer, but the scale of the project is much smaller. There are two big competitors on the roof market, consolidated and Oranjedak, both with a market share of approximately 25 mln. ZND is the third largest player on the market with a market share of approximately 15 mln.

**Distribution Channels**

Distribution flows through cooperative channels in construction and direct sales in renovation.

**Costs and Revenues**

In the recent period, ZND invested allot in knowledge and innovation en a sustainable way of doing business. They invested to get the ISO certificate and creating a knowledge centre to inspire and educate clients about the sustainable solutions.
The price they charge is the cost price plus a certain mark-up. The industry they are active in, forces them to be competitive in their pricing and together with Van Helvoirt they are able to be competitive in their pricing. Due to their cooperation with Van Helvoirt, Nedicom and their status as preferred supplier for BAM, it is possible for ZND to help think and design the solutions and orders together with the project managers from BAM for example. This way they can ensure a total solution with a good guarantee scheme and takes the market pressure of the pricing.

**Possibilities for support**

There is a need for rewarding companies that are investing in green and sustainable innovations and are stimulating market development in that direction. ZND

is investing in their ISO certification but this investment does not yield a positive return directly.
A national policy on subsidies for green roofs. Currently there is a scattered scheme, that differs per municipal. This slows down market development an creates uncertainty among the market players. A national policy would stimulate the market and gives incentives for more innovations.

"turntoo, a platform that turns the relationship between producers and consumers. Turntoo advocates 'performance-based consumption', a fundamental change in our current consumer society and its revenue models.

In the model of turntoo producers remain owners of their products. Consumers pay only for performance but not for the included stocks. The innovation speed increases, the use of environmentally friendly products is significantly cheaper for consumers. Because the product, after a fixed period of use, goes back to the producer, the consumer no longer is responsible for the disposal of the product. Each is responsible for his own actions".

**Corporate strategy**

Turntoo acknowledges a market trend towards sustainability. The market demands sustainability in some form but is not clear how to design this demand. Turntoo offers a solution for this design an does not focuses on the revenue model. Value creation through adoption and use. First successful use and complementation of some projects to establish appreciation and value for the brand and the concept. Creating a network of associated suppliers to offer a total performance based concept.

When this is established one can think of the revenue model as it will be initiated by the use of the concept.

**Case**

Turntoo strives to create a platform for performance based consumption. To value and ultimately price this platform is a challenge. There is a need to market this platform and scale it up. Turntoo believes it has to create mass before valuation and pricing is an option. Since the concept is not yet widely used an valued, pricing in early stages can harm development.

Furthermore a challenge lies in the valuation of several performance indices. Not every product is easily capture in a performance index.

**Experienced Barriers (derived from literature)**

- Investment profiles (TCO) ✓
- Information asymmetries (green=expensive) ✗
- Externalities (split incentives) ✓
- Infrequent decisions (unknown) ✓
- Access to finance (valley of death) ✗
- Regulations (not open for innovations) ✓

**Strategic Partners**

Thomas Rau is initiator of this concept and in cooperation with dutch, RAU, Tomorrow Design, and supported by: BAM utiliteitsbouw, Desso, EPEA, Interface-FLOR, Mosa, Philips, Steelcase, Triodos Bank, Urgenda, Van Houtum the concept is developed. To add value to the concept and especially the brand name Turntoo strategic partners are necessary to be able to offer the complete solution to performance based consumption with a design that is able to serve as a platform for all the different producers and other partners in the network to function as a whole.
Also Turntoo is part of the Cradle to Cradle network which creates certain spin-off effects in this area.

**Key Resources and activities**

Durig the years of development, knowledge has become the key resource. Ultimately a well established network of clients and producers is to be set up and the brand Turntoo is vested. Turntoo is to be a quality brand for cooperation in the building sector, offering a total design for performance based consumption. Currently the key activities consist mainly in consulting and guidance.

**Value Proposition**

Turntoo has developed into a source of knowledge around topics as cradle to cradle and performance based consumption. Knowledge is therefore a key resource together with a network of cooperative suppliers and clients. The strength of Turntoo lies in the ability to connect and design, creating a platform for a complete performance based scheme. The design an interior for an office for example and connect this design to the associated supplier to off the total package. This strength is initiated by the strong cooperation with Thomas Rau's original company, RAU Architects.
Currently a total performance based scheme saves up to 20% of your original costs with stable resource prices. As resource prices are going up, savings will increase.

**Customer Relationship and segment**

Turntoo is active in the building sector, housing, offices and institutions. Currently they are striving to undertake initiating projects and establishing long term relationship with their customers. Their own office is totally performance based designed and furnished.

**Distribution Channels**

Infrastructure has yet to be designed, currently relationships are being created and multiple product domains are being analyzed.

**Costs and Revenues**

Developing the concept is time consuming and does net yet yield a positive return. Strategy is to create infrastructure for development and up scaling, and a revenue scheme will follow given the number and type of users.

**Possibilities for support**

Turntoo acknowledges opportunities in the research area. More research is needed on all the different product groups to analyze their ability to consume performance based. This analysis should indicate the valuation of the performance for each product group.

The government more as a launching customer to initiate performance based projects to stimulate the use of the concept.
Governments should connect regulations in the area of sustainability to innovation policy. In California for example, it is obligatory for producers to name all resources used in the production of the product. This is a costly and sometimes ugly thing to do, since producers are not always willing to mention all used resources and ingredients. If they cooperate with the Californian institute for product development, they are excused from the obligation to mention al resources on the product.