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Business models of eco-innovations

An explorative study into the value network of the business models of eco-innovations and some Dutch case studies

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Introduction

Up until now the main ways many governmental institutions looked at valuing eco-innovations – in order to grant them subsidies or other kinds of support - seemed to be mainly based upon:

- the way the eco-innovation project itself was financed instead of the way the enterprise launching the eco-innovation was financed;
- the expected environmental effects of the eco-innovation;
- the feasibility of the new technology used in the eco-innovation.

It can be concluded that the attention given to the economic issues seemed rather limited. Economic issues were seen as the responsibility of the entrepreneurs themselves. It is however quite surprising that so far little studies have dealt with the issue of business models of eco-innovations, in particular their revenue models.

Recently a shift can be observed in the way governmental institutions look at valuing eco-innovations. Since the available budgets are shrinking and there is a growing pressure on the return of state support, more attention is given to the more promising eco-innovations, promising in terms of the market potential of the eco-innovations.

Research questions

In this study at least the next questions are to be answered:

- In what way(s) are revenue models of eco-innovations different from 'regular' innovations?
- Which factors determine the revenue model used?
- What kinds of revenue models do small and medium sized companies use to scale up their eco-innovations successfully?
- In what way do funders or financing parties stimulate eco-innovations and what is the role of the revenue models in this process?
- Which policy opportunities are connected with revenue models for eco-innovations? How can governments stimulate these revenue models?

The research methodology consisted of a combination of literature reviews, several expert interviews and a number of case studies amongst Dutch eco-innovators. However mainly aimed to be illustrations these case studies were also used as a test on our findings in the earlier parts of the research project. Both the entrepreneurs and the investors were asked about their need for support on the development of the revenue models.

Limitations

Since this research project is an explorative study, we cannot conclude from this project that the outcome is conclusive. In this research project only a limited amount of eco-innovators were interviewed and a list of experts. Nevertheless we found that it is possible to ask eco-innovators about their revenue models. Another limitation concerns the development towards new economic models and the way eco-innovations can be placed in this context. Apart from some specific revenue models like PSS we have not been able to find revenue models that are not based on our traditional economic system or that can be seen as new revenue models that look at the economic system in a different way.

Eco innovations are different from regular innovations

We know from literature that eco-innovations differ from regular innovations on the next issues:

- Different investment profiles over time (higher purchase price and set-up costs) and lower operating costs (maintenance and running costs).
- Information asymmetries due to search experience, and credence attributes.
- Externalities (e.g. environmentally sound alternatives imply a higher collective benefit but lower or equal private benefits than conventional alternatives)
- Infrequent decisions, meaning an extensive decision-making process that implies high involvement, high cognitive effort, and a substantial need for information due to limited experience.

The experts we consulted agree on the facts that:

- Looking at the differences mentioned above, externalities ('who benefits?') could be seen as the major difference. All other differences can also be seen within regular innovations.
- Sustainability objectives give a different direction to innovation. The main difference between eco-innovations and regular innovations are the reasons why the organizations involved 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.
- Many eco-innovations simply have a better footprint and do not serve a particularly different purpose or are developed for particularly different needs.
- Eco-innovations are becoming 'common business' more and more. An innovation process without attention to sustainability effects is difficult nowadays.
- Eco-innovations feed (push) or fit in to (pull) a different quality perception of customers.
- In the case of system innovations the situation is more complex. There is a paradigm shift. Systems are changing and the innovation process is different from regular innovations, more players are involved and system innovations need to be pushed. Another important difference between system innovations and other eco-innovations is that the former have to fit in with the existing infrastructure dominated by the big traditional utilities.

The value network of eco-innovations

In this study we looked specifically at the architectural layer of the business models in eco-innovations, in particular the value network. This consists of:

- Price Setting
- Revenue Model
- Supply Chain
- Capital Model

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 (varying 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)
- The social basis (trust, support)

Tailor made and dynamic

Revenue models of both eco-innovations and regular innovations 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 revenue 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 may government support, customer needs/ preferences and the actions of competitors.

Most revenue models of eco innovations seem to be no different from regular innovations

Based upon literature and the experts and entrepreneurs we spoke to, we can now say that only a small part of the revenue models of eco-innovations seem to be different from 'regular' innovations. Since most customers and financial parties involved in the revenue model of eco-innovators think and act according to the traditional economic views, most revenue models of eco-innovators are quite traditional too. This however does not imply that the revenue models of eco-innovators are simple.

From the interviews we learned that the revenue models are still quite traditional as most eco-innovators are or feel forced into using these models. In this study we found that public private partnerships (PPP) are frequently used to be able to finance the inevitable losses. Also total cost of ownership (TCO) is used frequently as a tool in revenue models to (try to) convince customers to pay for the higher purchase price and set-up costs. Interesting new developments 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 also seems an interesting way to place the responsibility concerning sustainability to the suppliers. Furthermore there is the issue of revenue models in cooperation within production chains. Especially in the building sector (because of the increasing emphasis on maintenance in the contracts) this is developing fast. Nevertheless companies seem to be reluctant in working this way, since this means they have to experiment with their revenue models.

Sustainability values make the value network more complex

Because in eco-innovations sustainability is added as an extra value (often consisting of many sub values) and eco-innovations often concern material scarcity issues the value network of eco-innovations seems to be more complex than regular innovations. Sustainability has its value or rather different values that need to be addressed in the value network of the business model. These values also mean that more effort needs to be undertaken in client relations, in communicating over these values. We can think of social benefits, environmental benefits, benefits to the biodiversity etcetera. As long as these values can easily be quantified and well translated into financial gains, this can keep the value network rather simple. When however these values cannot (as easily) be translated into financial gains the value network becomes more complex. This is immediately reflected in the capital model (higher costs) or means that eco-innovators have a hard time finding capital at all.

Performance-based contracts and chain cooperation

During the interviews and case studies a shift was illustrated from selling products and services to a performance-based scheme (PSS). These models make it possible to overcome high initial costs and alters capital flows making it easier to access capital and market the product.

Within the value network of an eco-innovation cooperation between parties involved seems to be more and more important, also in marketing the eco-innovation. Most case studies show intensive cooperation in the value 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 profiles. It would be very interesting to get a better insight in new value networks and revenue models that are created within new sustainable value chains.

Recommendations to eco-innovators

A recent study of EIM within Dutch SMEs showed that only one third of the SME's working on eco-innovations say that they are able to do create sound business models. Another 40% said they are able to do this to some extent and 22% say they are not able to provide a sound revenue model.

As most innovation experts know: on average only 1 out of 10 innovations becomes successful. Assuming this is no better for eco-innovations, there is an interesting characteristic of eco-innovators that might make a difference. Experts seem to agree that part of the eco-innovators is driven by their principals/ideals. This is both an advantage and a disadvantage. On the one hand, their idealism might make them hold on longer. On the other hand, blinded by their passion to improve the world, these often technologically driven eco-innovators seem to forget about or simply lack the capability of developing a suitable and sound value network. And marketing experts seem not to have found the eco-innovators yet either.

From this study it is clear that eco-innovators should frequently ask themselves:

- Do I really have a sound business model?
- Should I revise my business model (look at it in a different way)?
- Which adjustments need to be made to my value network?
- Which societal values does my product or service provide?
- Who is or should be interested in these values?
- Who can I turn to?

From the case studies and the expert interviews we learned that the most successful eco-innovators are able to combine both the commercial values and the societal values in their value network. Dutch organizations like Syntens, Energy Vallye, de Groene Zaak, Cleantech Holland and some specialized advisors and investors are very willing to support eco-innovators in this search.

The case studies in this study showed that eco-innovators are quite transparent on the business models and the type of revenue models they use. However when it comes down to a clear presentation of the various amounts concerned (production costs, capital costs, revenues, developments in their returns etcetera) this seems far more difficult. Concerning the eco-innovators we looked at, all entrepreneurs said that:

- Developing successful business models is hard and continuous work;
- Revenue models should be self-supportive (so preferably not depending on subsidies);
- Partner networks are a crucial factor in the business model;
- Active ambassadors are crucial to open up new markets.

Recommendations to financers

According to SME's the most significant barriers concerning financing eco-innovations are all external and in general the external barriers are perceived to be more significant than the internal barriers. The main ones are:

- Financing is not tailored to small scale financing needs.
- Potential suppliers of finance are insufficiently engaged with eco-innovative industries.
- There continues to be uncertainty towards government regulation.

When talking about eco-innovative SMEs and risk sharing instruments, venture capital attracts a lot of attention. However, venture capital can only fund a limited number of eco-innovative SMEs with very high growth prospects. A much larger share of eco-innovative SMEs rely on relatively small scale debt financing. There is clearly a need to promote instruments tailored to small scale financing needs.

One of the central conclusions of the study on financing eco-innovators is that the development of flexible risk-sharing instruments for eco-innovators is very important to engage more financial actors and bring eco-innovations to markets. Small scale risk sharing financing instruments, in terms of debt financing and financing from business angels, should therefore be the main focus in stimulating eco-innovators.

A substantial amount of the eco-innovators have problems in financing their products and services since financers use traditional credit ratings and traditional market analyses. Some venture capitalists and private equity funds (can) support the business model. Recommendations to the financers are:

- Increase the availability of risk capital to eco-innovators and look for new financing mechanisms (PPP).
- Support eco-innovators in their business models.
- Help to creating strategic alliances with other companies…… even in international markets.
- Create platforms to share the necessary information.

Recommendations to policy makers

This study has pointed out the various elements of the value network of eco-innovators. Policy makers should look at these elements and try to define the ways they can support eco-innovators in these elements. We live in a time period where the governments look at the private markets for solutions. There is nothing wrong with that, as long as eco-innovators feel supported by the government. However a recent study of EIM under 3.500 SME's showed that almost 75% of the Dutch SMEs feel there is no support from the Dutch government to work on eco-innovations. Looking specifically at Dutch SMEs working on eco-innovations two thirds of this group feels there is no support from the Dutch government.

It would be too easy to just point to financing parties as the problem solvers, since the financing parties can only survive by reducing their risks. If decision makers would like to improve access to finance and uptake of non-energy related eco-innovations, additional risk sharing finance instruments could be employed to address the market failures and legitimate hesitation. Sharing the risk with

private providers of finance would speed up the process where providers of finance become familiar with a new area and build knowledge and statistics to assess risk and base financing decisions upon.
The Dutch government now finances innovations based on projects that can be labeled in a certain innovation phase. This financing does however not (or better: no longer) include subsidies to top off high investments costs in potentially healthy business cases. Financing is crucial in eco-innovations, both in terms of access to financing parties as within the value network. To stimulate eco-innovations governments should monitor frequently the use and needs of SMEs of the financing schemes with respect to the targets set.

The study on financing eco-innovators has once again confirmed that government regulation, taxes and subsidies are seen as key drivers of eco-innovation and access to finance. In this respect it is crucial that the regulation is stable. Investors make investment with a 5-10 year time horizon and therefore look for long term regulatory stability. Ambitious targets for the environment and eco-innovation in order to increase demand for new improved solutions and foster innovation is likewise seen as key. Targets for the reduction of greenhouses gasses and use of renewable energy are the best known examples but standards for energy efficiency in buildings, reduction of particle emission and fuel efficiency in transport are other areas where regulation has been used to drive innovation and create a market for eco-innovations. Green public procurement and taxation of conventional solutions which create negative externalities are other regulatory instruments that promote eco-innovation and access to finance.

The experts and companies we spoke to all underline the importance of market development. Clear and consistent regulations, supportive 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.

"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 the producer of electric engines they put pressure on the producer tot take the risks. In granting the subsidy, more focus should be on this issue."

Eco-innovations are not focused around a common technological platform. Instead of a sector in conventional terms, it is more accurately conceived of as a theme or an umbrella term covering a range of technologies, products, services, business models, and potential target markets. This makes it difficult for potential investors to evaluate funding opportunities and asses the risks than if all investment opportunities where built around a common technology platform.

As eco-innovations often include social innovation governments can and should play a stimulating role. As far as the business models are concerned facilitation of eco-innovators is the only way. The government, both national and local, are very important to eco-innovators. They can act as launching customers. And they can also support the social basis: the public opinion needs trust.

“People with expertise on business models will most certainly not be working for the government.”

Governments should target themselves to maximally facilitate promising eco-innovators or promising eco-innovations to pass the valley of death. Not just by providing the necessary financing. Governments can help to create the market conditions for eco-innovators: lowering barriers, creating a level playing field, providing access to finance opportunities, even risk capital and commercial support. This seems particularly important in the case of radical or systematic innovations.

Although business models are the expertise of entrepreneurs and private parties, cooperation and information management proved to be important factors in scaling up the eco-innovation. Information should be collected and shared amongst parties active in eco-innovations as much as possible, platforms can be established where knowledge is shared and information flows are optimized. Spreading knowledge and experience on both successful and non successful business models of eco-innovations can be seen as an interesting learning issue for government. This can however only be done by researching, sharing information and a trustworthy government.

Without sound market perspectives and business models there will be no real innovations! The government has an important role to support market creation as a launching customer. In cooperating with entrepreneurs, knowledge centers and politicians targets can be set on the type of (niche)markets they wish to stimulate. By using instruments like feed-inn tariffs or using targeted subsidies to regulate markets these niche markets can be set.
Furthermore governments can provide the outlines of new markets. Within these outlines entrepreneurs must be able to freely choose the technologies they wish to use and the business and revenue models they believe in.
To enable radical innovations to be successful governments should cooperate with knowledge centers and commercial parties in stimulating developing programs that can use targeted R&D budgets. Clearly these programs have to be as demand driven as possible and make way for a new generation of implementation programs. Implementation programs develop markets with present technologies to become future markets with innovations of tomorrow.

Recommendations for future research

This study was meant to be an exploration. Barriers of investment profiles, externalities and infrequent decision making have proven to be important factors influencing the value networks and revenue models of eco-innovations. PSS models seem promising in theory to overcome these barriers but little evidence has been found on this in our interviews and case studies. Sustainability as a characteristic of eco-innovations is thought to capture evolutionary economic thinking, with open models and the sharing of knowledge.

In the present times governments trust the markets to solve many problems. Sustainability is thought to capture evolutionary thinking, with open innovation models and sharing of knowledge. The questions remains whether this works for eco-innovative SMEs.

Further research should focus on business cases and revenue models of certain products or product groups or of system/ market combinations. In the Netherland Green Deals and the so-called Top sectors are in the spotlights. Further research should focus on the specific fields of knowledge the Green Deals and the Top sectors stand for. For instance:

- Revenue models of the production and distribution of bio fuels or electric cars with a focus on the question which customers are willing to pay more for national products in relation to for instance Russian gas. And how can the government stimulate such market (for instance feed-inn tariffs)
- Focus on new business models that value environmental societal effects. For instance how can electric city distribution system be competitive and supported by local governments.

1 Introduction

Background

According to Alex Osterwalder, a well known expert in this field, entrepreneurs who meet and start talking about their business models all seem to have a different perception of the business model. Since business models are an major criterion for funders to provide access to venture capital this fact can be quite a hurdle to take.

Both the supply of and the demand for eco-innovations have risen significantly during the last years. 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. The network economy challenges companies to create different value propositions for every possible group of clients and experiment on this. Nowadays sustainable products and services are getting labelled more and more as quality products. To many entrepreneurs it is still quite a challenge to enter new of existing markets with the appropriate business models.

In the Netherlands the policy making on eco-innovations was recently placed under the responsibility of the Ministry of Trade, Agriculture and Innovation (Agentschap NL is part of this Ministry) where earlier this was placed under the responsibility of the Ministry of Infrastructure and Environment. This move seems to be based on a both political and economical conviction that eco-innovations are not very different from regular innovations. Participating at the ETAP conference on financing eco-innovations (Brussels, 2010) we also experienced quite some scepticism amongst the various foreign economists present over the issue of eco-innovations being different from regular innovations.

The evaluation of a number of Dutch subsidies to stimulate eco-innovations learned that these subsidies were very technology driven and (therefore) rather little attention was given to the business models that were (to be) developed to introduce these innovations on the markets[1]. After studying issues and barriers on the market acceptance of eco-innovations the question was raised on the business models of eco-innovations. So far very little studies have dealt with the issue of business models in eco-innovations, in particular with respect to the revenue models. In the Netherlands Houtgraaf and Bekkers recently published a book on business models and revenue models, providing an interesting base for this study.

Aims of this study and research questions

EIM started this study financed by both the Dutch Ministry of Infrastructure and Environment and Agentschap NL. Both organisations were interested in what the study brings in terms of policy opportunities.

[1] Although during the years the attention to and money spent on socio-economic research within the subsidy programs has risen, business models were no hard criterion to grant subsidies.

In this study at least the following questions are to be answered:

- In what way(s) are revenue models of eco-innovations different from 'regular' innovations?
- Which factors determine the revenue model used?
- What kinds of revenue models do small and medium sized companies use to scale up their eco-innovations successfully?
- In what way do funders or financing parties stimulate eco-innovations and what is the role of the revenue models in this process?
- Which policy opportunities are connected with revenue models for eco-innovations? How can governments stimulate these revenue models?

In this study we looked at single companies in business to business markets but also at more complex models of cooperating companies. And although very interesting in itself, evolutionary economics in contrast to traditional economics is a field of research we will not cover in this study.

Methodology

The research methodology used consisted of a combination of literature reviews, several expert interviews and a number of case studies in Dutch eco innovative companies.

In the first phase of the research project, a number of policy makers, scientists and experts from specialised institutes were contacted. A discussion was started using LinkedIn in a discussion group concerning business models in eco-innovation, however with little response. Both the desk research and the expert interviews were conducted in order to collect relevant data and information concerning business models in eco-innovations.

Based on this information the factors determining the choice of business models are described and a first conceptual model on this issue has been developed. These factors and the conceptual model were checked during conversations with experts of a number of business organizations and investors and in a few workshops (see Annex 2).

The financing issues were taken from a recent study by EIM and Oxford Research on financing eco-innovators[1].

The need for support on the development of the business models was based upon interviews with scientists from the eco-innovative field of research, experts in business models, financing and commercial parties active in eco-innovative sectors, completed with information gathered at the 2010 ETAP conference on financing eco-innovative SMEs (Brussels, 2010). Recently EIM performed a study under almost 3.500 SMEs in the Netherlands and asked them whether their innovations were sustainable and whether they were able to find proper revenue models[2].

[1] Financing Eco-innovation, EIM and Oxford Research, the European Commission, DG Environment January 2011

[2] Sustainable innovations (Duurzame innovaties), mini report, EIM, November 2011

At last seven case studies were held with Dutch eco innovative SMEs launching business to business products or services into the Dutch market and/ or foreign markets. However mainly aimed to be illustrations, the case studies (see Annex 1) also functioned as a test on our findings in the earlier parts of the research project.

Structure of the report

The structure of the report follows most of the questions raised. In chapter 2 the questions is answered to what extent eco-innovations differ from regular innovations. In chapter 3 the concept of business models is explained and some special business models are mentioned that are used frequently in eco-innovations to tackle the barriers they come up with. In chapter 4 some insights are presented from a study on financing eco-innovators. In chapter 5 we try to answer the question of which factors determine the business model used. Finally, chapter 6 holds some conclusions derived from the case studies we performed. Appendix 1 shows a description of the case studies. Appendix 2 holds a lists of the experts and entrepreneurs we spoke to and the workshops we visited. Appendix 3 provides an overview of the literature we studied.

2 Eco-innovations compared to regular innovations

2.1 Introduction

Looking specifically at the business models of eco-innovations clearly suggests that eco-innovations are different from regular innovations. In this chapter we briefly look at the definition of eco-innovations we will use and at differences between eco-innovations and regular innovations according to literature and some experts.

2.2 Definition used

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."*

The Competitiveness and Innovation Framework Program (CIP)[1] 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).

[1] The Entrepreneurship and Innovation Programme (2007 - 2013) 'EIP' is one of the three 'pillars' of Competitiveness and Innovation Framework Programme (CIP). The CIP's overarching aim is 'to contribute to the enhancement of competitiveness and innovation capacity in the EU, the advancement of the knowledge society, and sustainable development based on balanced economic growth'. The evaluation of the EIP concentrates on the three main blocks in the EIP that represent about 80% of the budget, being: 1.The Financial Instruments, 2. The Enterprise Europe Network and 3.Eco-innovation.

Clearly eco-innovations concern both products and services and production processes. Business models and business process models should clearly be distinguished (Gordijn, Akkermans et al. 2000). A review of the business model literature shows that the business model concept is generally understood as a view of the firm's logic for creating and commercializing value, while the business process model is more about how a business case is implemented in processes.
In this study we focus on eco-products and eco-services.

2.3 Differences

Found in literature

In the literature we studied we found a lot of discussion on the topic whether or not eco-innovations differ from 'regular' innovations. Kempton et al. 1992; Jaffe and Stavins 1994; Kenzig and Wustenhagen 2008 stated that there are at least four characteristics of eco-innovations influence market pull factors: "Costumer investment decisions regarding eco-innovations are characterized by":

- Different investment profiles over time (higher purchase price and set-up costs) and lower operating costs (maintenance and running costs)[1].
  Eco-innovations often entail high investments and low operational costs which means a different return on investment profile.
- Information asymmetries due to search experience, and credence attributes.
  Eco innovations are hampered by the green=expensive stigma. This is due to information asymmetries since the necessary information is needed to overcome this prejudice/ this point of view.
- Externalities (e.g. environmentally sound alternatives imply a higher collective benefit but lower or equal private benefits than conventional alternatives)
  Eco-innovations may have the characteristic that the party taking the investment is not the party that captures/ receives the correlated benefits.
- Infrequent decisions, meaning an extensive decision-making process which implies high involvement, high cognitive effort, and a substantial need for information due to limited experience.
  Customers interested in eco-innovations are usually not yet experienced in the decision making process since eco-innovations, most of the time, consist of a relatively new and undiscovered market or technique.

Opinions of some experts

The reactions of a number of Dutch commercial parties (business organisations, scientists and advisors) that represent and/or advice eco innovators are clear. They do not really see any major differences between eco-innovations and regular innovation, with the exception of systematic innovations. Therefore two levels of eco-innovations can best be distinguished.

In general the opinions are:

- Innovation is just a means to a goal: how can we satisfy the needs of customers? Sustainability objectives actually give a different direction to innovation. It leads to a better environment and to a better social climate.

[1] Kempton et al. 1992; Jaffe and Stavins 1994; Kaenzig and Wustenhagen 2008.

- Many eco-innovations simply have a better footprint and do not serve a particularly different purpose or are developed for particularly different needs.
- Nowadays more and more customers, both businesses and consumers look at sustainability, not just because they feel they ought to (ethics), but because they can (plenty of opportunities) and because entrepreneurs simply want it this way (business).
- Eco-innovations are almost ‘common business’. An innovation process without attention to sustainability effects is difficult nowadays.
- Eco-innovations feed (push) or fit in to (pull) a different quality perception of customers.
- The main difference between eco-innovations and regular innovations are the reasons why the organizations involved start to innovate (goal, idealism, et-cetera) 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.

In the case of system innovations the situation is more complex. In the case of system innovations there is a paradigm shift. Systems are changing and the innovation process is different from regular innovations, more players are involved and system innovations need to be pushed. Interesting examples are the use of electric cars, bio fuels and cradle to cradle concepts. The difference between system innovations and other eco-innovations is that the former have to fit in with the existing infrastructure dominated by the big traditional utilities.

3 The value network of eco-innovations

3.1 Definition used

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

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

Every business organization has at least one of more business models or business concepts. Although Schmidt et al. (2001) state that there is little explicit reference to business models and its key elements, business models is a growing field of research initiated around the dot.com boom. And as we already mentioned in the introduction entrepreneurs often have totally different ideas of their business models although Osterwalder created a clear blueprint. Business model is therefore an often used term in various contexts. 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.

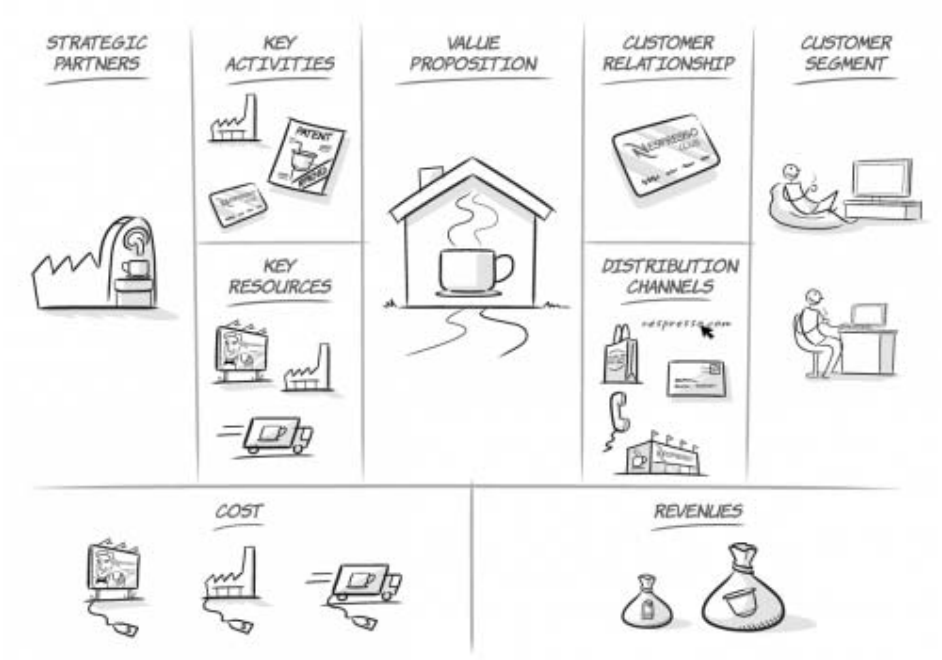
2 The second category is characterized by a more organizational point of view. A broad definition is provided by Weil and Vitale (2001), they define a business model as a description of roles and relationships among firms consumers, customers, allies and suppliers that identifies the major flows of product, 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; resources/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.”

3.2 Components of the business model

Alex Osterwalder is a leading[1] expert on the issue of business models. In 2005 Osterwalder, Pigneur and Tucci asked a number of persons for their definitions of what they understood to be a business model. From 62 respondents they received 54 definitions. For 44 definitions they could distinguish between a more value/customer-oriented approach (55%) and a more activity/role-related approach (45%). Based on these insights Osterwalder et al. tried to build the foundations to clarify understandings in the business model domain (see figure 1).

Figure 1 shows the nine components according to Osterwalder et al. a good business model necessarily consists of.

Figure 1 The nine components of the business model

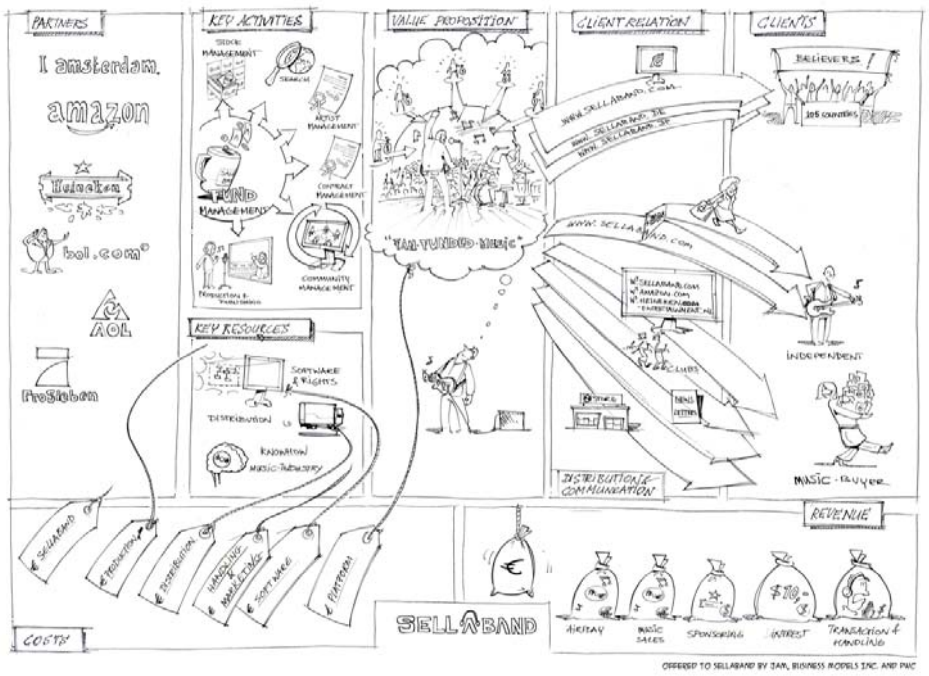


Source: Business Model Generation, Osterwalder A. and Pigneur Y., 2009

Translating these components into daily practice, figure 2 shows the way this can be done. It shows the inter music company Sellaband and the way this company has architected its business model.

[1] To publish a book on business models one should not use an traditional business model according to Osterwalder. He decided to appeal to a web community interested in his blog. Osterwalder: "People interested received a chapter of the book and were asked to give a reaction, so that the book would be enriched with experiences. Next, in stead of paying these people for their input, Osterwalder asked his co-authors to pay a fee. Starting with 24 dollar per person, this quickly went up to 243 dollar and the book (Business model generation) was finished with more than 400 co-authors. The book is published without a traditional editor. Osterwalder: "When you have a community that is enough".

Figure 2 An illustration of the nine components of the business model into the business model of the internet music company Sellaband



Source: Management team, business & strategy, 2-10-2009, based on A. Osterwalder

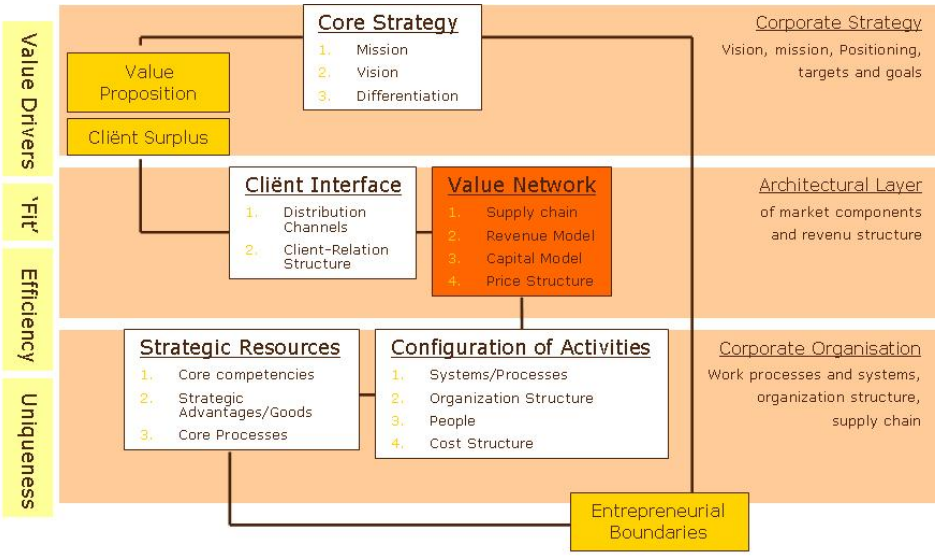
Osterwalder, Pigneur and Tucci define the business model as:

> *a conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value and relationship capital, to generate profitable and sustainable revenue streams.*

3.3 The architectural layer and the value network

In this study we use both the Osterwalder model and the model presented by Houtgraaf and Bekkers (see figure 3). The model in figure 3 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. Houtgraaf and Bekkers enhanced the architectural layer, the object of study in this research project.

Figure 3 Business Model Components



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

Looking at figure 4 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 study. 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 operationalized.

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, 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 study we focus particularly on the value network, the financial-economic aspects, in the up scaling of eco-innovations. This network consists of the next components.

Price Setting

This means 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. 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

The Supply Chain component of the business model describes what parts of value added is provided by external partners. This component is driven by transaction/switching cost and deals with the bilateral dependency between supplier and producer. Strategic alliances, joint ventures are becoming increasingly important in analyzing risk and revenue, since business environment is becoming more and more competitive. Knowledge is transferred among partners in the network and thereby increasing the importance of partnerships in the chain to maximize value and to overcome externalities optimally.

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 of 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 the chain, it is expected to ensure higher gains for the supply chain as a whole and thereby for 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.

3.4 Interesting revenue models for eco-innovations

Traditional revenue models

From studying literature we must conclude that little is known concerning revenue models used in eco-innovations. Since we all live in a economic system that is still mainly characterized by traditional values and traditional revenue models it may not be surprising that a large part of the present eco product and eco services offered, meet up with the traditional revenue models. 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 en Bekkers, 2010

Since eco-innovative companies often work with traditional market parties (both financing parties, other companies and customers) many experts expect that eco-innovations will often have traditional revenue models. This however does not guarantee them to be successful too. Success depends on many factors, including the way companies cope with the barriers of eco-innovations mentioned earlier.

In this study we found a number of models that seem to be more suitable to cope with the barriers connected to eco-innovations.

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. 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".* The PSS concept strives to provide a system where companies are able to fulfill customer needs in the most efficient way both economically as well as environmentally.

The PSS model is not a new model. 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.

Product Service systems (PSS) are actually an alteration on the well-known lease constructions. Different from leasing 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, a PSS sells 5000 sitting hours. Or instead of selling pesticides, a company may sell a maximum level of harvest loss. 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.

PSS 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). 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 environmental improvement. It has also been defined as a "self-learning" system, one of whose goals is continual improvement or a so-called dematerialized solution to consumer preferences and needs.

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 business model component 'Client Relation'). 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. 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 com-

bined with the users utilization interest, and their joint interest together with the society in terms of disposal.

Tukker 2004[1], 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 fully 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.

Public Private Partnerships

Public–private partnerships (PPP) describe a government service or private business venture which is funded and operated through a partnership of government and one or more private sector companies. These schemes are sometimes referred to as PPP or P3. PPP involves a contract between a public-sector authority and a private party, in which the private party provides a public service or project and assumes substantial financial, technical and operational risk in the project. In some types of PPP, the cost of using the service lies exclusively by the users of the service and not by the taxpayer. In other types (notably the private finance initiative), capital investment is made by the private sector on the strength of a contract with government to provide agreed services and the cost of providing the service is borne wholly or in part by the government. Government contributions to a PPP may also be in kind (notably the transfer of existing assets). In projects that are aimed at creating public goods like in the infrastructure sector, the government may provide a capital subsidy in the form of a one-time grant, so as to make it more attractive to the private investors. In some other cases, the government may support the project by providing revenue subsidies, including tax breaks or by providing guaranteed annual revenues for a fixed period.
Governments nowadays have various social and sustainability objectives they are willing to achieve with the help of companies (climate neutral cities, air quality in cities, water quality etcetera).

Total cost of ownership

Total cost of ownership (TCO) is not a business model in itself, but is actually a financial estimate whose purpose it is to help consumers and enterprise managers determine direct and indirect costs of a product or system. TCO is used in convincing client of the value of the product or service offered. It is a management accounting concept that can be used in full cost accounting or even eco-

[1] Eight types of product-service systems: eight ways to sustainability? Experiences from Suspronet, TNO, in Business Strategy and the Environment, 2004

logical economics where it includes social costs. A TCO analysis includes total cost of acquisition and operating costs. A TCO analysis is used to gauge the viability of any capital investment. An enterprise may use it as a product/process comparison tool. It is also used by credit markets and financing agencies. TCO directly relates to an enterprise's asset and/or related systems total costs across all projects and processes, thus giving a picture of the profitability over time. The use of TCO, when incorporated in any financial benefit analysis, provides a cost basis for determining the economic value of an investment. Examples include: return on investment, internal rate of return, economic value added, return on information technology, and rapid economic justification.
For example: TCO tries to quantify the financial impact of deploying an information technology product over its life cycle. These technologies include software and hardware, and training. TCO is widely used in the transport sector.

Business models in sustainable chains

A rather new development that challenges the development of business models is working together in sustainable production chains. Cradle to cradle concepts and the development towards more cooperation in building are actual and interesting challenges to find new business models. According to Voelpel, Leibold and Tekie (2003), taking into account the barriers eco-innovators face in scaling up 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:
  - Efficiency (e.g. increased in-formation flows and reduced information asymmetries between buyers and seller);
  - Complementary 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 the value network and the client relation as important components of a business model. 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.

3.5 Business models of eco-innovations according to experts

In this study we asked a large number of experts in eco-innovation (both Dutch as some international experts) about the uniqueness of the business models of eco-innovations and more specific about their value network.

Quick wins come with simple business models

So far, the most common way companies attack sustainability is by making a simple operations business plan: identifying cost savings in cutting down on waste, improving on energy use, etcetera. These are the so-called quick wins, the low-hanging fruit that is available to every company. Eco-innovators offering these quick wins usually have simple business and revenue models.

"We all live in a material world"

According to the experts most customers in the markets in which eco-innovations are sold, ask for traditional revenue models. Eco-innovators simple have to comply to that wish. Therefore most of the experts see no really new, but only slightly different revenue models in the field of eco-innovation. According to the experts there are no revenue models unique to the sustainability field, only the use of non-standard models (mentioned above) is more frequent in this sector.

Selling performance instead of products

There is already a number of large companies (e.g. Xerox, Michelin, Ellis, Caterpillar) that is moving away from simply selling products to selling performance and services. PSS models are used more and more and these models provide interesting opportunities to work on cradle to cradle concepts since this places the responsibility entirely with the supplier(s) of the products.
Building companies for instance are asked to take care of the maintenance of the buildings as well. Therefore they invest in sustainable energy and high quality/ low maintenance.

More uncertainties / higher risks

The experts mention that because of the (extra) sustainability dimension in eco-innovations the uncertainties surrounding the use of the business models may be higher than using business models in traditional markets. This is immediately reflected in the capital model or even means that eco-innovators have a hard time finding capital at all. When you boil it down to this point of view: eco-innovations are often solutions to material scarcity issues. 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. This might need a new approach to doing business and involve other business models and supply chain configurations.

More objectives or values are included, so more complexity in the value network

Sustainability has its value, or rather, different values that need to be addressed in the value network of the business model. These values also mean that more effort needs to be undertaken in client relations, in communicating over these values. We can think of social benefits, environmental benefits, benefits to the biodiversity etcetera. As long as these values can easily be quantified and well translated into financial gains, this can keep the value network rather simple. When however these values can not (as easily) be translated into financial gains the value network becomes more complex and abstract. In this case public private partnerships can help to find sound business and revenue models (for instance in addressing a financial gain to less environmental pollution in inner cities).

PPP to take care of the inevitable loss

A well-known problem concerning innovations, but maybe eco-innovations in particular, is the so-called inevitable loss, the part of the investment that will always remain unprofitable. When it is possible to sponsor this top off, more regular revenue models can be used and should be found. In this case PPP is also important.

Higher risk profiles create extra pressure on the revenue models

The availability of risk capital to eco-innovators is strongly related to aspects as is the company working in existing versus new markets, is there sufficient knowledge and trust with the investors concerning these markets. Customer demand is clearly looking at sustainability issues more and more and valuing it. Nevertheless this is a process that takes time, especially in the case of systematic innovations or transitions. The time factor is crucial in business models of eco innovations.

Support seems to be welcomed on revenue models

A recent study of EIM under about 3.500 SMEs in the Netherlands[1] showed that nearly 560 SMEs said they worked on eco-innovations, both new products or services and productions processes. As far as products and services were concerned the part of SMEs working on this, was 9%.

When asked for their capability to provide sound revenue models for their eco-innovations, only one third of these SMEs said they are able to do this themselves. Another 40% said they are able to do this to some extent and 22% say they are not able to provide a sound revenue model. Larger SMEs have far less difficulties.

Many economists will say that creating a sound revenue model is the one thing an entrepreneur should be capable of doing him or herself. Taking into account the complexity of marketing eco-innovations considering support in this field of knowledge could be wise. This same study also showed that almost two thirds of the Dutch SMEs working on eco-innovations, feel there is no support from the Dutch government to work on eco-innovations.

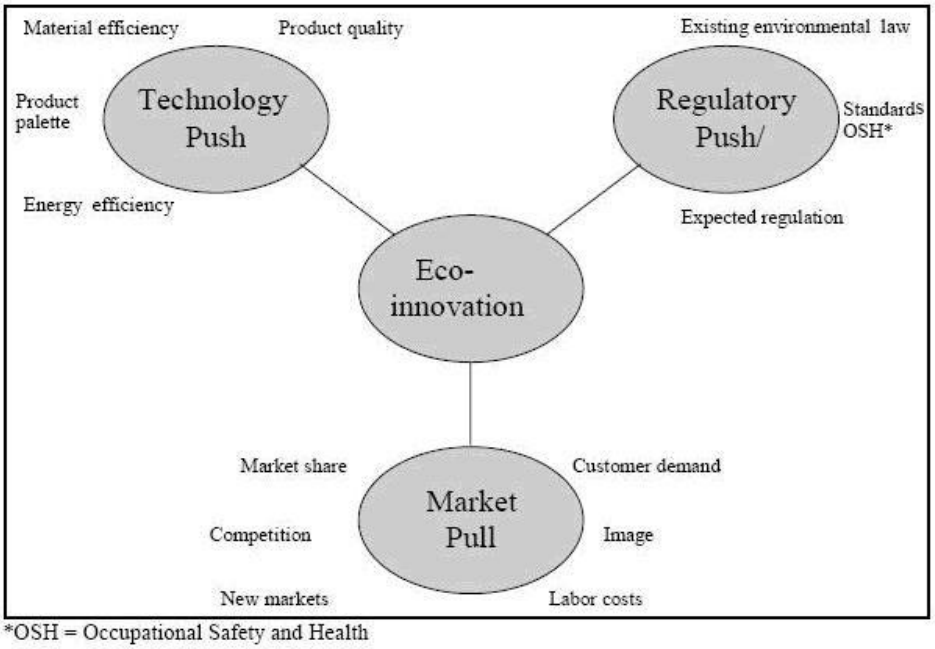
[1] EIM, Duurzame innovaties in het MKB (Sustainable innovations in SMEs), mini report, December 2011

4 Factors determining the choice of business models

In this chapter we try to answer the question by which factors the choice of business models is determined. At forehand we must conclude that this seems to be the most difficult question to answer. During the conversations with the experts several factors were mentioned but not in a systematic way. In this chapter we have tried to present the factors in a systematic way.

In 2000 Rennings presented the model shown in figure 3.

Figure 3 Determinants of Eco-innovations



*OSH = Occupational Safety and Health

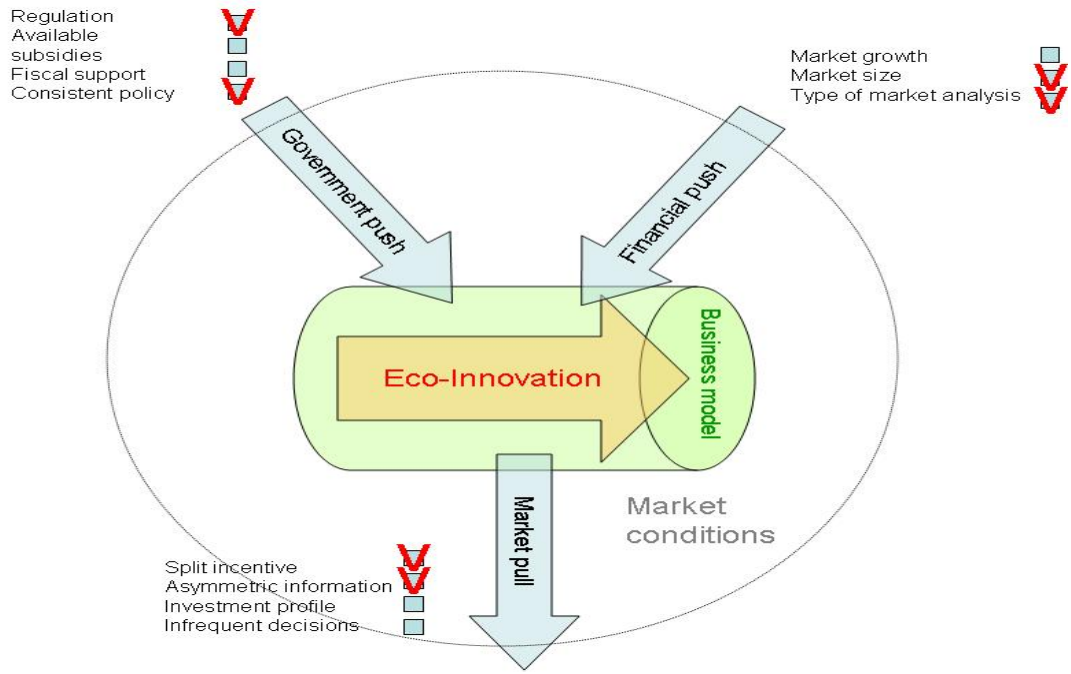
Source: Rennings, K. (2000)

Based upon both literature and the interviews with experts a number of factors can be addressed that influence the choice of a business model. These factors can be roughly divided into characteristics of the innovation itself and relevant market characteristics:

1 the complexity of the innovation: the (expected) time scope of the innovation in relation to the question whether or not the innovation is disruptive;
2 the market conditions: market characteristics such as the capital available, the risk profile, support from legislation, the available market information (difficult in general, but often lacking in the cases where system innovations are introduced);
3 the social basis (trust, support) underlying the innovation: an important necessity for a success business model.

In the case of eco-innovations in particular the social basis seems to be a rather crucial factor. In figure 4 the influence of governmental support is shown, as is the support by investors and customers. Of course these three parties are not limitative. Support by NGO's (social basis) and support by suppliers are also important. In fact this shows the importance of the multi-stakeholder approach in introducing eco-innovations.

Figure 4 Factors determining the business models of eco-innovations



Source: EIM (2011)

Some insights on this subject:

Tailor made and dynamic

Business models are always 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 the factors mentioned above. The prices of fuel and commodities change daily, but so do government support, customer needs/ preferences and the actions of competitors.

A solid social basis is very important

Since business models are tailor made it is not possible to predict the suitable business models or earning models in various situations. Nevertheless it can be said that market conditions can make or break a successful business model. In the case of eco-innovations a sound social basis (trust, support) is an important condition for success. Since governments create (the directions in) the social and

environmental policies they are a very important factor in creating or holding the social basis. Furthermore many entrepreneurs use various marketing tools to gain social trust, in particular social media are helpful in this regard[1].

Reliable sustainable effects

Part of the solid basis is a clear sustainable effect of the eco-innovation. Methods like LCA and SROI are very useful but also expensive methods to proof the sustainable effects of the eco-innovation on the environment and society.

Sustainable markets develop best under clear conditions

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 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. Furthermore the latest report of the Eurobarometer on the attitudes of European entrepreneurs towards eco-innovation show that Dutch eco-innovators mention as barriers to a successful uptake and development of their eco-innovations:

- 69%: uncertain demand from the market;
- 66%: reducing energy use is not an innovation priority;
- 64%: lack of funds within the enterprise.

[1] Bertens C. and B. Hollegien, Marktacceptatie van eco-innovaties (Market acceptance of eco-innovations), EIM, Zoetermeer, 2009

5 Financing eco-innovators

Since 2011 eco-innovations are less treated by the Dutch government as innovations that need special treatment in terms of subsidies, credit facilities, guarantees or fiscal advantages than in earlier years.

This part of the study is derived from a recent study by EIM and Oxford Research on financing eco-innovators in Europe[1]. This quite profound study[2] shows a number of insights.

Many eco-innovators are seeking financing

A very large share of eco-innovative SMEs is currently seeking financing. Of the early stage eco-innovative SMEs in the survey 75 percent indicates that they are currently seeking financing and 53 percent of businesses in the later development stage are seeking financing.

Most venture capital goes to energy generation and efficiency

Clear and systematic differences between eco-innovation sub sectors are difficult to find. Nevertheless, energy stands out in some respects. It includes a number of more mature technologies, like wind and photovoltaic, it includes a number of very capital intensive technologies, like wave power, bio fuels and fuel cells, and the market has reached a stage where a large market for suppliers of components and wind turbines has been established. Due to the consistent focus on energy and energy related technologies over the past decades, it is the area that providers of finance are most familiar with and where they have the most experience and knowledge to base their investment decisions on.
Data on cleantech venture capital investments show that most venture capital is invested in energy generation and energy efficiency. Energy generation has been a popular investment area, since the beginning of the nascent eco-innovation industry, while energy efficiency has become popular since the outbreak of the financial crisis and the shift of focus towards less capital intensive investments. The data also demonstrate that the cleantech venture capital market has an upward trend, since 2004. However, growth has stagnated as a direct result of the financial crisis. The American market for venture capital is significantly larger than in the EU and the cleantech venture capital is likewise significantly larger.

Debt financing is an important source of financing

Data on the financing structure of eco-innovative SMEs illustrate that debt financing is an important source of financing for eco-innovative SMEs – even at the early stages. The study shows that in the case of early stage eco-innovative SMEs, 48% of the SMEs have received debt financing (either as a normal loan or a loan backed by a loan guarantee) and 67 % of eco-innovative SMEs at the later

[1] Financing Eco-innovation, the European Commission, DG Environment, EIM and Oxford Research, January 2011

[2] The first part of the field work consisted of a survey among eco-innovative SMEs in the EU. Two complementary methods have been used: a telephone survey was conducted based on a list of more than 3,000 eco-innovative businesses compiled by the consortium and partners predominantly in the 12 EU member states (MS) and a web-based survey has been conducted among more than 2,000 EU-based cleantech businesses in the Cleantech Group's database. Furthermore the field work included 40 personal in-depth interviews with early stage financial actors and 10 case studies.

stages have used debt financing/loan guarantees. In comparison, 27% of early stage eco-innovative SMEs have received venture capital and 24% indicate they have received funding from business angels. Venture capital funds and business angels are often regarded as funding the most risky and innovative SMEs so they undoubtedly provide an important funding stream. In spite of this, they can only fund a limited number of eco-innovations.

Some serious barriers

The most significant barriers, as pointed out by the SMEs in their early stages, are that:

- Financing is not tailored to small scale financing needs. The study shows that many eco-innovative SMEs start out with relatively small amounts of financing.
- Potential suppliers of finance are insufficiently engaged with eco-innovative industries. Interviews with private providers of finance have shown that the incentives and the investment rationale of most financial actors are the same as for investments in other sectors. Investments are primarily made to make the highest possible profit. Investors might have concerns in addition to generating returns, but those are secondary. Banks focused on sustainability are exceptions. They have a mandate to focus on sustainability and this is as important as profit. Further, state promotional banks are different in that they are established to support innovation and create growth and employment and not to generate a profit. However, environmental concerns continue to be secondary, as the instruments do not differ from those without a green mandate.
- There continues to be uncertainty towards government regulation.

The most significant barriers are all external and in general the external barriers are perceived to be more significant than the internal barriers.

Market characteristics of eco-innovations according to financial actors

Interviews with banks, business angels, and venture funds showed that the investment criteria used by financial actors were the same for eco-innovative SMEs as the criteria used to assess investments in other sectors. Still, the dynamics of the eco-innovative markets reveal some characteristics that significantly influence how providers of finance assess finance requests from eco-innovative SMEs. The market characteristics make eco-innovation a difficult sector for attracting investment. The market characteristics are not unique to eco-innovation but appear to be more pronounced than in most other sectors. The identified characteristics include:

- The double externality problem. Eco-innovations produce positive externalities both in terms of innovation and environmental effects. There are also market distortions caused by high-carbon fuel pricing that do not reflect the environmental and social costs they impose. In fact fossil fuels are often subsidised, distorting the market even more. As long as markets do not punish environmentally harmful impacts or reward environmental improvements, competition between environmental and non-environmental innovation is distorted and a socially sub-optimal amount of investments occurs. The double externality problem is one of the main justifications for subsidies to promote eco-innovation. Regulation creates opportunities but also poses a risk if the profitability of solutions depends on regulation, which is out of the scope of control for SMEs and investors. This is especially a risk for long-term investments.
- Eco-innovation also stands out because it is not focused around a common technological platform. Instead of a sector in conventional terms, it is more

accurately conceived of as a theme or an umbrella term covering a range of technologies, products, services, business models, and potential target markets. This makes it difficult for potential investors to evaluate funding opportunities and asses the risks than if all investment opportunities where built around a common technology platform. This is combined with sub sectors, mainly non-energy, of eco-innovation still being immature. Often, technologies and business models are unproven, markets are unknown and many investments have not yet been exited.

- Lastly, some target markets for the eco-innovative SMEs operate in markets with weak competitive conditions. In some cases, the industry or target market is highly regulated or there is a high degree of public sector involvement. In other cases, the entry barriers are high because the market is dominated by a few large companies and/or because the established players prioritise supply security as opposed to new risky solutions.

6 Insights from the case studies

Selection of the case studies

Selecting the Dutch case studies we used in this study (see Annex 1) turned out to be quite a search. Looking for SMEs that work on eco-products or eco-services in business to business niche markets we could not simply use the the yellow pages. With the help of the business organisations and the experts we managed to find seven different companies that were willing to be open on their business models. We distinguished between companies in the energy domain, the mobility domain and the materials domain.
It must be said at forehand that, although we tried to find as many examples of successful value networks and revenue models as possible, not all of them were actually successful.

Subjects

In the case studies we first identified the experienced barriers of the entrepreneurs in trying to scale up their eco-innovation:
- 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)

Secondly, we examined the elements of the value networks and the revenue models that were used, on issues like:
- A shift towards selling performance instead of a product or service?
- More and intensive (chain)cooperation?
- A higher emphasis on information flows?
- Extraordinary revenue models (new or innovative models)?

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

The companies

In the energy domain we found:
- *Greenfox* (replacing fluorescent light bulbs in existing frames) facing low product commitment at customers and the barrier of infrequent decision making. Important to Greenfox proved to be the cooperation with Osram as a major supplier of the lamps and with Roteb the social workplace where Greenfox products are installed. In general Greenfox has a simple and healthy revenue model. Greenfox relies on a number of ambassadors to open up the market.
- *DonQi* (urban windmill) faces relatively high initial costs and its revenues depend highly on the surroundings the windmill 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 (and have the possibility to dress them up with advertisement). The revenue model is simple but DonQi still works on developing a healthier revenue model.

In the mobility domain we found:

- *All Green Vehicles* (produces and installs electric vehicle engines) faces all the barriers known from literature. The market is not yet willing to take the risk. The product entails high investment costs, forcing AGV to focus on niche markets like exclusive sport cars and the transport industry. 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. The business and revenue models of AGV are changing. High capital risk and invested interests forces AGV to install the engine in vehicles they first acquire on the market. After installation and testing, the vehicle is then sold. 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. This seems to be a healthier business and revenue model.
- *Cargohopper* (eco-friendly city distribution) faces access to finance as a main barrier. The transport industry is an industry that requires large investments and an innovative and unproven concept like Cargohopper does not (yet) meet the demands set by the banks in granting a loan. Competition forces Cargohopper to maintain traditional prices for their services with the Cargohopper while investments in these vehicles are significantly higher. The solution is expected to come from internalizing and valuating external benefits, but currently these externalities are still a barrier. 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. This way positive incentives and externalities, that are currently in the interest of the municipal, are internalized in the business model. The city of Utrecht however does not wish to subsidize. Cargohopper still works on developing a healthy business and revenue model.

In the materials domain we found:

- *Pharmafilter* (waste and water treatment) faced high initial costs en also here the challenge is to internalize and value the external benefits. The concept of Pharmafilter is actually based on the risk management of a local hospital, concerning water and waste treatment (use of chemicals and attention to hygiene). Scattered and vague regulations were a major barrier for Pharmafilter, which they tried to overcome by close cooperation with several government institutions. Pharmafilter now has simple and successful business and revenue models but it took a lot of time to develop the concept and the business model. Pharmafilter works successfully on improving its value network and although the project concerns high investments no borrowed capital was needed.
- *ZND* (green roofs) faces the barrier of the unknown as they try to achieve a first mover advantage. Little market information and infrequent decision making has driven ZND 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 and the importance of information flows. The business and revenue models are simple and competitive.
- *Turntoo* (a PSS concept: selling performance in office environments) faces high investments and 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 value performance of products and ser-

vices. Both the business and the revenue models are however, like the concept itself, still in an experimental phase.

It is to be expected that eco-innovators tend to be more transparent on their business models than regular innovators. For transparency is an important part of sustainability. The case studies showed that eco-innovators are quite transparent on the business models and the type of revenue models they use. However when it comes down to a clear presentation of the various amounts concerned (production costs, capital costs, revenues, developments in their returns etcetera) this seems to be far more difficult.

Concerning the value networks and the revenue models we looked at, all entrepreneurs say that:
- Developing successful business models is hard and continuous work;
- Revenue models should be self-supportive (so preferably not depending on subsidies);
- Partner networks are a crucial factor in the business model;
- Active ambassadors are crucial to open up new markets;
- National and local government(s) are not very supportive, in supporting eco-innovatieve products/ services and their business models.

Limitations

Since this is an explorative study, we can not conclude from this project that the outcome is conclusive. In this research projects only a limited amount op eco-innovators were interviewed. Nevertheless we found that it is possible to ask eco-innovators about their business models.
Another limitation concerns the development towards new economic models and the way eco-innovations can be placed in this context. Apart from the PSS models we have not been able to find business models that can be seen as new business models that look at the economic system in a different way.

Support requests

Looking at a number of specific requests for support, we found:
- 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.
- An important role is to be played by the government in providing guarantees for bank loans.
- 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 of connectors, adaptors, etc.. A stimulating role is to be played here by the national or European government.
- The Netherlands is a trading county, less used to making risky investments and being innovative. An investment expected to have a two years not profitable period 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 the producer of electric engines they put pressure on the producer to take the risks. 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. Government are important in creating the necessary trust or support.
- There is a demand for a national policy concerning green roofs, currently it is scattered among the Dutch municipalities.
- More research is needed on 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 should act 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 all resources used on the product.

ANNEX I The case studies

In this annex we present the case studies.

1 Greenfox: energy efficiency
2 AllGreenVehicles: electric cars
3 Carhopper: city distribution
4 DonQi: urban windmills
5 Pharmafilter: water and waste treatment
6 ZND: green roofs
7 Turntoo: building solutions

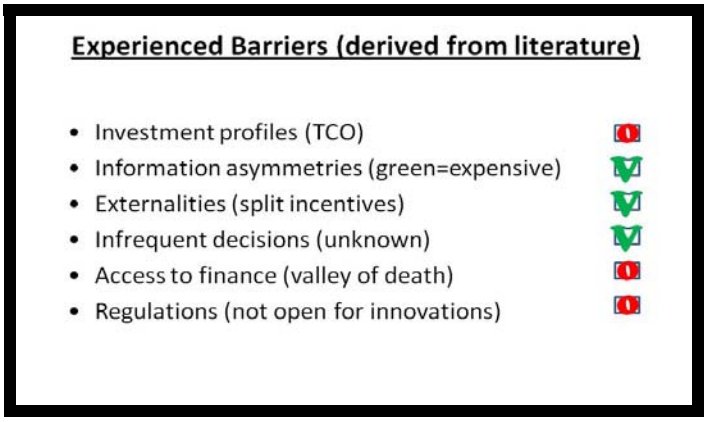
6.1 GreenFox

“GreenFox is a 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 tech-

nology 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 electronica/driver (EVSA) and the lamps that the unique extenders of Greenfox is built for.
- Social workplaces in Den Haag, Amsterdam, Dordrecht and Rotterdam
  - Social workplace Den Haag is one of the ten social workplaces that 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 bank is a partner of GreenFox which can do the initial investment of the costs to rebuild a fixture. This makes it possible for cities to reduce their energy without an investment.
- Municipals
  - One of the key markets for GreenFox.

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 Den Haag (Haeghe Groep) 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 and the electronics, 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 life-span 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 social workplaces like Haeghe Groep in the production, installation 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 regular customers. Because of its short return on investment time (2 years approximately) the market does not demand for any financing or maintenance schemes. Municipals have a long term relationship. Because the investment is a loan of ABN and the energysavings is used to pay the terms.
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 45 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 a 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.

6.2 AllGreenVehicles

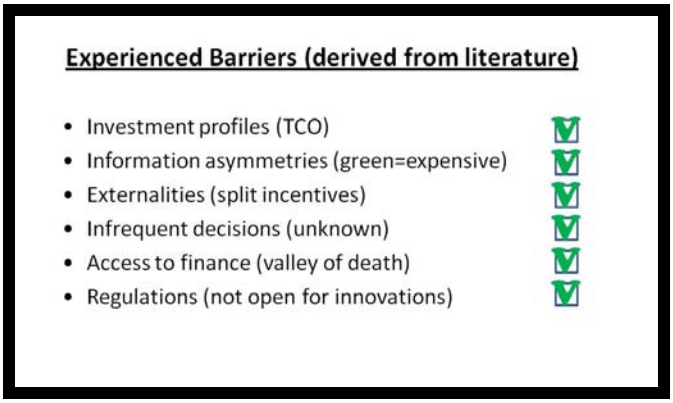
“Started in 2007 from Maasland All Green Vehicles was the importer of the electric car manufacturer Miles for the Benelux. Besides this brand AGV represents a number of high quality electric vehicle manufacturers and is closely involved in the development of some new models. The knowledge gained is also 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.

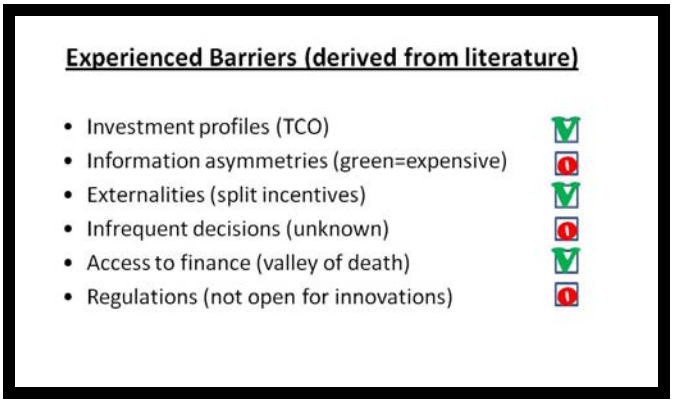
There is a gap between the parties that have been granted government subsidies and the parties that bear the risk. For example transporters are granted subsidy for an innovative projects, but when doing so and engaging in a business deal with AGV they try to put the risk on the table of AGV. In granting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

6.3 Cargohopper

“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 sec-

tor 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 retail 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.

6.4 DonQi

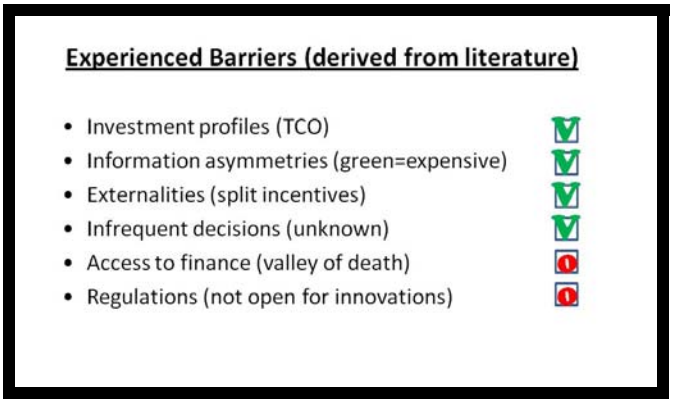
“DonQi Urban Windmill is a compact, silent wind turbine. This unique wind turbine is developed in cooperation with the Dutch National Air and Space laboratory, and can function with wind speeds up to 65 knots and is strong enough to survive storms with wind speeds up to 200 km/h.
An ideal energy source 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 other urban windmill producers, like AirDolphin, Ampair or Energyball, but the DonQi outperforms these by far on basis of the efficiency per m2 rotor surface. Competition can be thought to be companiess like SouthWest Windpower, Zephyr and Fortis, due to their technological knowledge, but some windmills are roughly three times in size. And other suppliers of decentralized energy sources. DonQi operates in 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.

6.5 Pharmafilter

Pharmafilter

“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. The advantages of the concept are:

- 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.

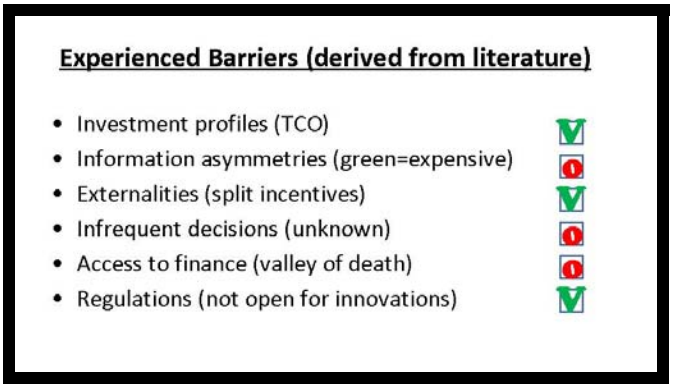
As a result the treated water is very clean and can be discharged on surface water or reused for example as toilet flushing water, biogas for production of energy, remaining waste (sludge from the digester) will be recycled and/or used for energy generation".

Corporate strategy

Over the last 5 years Pharmafilter invested heavily in developing the concept with no return. Currently it is a proven concept and the market price is set at € 2,5 mln.. For a standard unit (although in some hospitals it will be tailor made). 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 and Germany first, then other countries around the world will follow. Also for emerging economies, 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 marketed. 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 still 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)
- De Jong Duke (producer of the crunchers)
- De Jong & Maaskant (not related, for power injection moulding)
- Van Gansewinkel Group (waste management)

- People on the Move (design)
- Mirel (producer of bioplastics)
- And several others in the area of advise and counseling

Key Resources and activities

The 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 broad network of partners facilitating the development of the concept. Government support and the cooperation with the Reinier de Graaf Group is especially important in this phase.

Value Proposition

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.
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.

Customer Relationship and segment

In this phase of development Pharmafilter has only one client still, 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 has increasingly proven its value, more and more hospitals are interested, both national and international. They are currently focusing on Dutch Hospitals and hospitals in Germany, but when the infrastructure of the organization has further developed, Pharmafilter can be marketed internationally.
Besides hospital, airports are considered to be an interesting future 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 De Jong Duke the

producer, who financed this development. The crunchers are priced at a competitive market level since they are under the pressure of competition from bed pan washers.
The disposables Pharmafilter offers (as a sustainable substitute for often reusable plastic or metal products) 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 for the entire concept. This is feasible, based on the value it creates for the hospital en thereby estimating a return on investment.
It is estimated to save on (waste) water, waste logistics and waste costs per year.
Other benefits as mentioned in the value proposition have not been specified and quantified.

Possibilities for support

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.

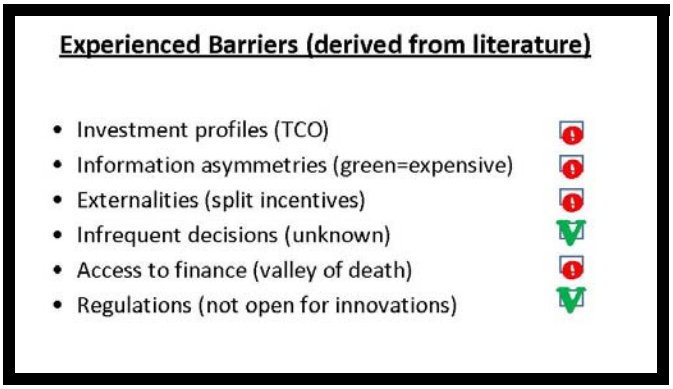
6.6 ZND

ZND DAKBEDEKKING

“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

To deliver the optimal solution for green roofs, ZND cooperates with Van Helvoirt, the '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 and offer clients a total solution with the advantage 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.
Nedicom is a related company that is specialized in the frontage of a building. Together with Nedicom ZND is able to deliver solutions for the entire exterior of a building. Furthermore 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.

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

ZND is 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%). ZND does not work for the consumer market since the costs of designing a plan and writing an offer are too high compared to the scale of consumer projects.

There are two big competitors on the roof market, Consolidated and Oranjedak, both with a large market. ZND is approximately the third largest player on the market.

Distribution Channels

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

Costs and Revenues

In the recent period, ZND invested a lot in knowledge and innovation and in a sustainable way of doing business. ZND invested in several ISO certificates and created a knowledge centre to inspire and educate clients about the sustainable solutions.

The price ZND charges, 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 the co-operation with Van Helvoirt, Nedicom and their status as preferred supplier for BAM, it is possible for ZND to help think and design tailor made solutions and get interesting orders. This way they can ensure a total solution with a good guarantee scheme and this 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, government could take a leading role in standardizing these kind of certifications in order to reward sustainable entrepreneurship.A national policy on subsidies for green roofs. Currently there is a scattered scheme, that differs per municipality. This slows down market development and creates uncertainty amongst the market players. A national policy would stimulate the market and gives incentives to more innovations in this field of business.

6.7 Turntoo

"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.

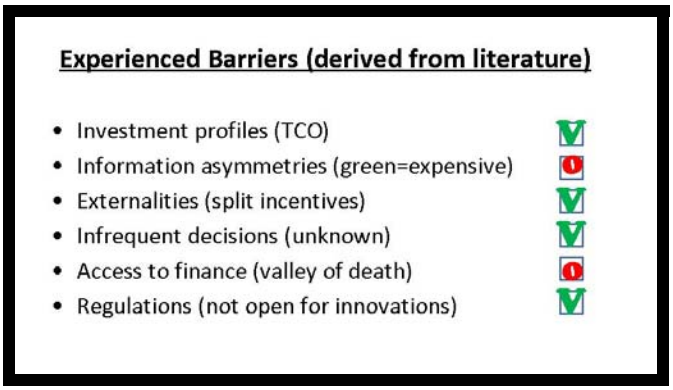
In the model of Turntoo producers remain owners of their products. Consumers pay only for performance but not for the included stocks. The innovation speed increases. Because the product, after a fixed period of use, returns to the producer, the consumer no longer is responsible for the disposal of the product. Everyone 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 focus on the revenue model. Value creation arises through adoption and use. Turntoo looks first for 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.



Strategic Partners

Thomas Rau is initiator of this concept and in cooperation with RAU, Tomorrow Design, and supported by: BAM utiliteitsbouw, Desso, EPEA, INNAX, 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.

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 not 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.

ANNEX II Our sources

In search of the insights mentioned in the study we questioned a number of experts both in the Netherlands and (also with the help of Marcel Bovy) in some other European countries. We particularly would like to thank:

The entrepreneurs:
- Mr. R. Snijders (DonQi)
- Mr. R. Deurloo (Greenfox)
- Mr. J. van der Linden (Cargohopper)
- Mr. C. Ulijn and mrs. J.Ummels (ZND)
- Mr. E.J. Vroegop (All Green Vehicles)
- Mr. M. Batelaan (Pharmafilter)
- Mr. D.J. Joustra (Turntoo)

Sector specialists:
- Mr. Peter Fraanje (Bouwend Nederland)
- Mr. Marcel van Haren (Cleantech)
- Mr. Mark Delavieter (Energyvalley)

Scientists and advisors:
- Mr. Bas Hillebrand and mr. Paul Driessen (Radboud Universiteit Nijmegen)
- Mrs. Marleen Bekkers (ICSB)
- Mr. Harry te Riele (StormCS)
- Mr. Marcel Bovy (Bovy Sustainability Guidance)
- Mr. Fisse Tessema (Wuppertal Institute)
- Mr. John Elkington (Volans and SustainAbility)
- Mr. Robert Rubinstein (TBLI Group)
- Mr. Jan Paul van Soest (Jan Paul van Soest Sustainability)
- Mrs. Femke Groothuis (Ex'tent)
- Mrs. Simone Veldema (GreenbizConsultancy)
- Mrs. Quirien Verbakel-Veldman (Syntens)
- Mr. C. de Vries (Start Green Venture Capital)
- Mr. M. Hendriks (http://www.e2cleantech.com/)

Government:
- Mr. Bart Hellings (Koplopersloket, EZ)
- Mrs. L.L. de Nijs-Vergeest (Agentschap NL)
- Mrs. Annemarie Bor (Agentschap NL)

Furthermore we had the fortunate opportunities:
- to present our study at a preliminary stage at the 10th ETAP conference in Brussels in 2010;
- to visit and participate in a Reed Business conference on business models concerning sustainable energy;
- to participate in a evaluation discussion with experts on the Dutch subsidy program 'Milieu en Technologie' (national program, similar to LIFE+);
- to present our first results at a VVM (Dutch community of sustainability professionals) conference on eco-innovations.

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