

SUSTAINABLE INNOVATION IN THE DUTCH CONSTRUCTION INDUSTRY. ENTREPRENEURS AS AGENTS OF CHANGE

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1. Introduction

Since the film of Al Gore *An inconvenient truth*, sustainability stands high on the national agenda of most countries. Concern for the environment is one of the main reasons in combination with opportunities to innovate. In general, innovation and entrepreneurship are important in the realm of national economies because they hold the key to the continuity and growth of companies (e.g. Hage, 1999; Cooper, 1987; Van de Ven, 2007) and economic growth within a country. It is therefore obvious that national governments are investing money to enable and improve innovation management and entrepreneurial behaviour within organizations with sustainability in mind. Policy measures are aimed at reduction of carbon dioxide emission, waste management and alternative use of energy sources and materials. In line with these measures companies are urged to integrate sustainability in their business processes and search for innovative sustainable solutions.

While on a national level policy measures towards a more sustainable society are defined, enterprises – and especially small and medium sized companies - lag behind and fail in incorporating these measures appropriately in their day-to day business. As a result research for sustainability has become an important driver for innovation.

Within the Centre for Innovation and Entrepreneurship (CI&E) at The Hague University of Applied Sciences we have taken the initiative to develop an innovation and research program for the construction industry to help small and medium sized companies (SME's) integrate sustainability in their business processes, while simultaneously professionalizing students and lecturers. This paper is part of ongoing research among 40 companies in the region of South-Holland. The companies are mostly SME's varying from very small (6 employees) to middle-sized (more than 100).

According to Rennings (2000) while innovation processes toward sustainable development have received increasing attention during the past years, theoretical and methodological approaches to analyse these processes are poorly developed. This paper describes a theoretical approach developed at our university's Centre for Innovation and Entrepreneurship, which combines education and research. It is an inductive approach that departs from real-life problems encountered by companies, and is aimed at developing a model that supports companies in integrating sustainability in their business and innovation processes. We describe the experiences so far with a number of companies in the construction industry, which participate in the innovation and research program described above and the barriers they encounter.

Our sustainable program is centred on four themes: cradle-to-cradle, social corporate responsibility, climate-neutral construction and sustainability and customer orientation in the building process. It is an exploratory research in which students and undergraduates are involved under the supervision of a lecturer as senior researcher of this program. Through an in-depth analysis of the companies, participant observation and in-depth interviews with the owners/directors of the companies, experts and prominent sustainable trendsetters, insight is gained in innovation processes towards sustainable development. Preliminary conclusions show that on a company level one of the main bottlenecks is the dilemma posed by the need for profit for the continuity of a company, while taking into account people and planet. The main bottleneck is however the inability of companies to translate policy measures into strategy and operations.

This paper is set up as follows. In section 2 we give an account of European and Dutch policy measures geared at stimulating sustainability in a business context and especially the building and construction industry. In section 3 an overview is given of the economic importance and characteristics of the Dutch building and construction industry and the problems in this sector. These problems are offset against the opportunity of sustainability as a strategic option for SME's in this sector. In section 4 the innovation and research program developed at the CI&E is introduced in the context of the main research question.

Following that in section 5, methodological choices are addressed and the research design is presented. We finalize this paper in section 6 with our conclusions and recommendations for further research.

2. Sustainable development and innovation

Sustainable innovation is a theme that stands high on the agenda of national governments. The construction industry is a key player when it comes to contributing towards a more sustainable society and environment. Sustainability should contribute towards economic development is the key message.

If we consider the importance of economic development in a society, we can observe that economic development is sought by societies not only to satisfy basic material needs, but also to provide the resources to improve the quality of life in other directions, meeting the demand for health care, education and a good environment. However, many forms of economic development make demands upon the environment; they use natural resources which are sometimes in limited supply, and generate by-products of pollution and waste.

But there are also many ways in which the right kind of economic activity can protect or enhance the environment. These include energy efficiency measures, improved technology and techniques of management, better product design and marketing, waste minimization, environmentally friendly farming practices, making better use of land and buildings, and improved transport efficiency. The challenge of sustainable innovation and development is to promote ways of encouraging this kind of environmentally friendly economic activity, and of discouraging environmentally damaging activities. In a nutshell this is our definition of sustainability besides the fact that the purpose of sustainable development and innovation is not merely to gain profit, but to contribute towards the well-being of people and show responsibility towards our planet. Hence the output indicators for sustainable business are mostly defined in terms of the 3 p's profit, planet and people. This is our frame of reference in the sections to follow.

3. European and Dutch policy towards sustainability

For the first time in human history, the majority of people live in urban areas. According to UN-HABITAT, cities consume 75 percent of the world's energy and are responsible for 80 percent of greenhouse gas emissions. And by these means, buildings are accountable for about 24% of world's CO₂ emissions (IEA, 2008). This illustrates not only the relevance but also the importance of the sustainability measures undertaken by national governments in all areas especially in the construction industry. Cities and urban areas have a large carbon footprint and consequently decarbonisation of these areas has become the global goal on national and international agenda's.

On a European level 40% of total energy consumption is absorbed by Europe's 160 million buildings which represent 40% of Europe's CO₂ emissions. Most of the energy from buildings (57% of domestic consumption) is used for space heating (ACE, 2004)¹. Hence, the countries of the European Union have committed themselves to reduce their overall emissions to at least 20% below 1990 levels by 2020². The ambitious Dutch government has promised to go beyond this EU-level by reducing its CO₂ emission to 30% in 2020. This ambition level and the important influence of buildings in reducing carbon dioxide emissions, has resulted in Dutch sustainability plans, which focus on the construction industry.

In most European countries, requirements for new buildings are set in national construction norms. According to Noailly (2010), in general "there are two forms of regulatory standards: (1) thermal insulation standards that set requirements on the minimum level of insulation of different building components and (2) energy performance standards that set a maximum on the energy demand of a building as a whole." In the Netherlands building codes are based mostly on energy performance standards which look at the whole building instead of the parts (floors, walls, windows e.g.). These performance standards were recommended by the 2002 European Building Energy Performance Directive.

The buildings in the Netherlands are accountable for one third of total CO₂ emissions in the country. In addition as much as 40% of the yearly waste production is originated from the building and construction sector and it is this industry which consumes the half of the total raw material.³ That is why sustainability depends on buildings - and in the slipstream the construction industry – being 'sustainable' and integration of sustainability in business processes en business approach.

¹ ACE, 2004, Briefing on the energy performance of buildings directive, Association for the Conservation of Energy

² 20/20/20 by 2020: Europe's climate change opportunity (January 2008). Available: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52008DC0030:EN:NOT>

³ Duurzamer Ondernemen (2009), p. 138

Approximately, one of ten companies (12%) in the Netherlands is related to the construction sector and with 6% of the Gross Domestic Product (GDP) this sector takes a significant position in the Dutch economic output. The bulk of the Dutch companies (99%) in the construction branch are SME's, of which the majority (93%) with less than 10 employees in function.

This sector is responsible for about three-quarter of the total employment in the whole sector (EIM, 2009).⁴ However, the global financial crisis has had disastrous effects on the construction industry in The Netherlands. In 2009 the orders for firms of architects has been halved⁵ and the prospects for 2010 en 2011 are that the financial problems caused by the crisis will grow further.

In summary what is outlined in the previous section, shows clearly why the construction industry – and specially SME's in this sector – are critical players when it comes to developing into what we refer to as “*sustainable innovators*”. It also shows the challenges they have to face in view of the economic situation, in combination with the characteristics of the sector.

Dutch policy measures geared at stimulating sustainability in a business context

In comparison with other European countries, the Netherlands have strengthened its regulations for the thermal insulation standards and the level of Dutch standards is nowadays as stringent as in Europe (Noailly 2002). The Dutch government has recently launched a large range of demonstration projects aimed at realizing 5000 high energy performance buildings by 2012 and to develop energy neutral buildings by 2020 (VROM 2002).

According to an analysis carried out by CPB (2010), the Dutch environmental policy focused on the building sector has been intensified in the mid-1990s and slowed down after 2001. This recent study shows that the large number of policy programmes implemented successfully in the Netherlands in a short period of time has had a counter effect on innovation in the country. High uncertainties about future policies cause firms to postpone investments in sustainable innovation activities.

Just to give an impression of these measures we mention a few. The main policy instruments in the last thirty years were: Energy Performance Norm (EPN) introduced and Energy Tax in 1996 along with fiscal incentives, subsidies and voluntary agreements between business and government, all aimed at contributing towards reduction of CO₂ emissions. According to an evaluation by Joosten *et al.* (2004), the energy tax has had the largest impact on reducing CO₂ emissions in the building and construction sector over the 1995-2002 period.

In general when it comes to implementing policy measures aimed at stimulating sustainable business and innovation, SME's play an important role. The Dutch construction industry shows to be good in adopting new technologies, for example new building materials and particularly on the logistical level, but is very poor in being innovative. According to a research by De Jong and Muizer (2005)⁶ in which 58 different business sectors were studied, the construction sector scored the 55th place. This demonstrates one of the main problems characteristic for this sector to undertake sustainable business models: a lack of innovative spirit among entrepreneurs.

Despite this fact, the *awareness* of SME's in the construction industry in relation to the importance of environmental issues and a sustainable way of business, is however low. In addition, a *pro-active approach* towards sustainability is missing. Practice moreover shows that SME's that innovate in sustainable ways are mostly guided by regulations and governmental rules and only in second instance by customer demand or end-user requirements.

Finally, considering motives to innovate in a sustainable way, it is the economical relations (customers, deliverers or investors) SME's have - and not the social contacts or contacts not geared at an economic transaction - which are the most influential for the innovation processes in the SME's of the building and construction industries.⁷ While sustainability is not merely geared at profit, but also people and planet are important indicators to measure success and the extent to which companies can be labelled as “*sustainable innovators*”.

⁴ Ondernemen in de sectoren, Feiten en ontwikkelingen 2007-2009 (EIM 2008). Available:

<http://kluwerresearchbase.lynxserver.nl/ondernemen-in-de-sectoren-2007-2009.65720.lynx?RapportPointer=9-416-3665-314276>

⁵ Bond van Nederlandse Architecten (BNA)

⁶ De meest innovatieve sector van Nederland, Ranglijst van 58 sectoren. Available: <http://www.ondernemerschap.nl/pdf-ez/m200502.pdf>

⁷ Nijenrode 'Innovatie voor duurzaamheid in het MKB' (december 2005)

4. The Dutch building and construction industry

In this section a more detailed overview is given of the economic importance and characteristics of the Dutch building and construction industry and the problems in this sector. These problems are offset against the opportunity of sustainability as a strategic option for SME's. The building and construction branch is dominated by small and medium sized companies (SME's). More than 75% of the construction firms have 1 or merely a few employees. About 10% of the companies are part of medium sized companies, with 10 to 100 employees in office. In comparison with other sectors this is a large population.⁸

We have mentioned that innovation has a high priority on the political agenda of the Netherlands. The government addresses innovation as a prerequisite for the preservation of strong competitive power and a sustainable economical growth (Regering.nl, 2007a). The creation of an innovative climate is one of the objectives of the Dutch government, *innovation* being one of the six focus themes of the coalition (Regering.nl, 2007b).

The construction sector delivers an important contribution to the Dutch economy as every Dutch citizen in his or her day-to-day life deals and is confronted with the quality of the built-up environment on a daily basis by means of residing, working, recreating, and travelling (Bouwend Nederland, 2006a). Although the construction sector still has a reputable economic share in the Netherlands, the relative share is somewhat stagnating (Verweij *et al*, 2000). Product and process innovation has the potential to contribute to the improvement of the construction sector economy. Innovation is increasingly important to the construction firms, in the sense that they are able to profile and reposition themselves in the fast changing society and to strengthen their market position (Bouwend Nederland, 2006b).

However, in the previous section we discussed that the construction industry is considered to score low on innovation and has an image of being conservative (Pries and Heijgen, 2005). De Bruijn and Maas (2005) performed a study on innovation in the Dutch construction sector based on R&D (Research and Development) activities. The results indicate that the construction sector is less innovative than other benchmarking industries, i.e. labour intensive and capital intensive industries. This study came across some interesting aspects that constrain innovation in the construction sector. The main issue is that the market structure does not offer any incentives to innovate. First, the firms are not engaged in continuing collaborative relationships as they team up mostly on project basis. Besides, there is lack of trust in the exchange of knowledge between the collaborative parties. The supply and value chain of the construction process is intricate as depicted in Table 1, and this hampers co-operation and collaboration in the innovation process.

Table 1 Parties involved in the phases of the construction process (traditionally)

	Design		Building & Construction		Maintenance
	Planning	Design Phase	Development	Realisation	Maintenance
Parties involved	client	client	client	-	-
	architect	architect	architect	-	-
	contractor	contractor	contractor	contractor	contractor
	supplier	supplier	supplier	supplier	

Another notion for the negative image of the sector where innovation is concerned is that traditional construction firms focus on technological innovations and less on *market driven innovations* (Bouwend Nederland, 2005b). It is precisely the latter type of innovations that are visible to the end-users, and to society. Despite the fact that the sector obviously lags behind on innovation, the innovation monitor of Twynstra The Bridge – a well-known consultancy firm in The Netherlands - shows that the construction sector is the only Dutch sector where the improvement of innovation is one of the strategic priorities of the sector (Bouwweb.nl, 2006).

Literature shows that the Dutch construction industry is often characterised by its “*specific character*”. The products of this sector have a very long life cycle, with high costs and a regional focus. The processes are dominated by a tough competition on price and are based on ad hoc approaches, and lead by strong failure of costs. Only 0.22 percent of the turnover in building and construction is spent on R&D investments, very low compared with the percentage in capital-intensive (3.6 percent) and labour-intensive (1.7 percent) industries. Building and construction also score low in terms of the proportion of knowledge employees in the total workforce, for both academics and R&D personnel.

⁸ Parlementair Enquête, 2.3.2 Signalement van de bouwnijverheid

Innovation in this sector tends to focus on finding solutions on an ad-hoc basis to problems that occur on the building site.⁹ Finally, the outsource procedures are not focussed on innovation, where predefined specifications leave little space for innovative contributions from contractors.

In summary this sector dominated by SME's is not leading in innovation. However the importance of innovation is high - and especially of sustainable innovation - given the societal impact of a sustainable business approach for the well-being and welfare of society and its individuals. Especially when we consider the fact that only 4 percent of the 7 million houses in the Netherlands has the energy label A which indicates the 'sustainability' of the buildings (PwC, 2008). The sector lacks a pro-active attitude and does not know where to begin. There is only a small group of early adopters who want to innovate and a collective sense of urgency is lacking.

Innovation in the building sector

The traditional main actors in the building sector are the client/initiating organisation, architect, advisor, contractor, and the supplier & sub contractor (Maas, 1997). In this traditional organisation model (Figure 1) the responsibilities for the initiation, design, and construction are strictly separated. The client puts up a requirement specification with the assistance of an architect or a project management advisor. The architect then designs the building and is sometimes supported by an advisor. When the design is completed a contractor is selected to construct the building.

Traditionally, these construction organisations are responsible for the development of their products and services. However, nowadays the users are an increasingly important group (Verweij et al., 2000; de Bruijn and Maas, 2005; Benthem, 2006) though they are not included in these traditional models.

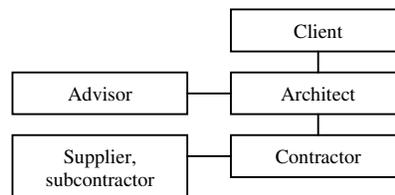


Figure 1 Organisation model in the construction industry

In a study by Benthem (2006) collaboration in the construction sector is studied focussing on the interaction between traditional actors in the construction industry, based on the work of Maas (1997). To do so, an innovation scan was conducted and this resulted in some interesting conclusions which account for the poor innovation performance. Construction firms tend to compete on price rather than on quality. Furthermore, there is not enough knowledge transfer between companies.

With the installed Regieraad Bouw the emphasis is on renewal in the construction sector, including a more sustainable way of doing business and contribution of the sector to the achievement of a more sustainable society.

Research focus

Against this background the research program was developed by the CI&E. The focus of the research is SME's in the construction and installation business in the region of South-Holland. In economical terms this is an important region that has a high strategic importance. It is a densely populated area with several industries that play an important role for the Dutch economy. In addition it is the region where the Dutch government is based and large Legal Institutions, embassies and well-known and reputable universities. Consequently it is an urban area with a varied and diversified landscape. For the construction industry it is a 'market' where a lot can be gained in terms of sustainability.

Problem definition

The problem in this sector is twofold. On the one hand, as we described in the previous sections, companies in this sector are not innovative. On the other hand the sector is urged to innovate and develop products and processes geared at contributing towards the targets defined in relation to reduction of CO2 emission and becoming a more sustainable innovator and contributing towards a more sustainable environment, a so-called 'low-carbon' economy (Lisbon Council, 2009).

⁹ TNO Bouw en Onderhoud 'Innovatie in de bouw' (juni 2005)

Research objective and research question

Following from the problem definition this research question was defined:

How can sustainability be incorporated into a company's operations, in order to maximise their ability to gain competitive advantage and improve their competitive position?

In the next section our research design is described and the program we developed in order to carry out the research among a group of 40 companies.

5. The sustainable innovation and research program

In December 2008 we started a two-year research programme to exploring the 'sustainability' in terms of processes and products of small and medium sized companies (SME's) in the Dutch construction industry. Our sustainable program is centred on four themes: cradle-to-cradle, social corporate responsibility, climate-neutral construction and sustainability and customer orientation in the building process.

The main assumption underlying our program is that in order to maintain competitive advantage and market attractiveness - especially in times of economic crisis we are in the midst of- companies need to distinguish themselves via sustainable innovation processes and products. In so doing they contribute towards developing a more sustainable society. Due to their scale, SME's however have a hard time selecting technological opportunities and translating them into commercial solutions and in making the right choices and translating them into a feasible and competitive sustainable innovation strategy for the company.

Against this background a programme was developed that on the one hand supports companies in their search for sustainable opportunities, while simultaneously exploring the barriers and pitfalls they encounter in that process.

This research project is a collaborative effort of our university's Centre for Innovation & Entrepreneurship and a Dutch innovation network, Syntens, which supports companies with their innovation efforts, the branch organization for the construction industry Bouwend Nederland and the branch organization for the installation industry, Uneto-VNI.

The programme is partly funded by the Foundation for Innovation Alliance, liaising with the Dutch Ministry of Economic Affairs. It is a foundation set up by the Dutch Ministry of Educational Affairs. The objective of the Foundation is to stimulate the development of innovation programs in partnership between universities, companies and intermediary supporting organizations, *i.e.* between education, research and the companies in a certain region. In the research project students of The Hague University simultaneously support the companies towards the identification of a sustainable strategy and improvement of their business and innovation processes.

So far, twenty companies spread over three cycles participated in this project. Companies are selected from members of both branch organizations for the industry and are all located in the area of The Hague.

The participating companies in this project differ in type. They more or less cover the entire value chain within the construction industry and form a reflection of the total group of SME's operating in this industry. Participants are architects, engineering consultants, contractors, builders, installation firms and specialist suppliers, e.g. of glass.

Companies also differ in size, turnover, employability and innovation power and capacity (see Table 2). With innovation capacity we mean the ability of an organization to gear their efforts towards the development of new products and processes. It is reflected here in number of employees dedicated to Research & Development.

Table 2: Participating enterprises in figures

	Average	Range	
		Min.	Max.
Annual turnover	€ 17.5 mln	€ 0.4 mln	€ 80 mln
Total no. of employees	47.4	6	153
No. of employees in R&D	1.1	1	6

The main research objective is to gain insight in the way companies in this sector innovate and define barriers and pitfalls that hinder 'sustainable innovation' on the four themes defined below. Besides these four themes, four aspects were defined related to internal processes that play a role in the management of innovation processes: competencies, co-operation and collaboration, the organization of the building process and the internal organization (see Figure 2).

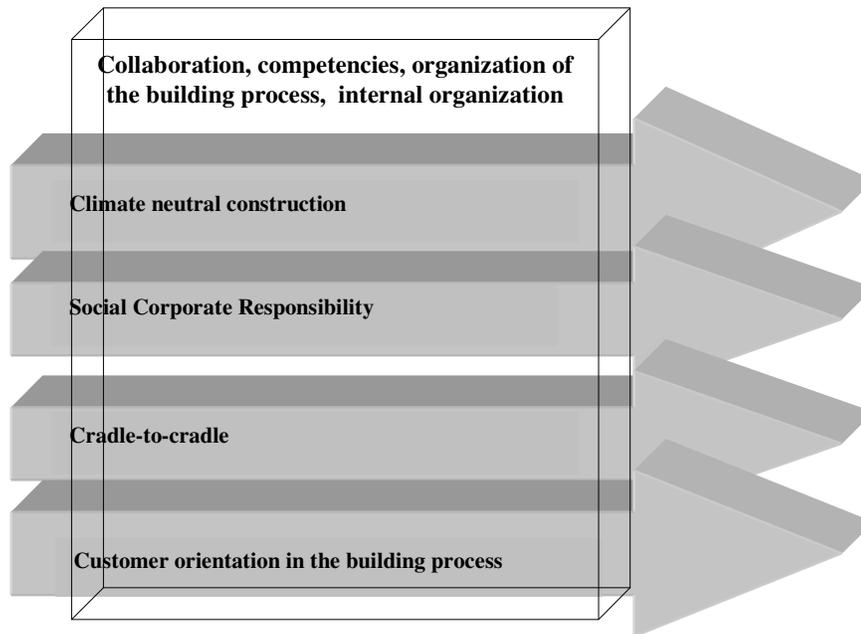


Figure 2: Themes of the research program of the CI&E

In addition to the main research objectives, also enterprise objectives were formulated. These enterprise objectives primarily focus on the formation of networks and dissemination of knowledge, aimed at embedding sustainable results in the industry on completion of the programme. The idea is that by creating networks knowledge is disseminated among companies and learning is stimulated.

6. Methodology and research design

In general terms, the current programme aims at strengthening multidisciplinary collaboration, knowledge creation and dissemination between entrepreneurs, education and research. Using best practice examples of a group of 40 companies in the construction industry, a model is used that might serve as a driving mechanism for sustainable process and product innovation that fits the nature and characteristics of the companies in this industry.

The research is longitudinal and exploratory and aims to gain a practical insight in the day-to-day operations of the participating companies. It is aimed at eliciting knowledge and lessons through an inductive approach. The knowledge thus gained might eventually prove to be useful for the entire construction industry and possibly for other industries as well. In short, it is a way of looking at current operations and combining them with entrepreneurs' ambitions in order to arrive at generally applicable theories.

The overall aim of the program is threefold:

- 1) On the one hand the objective is to create an architecture in which students, lecturers and companies can share knowledge, learn and work towards specified goals.
- 2) On the other hand the objective of the program is to contribute to the innovative power of participating SME's and development of problem-solving skills.
- 3) And last but not least the program aims to contribute to the professionalization of both students and lecturers, i.e. teach them research skills, develop a reflective attitude towards the knowledge they have acquired during their study and develop an entrepreneurial and innovative behaviour.

It is an exploratory research which aims to unfold a number of issues: how do companies in this sector innovate and what is the role of the entrepreneur in the process, and how can companies in this sector gain competitive advantage through sustainable innovation?

The research was carried out through

- a) a baseline measurement at the start of the program,
- b) an in-depth scan of the company through semi-structured questionnaires
- c) in-depth semi-structured interviews with all the directors/owners of the companies.

Considering these aims, we had to find a way of linking entrepreneurs, students and faculty. Our method consists of three elements:

1. a process model in which entrepreneurs, undergraduate students and faculty are brought together
2. a research model guiding data collecting in the research process.
3. a theoretical model that provides a framework for the research and the companies.

The process model

The process model (see Figure 3) was developed to ensure that students are linked to entrepreneurs within a fairly rigid system of the academic timetable in universities of applied sciences. Four periods of 20 weeks provide the basis for this model. In each of which one or two students are matched with one of the entrepreneurs in the construction industry, following an intake by one of the faculty members.

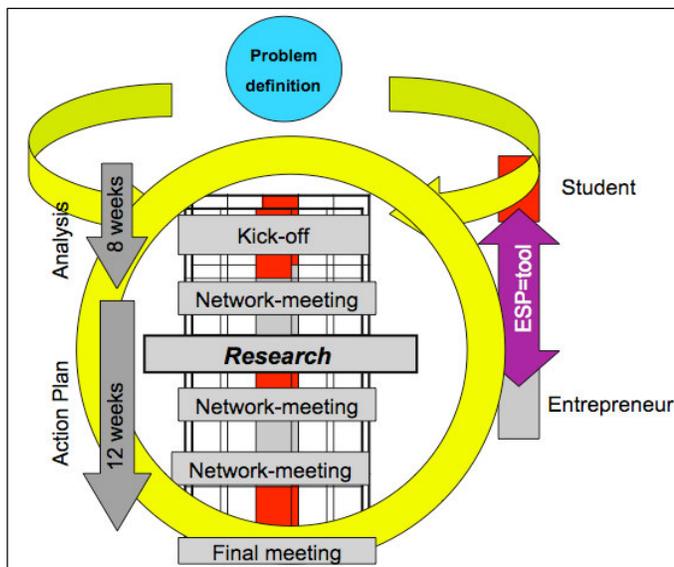


Figure 3: process model for innovation programmes linking universities and SME's

The start of the project for each company is marked with a base-line measurement by filling in a questionnaire during an intake interview between the owner/management and a student. Next a semi-structured interview takes place to scan the company, make a profile of the company and detect what specific problems are.

Companies are asked to define on which of the four themes they want to focus. This forms the basis for the research and action plan of the students. In a period of 20 weeks they work together with the entrepreneur to make incremental steps in becoming a “sustainable innovator”.

The individual process between student and entrepreneur is supported by network meetings with a number of companies. In network meetings entrepreneurs, students and faculty gather to address topics that are relevant to more than one company or that can serve as best practice models to others. Preferably these meetings take place on location, i.e. at one of the participating organisations, rather than at the institute of higher education. Topics deal with the four main project research themes in sustainability: cradle-to-cradle, social responsibility, customer orientation, climate neutrality.

The process model is a development tool through which we aim to raise the awareness of the participants towards sustainability, change their attitude and eventually their behaviour. These changes have to become visible in the organization.

Entrepreneurs were primarily evaluated to the extent to which their behaviour changed through participation in the program. The output indicator for changed behaviour is measured in terms of visible actions leading to sustainable product or process innovation.

The assessment of the *students* took place via the reports in which they on the one hand had to write an action plan for the company where they had been based during the period of their practice. The report also assessed students on research skills, their ability to apply knowledge in a practical context and their capacity to reflect on that knowledge and offset it against existing theories.

Lecturers were assessed on two aspects: the extent to which they adapted their curricula on the basis of the experience and knowledge gained and the broadening of their knowledge base as a result of the supervision of students and their own involvement with the companies.

The research model and theoretical framework

The research model is complementary to the process model. A semi-structured questionnaire is to analyse the company and define strategic topics. These topics are clustered into one of the four research themes, mentioned earlier.

Innovation is defined in a broad sense: it refers to purposefully innovating products, processes and work methods De Jong (2006). This definition complies with the one brought forward by Tidd and Bessant (2009), who speak of the innovation space within an organisation.

Four types of innovation can be distinguished: paradigm, position, and process and product innovation. They describe phases that an organisation should go through from strategic innovation to implementation. Four aspects are important according to the authors:

- looking for opportunities and recognising them
- selecting opportunities and formulating a strategy
- implementing the strategy
- learning from that implementation

Innovation is seen as a continuous process supported by routines and methods that contribute to a successful process and outcome. These routines refer to aspects also integrated in our approach: co-operation, the internal organization, competencies and the organization of the process. Innovations can be incremental or radical and according to Tidd et al the ability to innovate is directly linked to the entrepreneurial skills of the owner / managing director who needs to recognise opportunities and assess their potential.

7. Research findings and recommendations for further research

Attracting companies in the region to participate in our sustainability program was difficult and efforts were not very productive. Most of the firms which were approached showed little interest in participating in this program. Thus, so far 20 companies have participated in our programme, whereas more than 200 firms since December 2008 onwards were approached. From the figures it follows that though awareness amongst the companies of sustainability is present, the interest and motivation to actually do something, is low. Entrepreneurs play a key role in that respect. The research seems to indicate that the entrepreneurs in the construction industry involved in our project can hardly be called 'agents of change'.

From the twenty SME's which participated in the programme, and which can be seen as the most willing to be involved in sustainable strategies, two decided to stop and another two companies are not motivated to go further with this project. As mentioned before, lack of innovative spirit among entrepreneurs is the main problem for the construction sector to use sustainable business models.

If we look at the population of companies, results through a baseline measurement carried out at the start of the program show that only two of 10 actively participating companies (20%) have an R&D department (Table 3). On the other hand, only four companies (40%) have innovated by creating new business models, products or services. These 10 companies all score low in terms of the proportion of knowledge employees in the total workforce, both academics and R&D personnel. While all these factors are needed to create an innovative spirit and ambience within the company and develop competencies to generate new business models based on sustainability.

Table 3 Result baseline measurement

SME's	Employees			R&D	Annual turnover	Business	Business	Business
	Total (fte)	higher educated (fte)	higher educated (%)	(fte)	(x € 1000.000)	unchanged (%)	improved (%)	New (%)
W	100	33	33	6	30	90	0	10
B	35	1	3	0	15	100	0	0
K	19	2	10.5	0	0.4	80	10	10
S	18	0	0	0	-	n/a	n/a	n/a
N	100	4	4		30	n/a	n/a	n/a
H	30	3	10	0	-	n/a	n/a	n/a
V	45	0	0	0	-	n/a	n/a	n/a
L	50	2	4		4.6	70	30	0
P	153	16	10.5	0	80	90	5	5
M	12.2	9	74	3.3	0.8	87.2	6.6	6.2

Participant observation (network meetings)

As mentioned earlier, network meetings were held with groups of companies on the four themes of the program. The aim was to raise awareness on sustainability as a business opportunity and develop knowledge among the participants on the four themes and aspects related to sustainability. The participation of the companies in these meetings was low. For example during a recent network meeting with one of the biggest home-building cooperatives as a major client, only 15% of the companies did participate. This again shows the lack of pro-active attitude and motivation to participate in programs which focus on a long-term strategy and requires a vision on investing for the future.

In-depth scan of the company through semi-structured questionnaires

The results of the in-depth scan of the companies show that most of the companies are aware of the urgency to innovate their business model focused on sustainable strategy, but on the other hand their short-term problems and deadlines make it impossible to implement their plans. In the process, under the pressure of the market, the sense of urgency to integrate sustainability in their business processes, diminished. Most of them also complain about the large number of policy programmes by the government and the counter effect of these policies on their daily business. Because of these policies the costs are getting higher, especially for SME's without R&D.

In general companies are not pro-active when it comes to acquiring knowledge on the subject. This makes the step to change their behaviour difficult, since learning starts with changing models about doing business in a certain way (Harkema, 2004).

In-depth interviews with directors

Several directors of the companies involved in this program were interviewed. The results so far show that the main motivation for their engagement in this project is not the vision to make the company sustainable, but the fear to lag behind in comparison to competitors. Almost all entrepreneurs stress the difficult financial situation, caused by the economic crisis, and the hard competitive atmosphere of the construction industry to fight on (lowest) price.

There appears to be a structural mentality among these entrepreneurs of shifting responsibility up or down the chain, or in other words passing the buck to another party. This results in a so-called 'circle of blame', which seems to hamper the adoption of a pro-active attitude. This 'circle of blame' can be explained as follows: the investors encouraged by the attention and priority to consider people and planet besides profit, advocate that they want to invest in sustainable construction projects, but there is a limited supply of sustainable products or services. On the other hand architects and contractors claim that investors are not interested in sustainable projects, but they select the most lucrative proposals, in terms of price. They in turn cannot afford to propose projects which are sustainable but not always low-priced. The circle closes with the end-user being forced to choose a product which is not sustainable.

The mentioned *circle of blame* in the value and supply chain makes it very difficult to adopt alternative visions and business models from the conventional way of doing business, where price and costs are the main drivers for innovation, besides being regarded as the only guarantee to safeguard new orders.

If we consider the aspects related to the organizations which were integrated in our model – co-operation, competencies, the internal organization, the organization of the process – the following observations can be made.

- 1) Though co-operation and collaboration are a must in this business, the way of working along the value chain is very much ingrained and based on cost-efficiency. This stands in the way of sustainability where profit is not the only driver for innovation, nor doing business as we have seen in prior sections.
- 2) The internal organization is a reflection of the dominant business model in this sector. A more in depth case-study carried out among 3 of the companies that participated in the project, showed that organizational culture also plays an important role. Culture can contribute to developing awareness of the importance of sustainability as a business proposition, but also as a way of working and developing a new frame of mind towards the goals of a company

Additionally the market structure does not motivate entrepreneurs to be innovative. First of all, building companies work together in constantly changing projects, each with a unique building or construction. There tends to be an absence of trust in exchanging knowledge in such random work teams. Secondly, contracting procedures do not encourage innovation. The construction industry is mainly a capacity supplier, within strictly defined conditions. However, there is innovation in the construction process, particularly on the logistical level, but real chain-integration to diminish failure costs remains limited.

In summary, both aspects related to the firms in combination with characteristics of the market, hamper the adoption of sustainability as an alternative option of doing business, besides the more traditional way. The results of the research so far, show that where innovation and particularly sustainability are concerned, this sector does not have a pro-active attitude and does not know where to begin. The entrepreneurs/owners of the SME's complain about high uncertainties involved with future policies. These cause firms to postpone investments in R&D and sustainable innovation activities.

Future research

Further research will have to confirm our findings so far. Our programme also fits in the framework of action-research, where on the basis of our findings we define interventions to bring the programme further. One of our future plans is to create a broad network of SME companies where different parties in the construction supply and value chain are encouraged to collaborate under sustainable conditions. We will also give best practices and stimulate the owners of the companies, by interviewing experts and trendsetters in sustainable innovation, involving them in the programme. We will also motivate and involve local government partners and policy makers to make SME's in the construction industry more accessible.

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