

## **Entrepreneurs as Agents of Change: Sustainable Innovation in the Dutch Construction Industry**

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### **Abstract**

Over recent years aspects of sustainability have claimed a central role in many countries. As a result research for sustainability has become an important driver for innovation. This paper describes developing a model that supports SMEs in integrating sustainability in their business and innovation processes.

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 and economic growth within a country. National governments are spending vast sums of money to enable and improve innovation management and entrepreneurial behaviour within organizations. This is also the case in The Netherlands. Partnerships involving universities (education), companies (preferably SMEs) and industrial associations (business) and representatives from governmental organizations (community) are stimulated and should be geared towards: the development of sustainable networks, a contribution to regional economic growth within sectors, the development of learning communities in which best practices are shared, knowledge circulates and knowledge is created through applied research and last but not least sustainable relations are developed between universities and the business community.

Within the centre for innovation and entrepreneurship at our university we have taken the initiative to develop an innovation programme for entrepreneurs in the construction industry to help them integrate sustainability in their business processes, while simultaneously professionalizing students and teachers. Sustainability and concern for the environment are two of the main reasons for entrepreneurs to look for opportunities to innovate. Policy measures are aimed at reduction of CO<sub>2</sub> 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.

This paper describes the experiences with a number of SMEs in the construction industry and the barriers entrepreneurs encounter on the road towards sustainability. We focus on the role of the entrepreneur in the process of sustainable innovation and development. We conducted exploratory research and through an organisational analysis and in-depth interviews with the owners/managers of the companies insight was gained in innovation processes towards sustainable development. Conclusions show that 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 dilemmas of innovation are described as issues that need to be addressed and which influence the innovative capacity of companies and organizations. This paper deals with the underlying factors related to the dilemma between sustainability and growth/profit.

**Key words:** entrepreneurship, change agents, sustainable innovation, construction industry

### **Introduction**

Ever since the first showing of Al Gore's film *An Inconvenient Truth*, sustainability has stood 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. Sustainability should contribute towards economic development is the key message. There are several 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.

At present, the majority of people live in urban areas. Cities consume 75% of the world's energy and are responsible for 80% of greenhouse gas emissions and buildings are accountable for about 24% of the world's CO<sub>2</sub> 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 agendas.

On a European level 40% of total energy consumption is absorbed by Europe's 160 million buildings which represent 40% of Europe's CO<sub>2</sub> emissions. Most of the energy from buildings (57% of domestic consumption) is used for space heating (ACE, 2004). Hence, the countries of the European Union have committed themselves to reduce their overall emissions to at least 20% below 1990 levels by 2020 (EU, 2008). The ambitious Dutch government has promised to go beyond this EU-level by reducing its CO<sub>2</sub> 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. The construction industry could be a key player when it comes to contributing towards a more sustainable society and environment.

The buildings in the Netherlands are accountable for one third of total CO<sub>2</sub> emissions in the country. In addition, as much as 40% of the yearly waste production originates from the building and construction sector and it is this industry which consumes half of the total amount of raw materials (Groesbeek, 2009). That is why sustainability depends on buildings -- and in the slipstream the construction industry -- being 'sustainable' and on integration of sustainability in business processes and business approach.

Approximately, one in ten companies 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 industry are SMEs, of which the majority (93%) have less than 10 employees. SMEs are responsible for about three-quarters of the total employment in the whole sector (EIM, 2009). This 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.

Although the construction sector still has a reputable economic share in the Netherlands, the relative share is declining (Verweij et al, 2000). Moreover, the global financial crisis has been disastrous for the construction industry in The Netherlands. In 2009 orders for firms of architects were halved, having dramatic effects on contractors and suppliers in 2010 and the prospects for 2011 are far from positive.

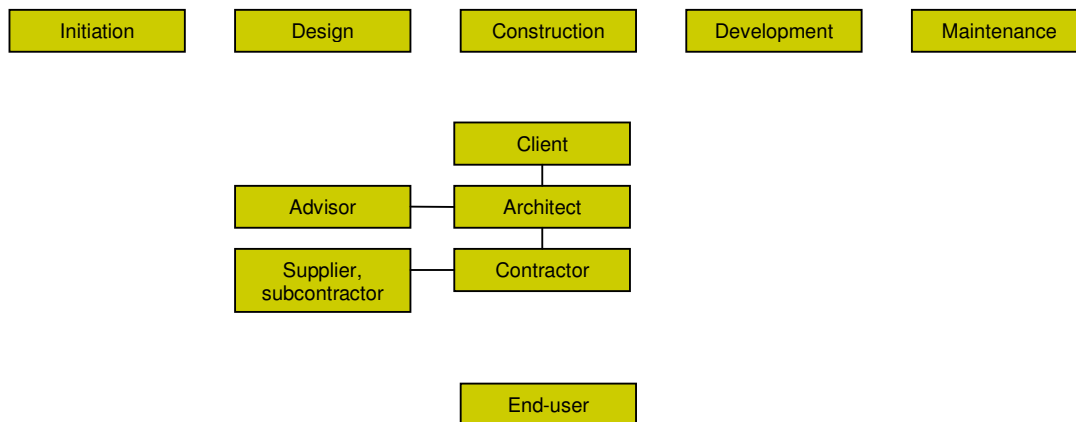
According to De Jong and Muizer (2005) in which 58 different business sectors were studied, the construction industry ranked 55. This demonstrates one of the main problems characteristic to this sector: the lack of innovative spirit among entrepreneurs to engage in sustainable business models. In general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

but is very poor at being innovative (De Bruijn and Maas 2005) and has a reputation for being conservative (Pries and van Heijgen, 2005). In addition, a pro-active approach towards sustainability is lacking. SMEs that innovate in sustainable ways are mostly driven by government rules and regulations and in second instance by customer demand or end-user requirements.

### **Dynamics of the Dutch building and construction industry**

The studies above show some interesting aspects that constrain innovation in the construction industry. 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 a project basis. Moreover, there is lack of trust in the exchange of knowledge between collaborating parties. The supply and value chain of the construction process is intricate and this restrains collaboration in the innovation process.

The traditional main actors in the building sector are the client/initiating organisation, architect, advisor, contractor, and the supplier and sub contractor (Maas, 1997). In this traditional organisation model (see Figure 1) the responsibilities for the initiation, design, and construction phases 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. Only when the design is completed a contractor is selected to construct the building.



**Figure 1:** Organisation model in the construction industry

Traditionally, these actors are responsible for the development of their own products and services. However, nowadays the end-users are an increasingly important group (Verweij et al., 2000; de Bruijn and Maas, 2005; Benthem, 2006) although they are still not included in these traditional models. Benthem (2006) studies collaboration in the construction sector focussing on the interaction between traditional actors in the construction industry, based on the work of Maas (1997). He suggests that construction firms tend to compete on price rather than on quality and that there is not enough knowledge transfer between companies. These aspects account for poor innovation performance.

Another reason for the negative reputation of the industry where innovation is concerned is that traditional construction firms focus on technological innovations and less on market driven innovations (Bouwend Nederland, 2005). It is precisely the latter type of innovations that are visible to the end-users and to society. Although the sector obviously lags behind in innovation, the innovation monitor of Twynstra The Bridge Consultants (2007) shows that the construction sector is the only Dutch sector where improvement of innovation is one of the strategic priorities.

The Dutch construction industry is often characterised by its “specific nature”. 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, leading to high failure costs. Only 0.2% of the turnover in building and construction is spent on R&D investments; very low

compared to the percentage in capital-intensive (3.6%) and labour-intensive (1.7%) industries. Building and construction also score low in terms of the proportion of knowledge employees in the total workforce.

### Research programme

Against this background our research programme was developed exploring sustainability in terms of processes and business models. We focus on SMEs in the construction industry in the West of Holland. In economic 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 to 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.

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 CO<sub>2</sub> emission and becoming a more sustainable innovator and contributing towards a more sustainable environment, a so-called 'low-carbon' economy (Lisbon Council, 2009).

Following from this problem definition a research question was defined:

How can sustainability be incorporated into a company's operations, in order to maximise its ability to gain competitive advantage and improve its competitive position; and what is the role of the entrepreneur in the process?

Our research programme is centred around four sustainability themes: cradle-to-cradle, social corporate responsibility, climate-neutral construction and customer orientation in the building process. The main assumption underlying our programme is that in order to maintain competitive advantage and market attractiveness - especially in times of economic crisis - companies need to distinguish themselves through sustainable innovation processes and business models. In so doing they contribute towards developing a more sustainable society. Due to their scale however, SMEs have a hard time selecting technological opportunities, translating them into commercial solutions, making the right choices and translating them into a feasible and competitive sustainable innovation strategy for the company.

The programme aims to support companies in their search for sustainable opportunities, while simultaneously exploring the barriers and pitfalls they encounter in that process. The participating companies in this programme differ in type. They more or less cover the entire value chain within the construction industry and represent the total group of SMEs operating in this industry. Participants are architects, engineering consultants, contractors, builders, installation firms and specialist suppliers, e.g. of glass.

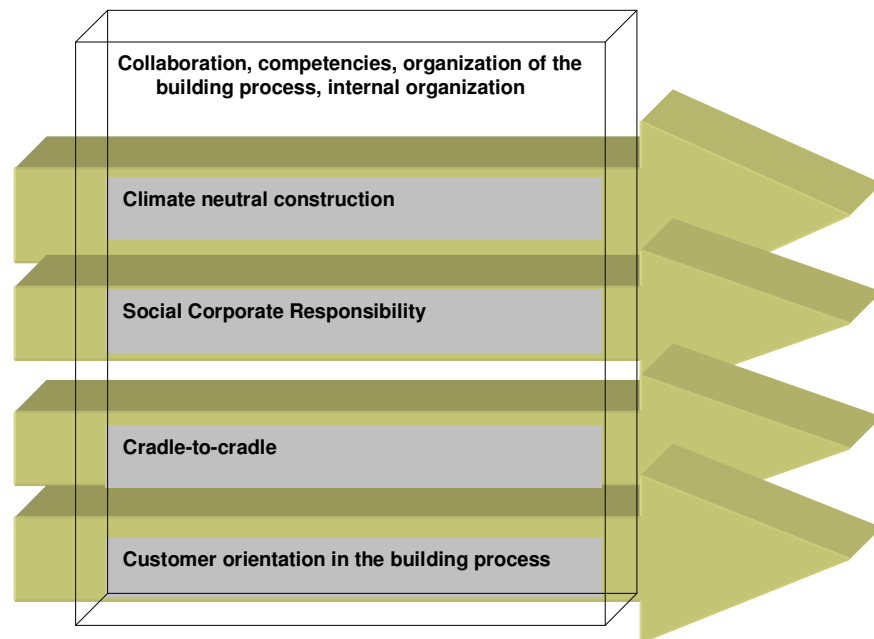
Companies also differ in turnover, employability and innovative capacity (see Table 1). With innovation capacity we mean the ability of an organization to gear their efforts towards the development of new products and processes. It is reflected here in the number of employees dedicated to Research & Development.

**Table 1:** 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 restrictions for 'sustainable innovation' on the four themes mentioned above. As an overlay across these four themes, four aspects were defined relating 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 programme of the CI&E relating to internal processes

In addition to the main research objective, enterprise objectives were formulated. These 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.

### **Methodology and research design**

In general terms, the current programme aims at strengthening multidisciplinary collaboration, knowledge creation and circulation among entrepreneurs, education and research. Using best practice examples of 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.

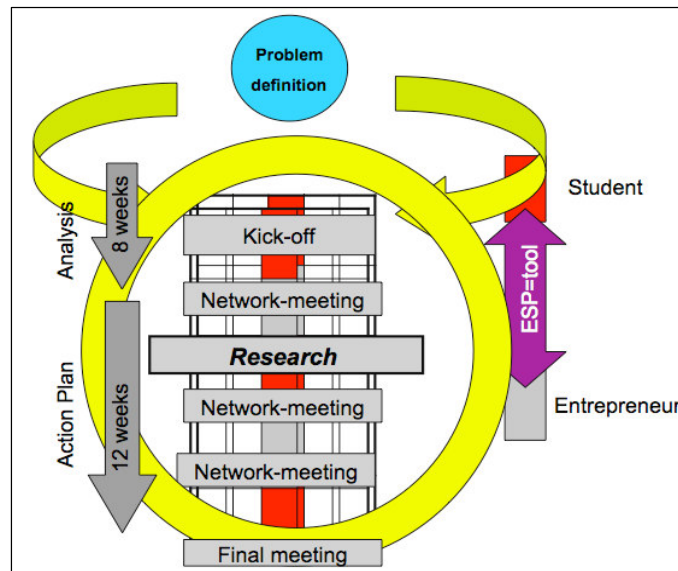
The overall aim of the programme is twofold. Firstly, the objective of the programme is to contribute to the innovative capacity of participating SMEs and development of problem-solving skills. Secondly, the objective is to create an environment in which students, lecturers and companies can share knowledge, learn and work towards specified goals.

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

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

### The process model

In our programme undergraduate students analyse the companies and support them towards the identification of a sustainable strategy and improvement of their business and innovation processes. 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 SMEs

The research was carried out through

- a baseline measurement at the start of the programme,
- an in-depth scan of the company through structured questionnaires
- in-depth semi-structured interviews with the owners/managers of the companies.

The data collected allowed us to make a profile of the company and detect specific problem areas.

The individual process between student and entrepreneur is supported by network meetings with a number of companies. During 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 relate to the four main project research themes in sustainability: cradle-to-cradle, social corporate 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 on the extent to which their behaviour changed through participation in the programme. 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 had to write an action plan for the company where they had been based. 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.

Faculty were evaluated 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

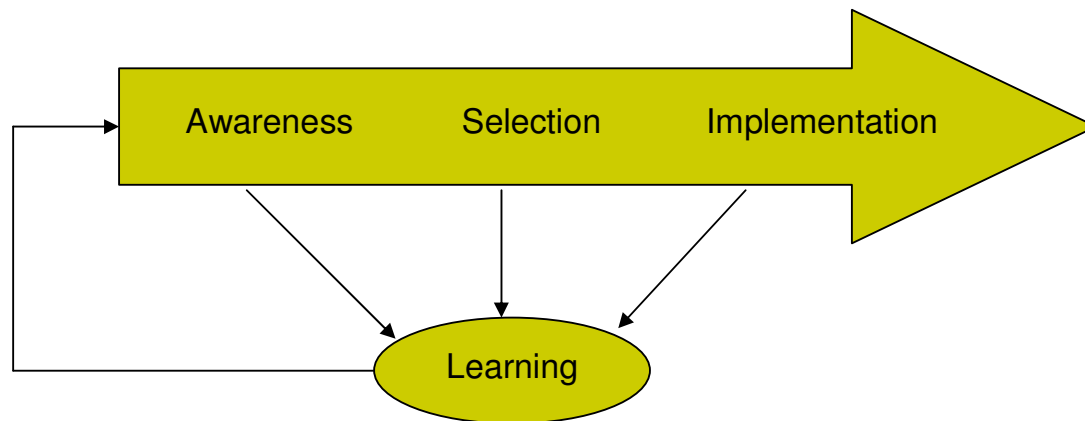
The research model is complementary to the process model. To determine the strategic themes and problems in the industry, key-players and stakeholders were interviewed. In general terms we are interested in establishing how SMEs in this sector innovate and what are barriers for innovation. For the theoretical model we used the broader definition of innovation put forward by De Jong (2006) that innovation is purposefully innovating products, processes and work methods. This definition fits in well 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, process and product innovation. These innovations can be incremental or radical and according to their contribution to organisational growth and continuity can be classified as more or rather less successful. Innovation according to Tidd and Bessant is directly linked to the entrepreneurial skills of the owner / managing director who needs to recognise opportunities and assess their innovation value.

Data collection takes place through the inductive approach. Data triangulation is leading in the approach, as it contributes to the robustness and reliability of the data. In spite of the inductive approach, we decided to build a theoretical framework through desk research. Not so much as to validate that theory, nor geared at the development of a new theory, according to the method developed by Glaser and Strauss (1967), but to bring focus to the research and serving as 'a pair of glasses' through which to look at our study object. The innovation model of Tidd and Bessant (2009) acts as a framework for that purpose. 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.

We use a modified version of their model (see Figure 4) as we introduce reflection and learning stages after each of the steps in the model, thus introducing a continuous learning experience.



**Figure 4:** modified innovation management model of Tidd and Bessant

Against the background of the research question this has proved to be a valuable method to observe reality in similar research programmes we have undertaken in the manufacturing and glasshouse horticultural industries.

### Discussion and findings

Attracting companies in the region to participate in our sustainability programme was difficult and efforts were not very productive. Most of the firms we approached showed little interest in participating in this programme. Thus, so far 24 companies have participated in our programme, whereas more than 300 firms were approached. From the figures it follows that though awareness of sustainability is present in companies, the interest and motivation to actually do something, is low. Entrepreneurs play a key role in that respect. However, the results seem to indicate that the entrepreneurs in the

construction industry involved in our programme are reluctant to take the lead in incorporating sustainability into their company's operations. In this respect they can hardly be called 'agents of change'.

If we look at the participating companies, results show that only 20% of the companies employ people in a dedicated R&D position, whereas only 40% have innovated by creating products or services that are new to the firm. Business models were not innovated. The companies all score low in terms of the percentage of knowledge employees of the total workforce with a background in higher education. Yet, all these aspects are necessary to create an innovative spirit and ambience within the company and develop competencies to generate new business models based on sustainability.

During the network meetings the aim was to raise awareness and disseminate knowledge on sustainability as a business opportunity. The participation of the companies in these meetings was low. For example during a network meeting with one of the biggest housing corporations, a possible major client to the participating companies, only 15% of the companies did participate. This again shows the lack of pro-active attitude and motivation to participate in programmes which focus on a long-term strategy and require a vision on investing for the future.

The results of the in-depth scan of the companies show that, although most of the companies are aware of the urgency to innovate their business model focused on sustainable strategy, 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 diminishes. Most of the companies also complain about the large number of government policy programmes and the counter effect of these policies on their daily business. Because of these policies costs are rising, especially for SMEs 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 sustainable way (Harkema, 2004). The main motivation for participating in this programme 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. The result is a so-called 'circle of blame', which seems to restrict the adoption of a pro-active attitude. This 'circle of blame' can be explained as follows: investors, encouraged by the attention and priority to consider people and planet besides profit, advocate that they wish to invest in sustainable construction projects, but that 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, as 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.

This wide-spread attitude in the value and supply chain makes it very difficult to adopt sustainable business models as alternatives to 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.

The internal organization of the companies is a reflection of the dominant business model in this sector. A more in depth case-study carried out among three of the companies that participated in the programme, 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 at a logistical level, but real chain-integration to diminish failure costs remains limited.



In summary, these characteristics of the market and organisational culture restrict the adoption of sustainability as an alternative option of doing business. The results of the research so far, show that where innovation and particularly sustainability are concerned, the construction industry does not have a pro-active attitude and does not know where to begin. The owners/managers of SMEs complain about high uncertainties involved with future policies. These cause firms to postpone investments in R&D and sustainable innovation activities. Without a dramatic change in attitude in the value and supply chain of the construction industry, sustainable innovation will remain a scarce commodity.

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