

**PRIME INNOVATION AND SUSTAINABLE ENTREPRENEURSHIP IN THE DUTCH
RUBBER & PLASTICS INDUSTRY**

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Abstract

Since the explicit goal setting in the Lisbon Agenda 2010, the Dutch attention for technological innovation is growing to large proportion. The underlying research will focus on the integration of innovation with sustainable entrepreneurship as central notion and the translation of generic guidelines for reporting on sustainability issues into a zero assessment model for sustainability innovations within small and medium-sized companies. The results of the PRIMA project, carried out within the rubber and plastics industry will be demonstrated as an example of explorative research into this field. It will show that many innovations for sustainability are directed at process variables, such as reduction of resource use, energy saving programs and recycling. Companies with more 'sustainability in the core' also show innovation in product design and development of new technologies. Knowledge circulation between the consortium partners provides useful insights in new methods for sustainability innovation.

1. Introduction

Since the explicit goal setting in the Lisbon Agenda in 2000 for the members of the European Union to become the world's most competitive region by 2010, the Dutch attention for technological innovation is growing to large proportions (www.innovatieplatform.nl). Europe lags behind Japan and the United States and need to catch up. Key to address this problem is to innovate more and better than close competitors. To accommodate this policy, the Dutch Government has installed the Innovation Platform, presided by the Prime Minister. Its goal is to strengthen the innovation potential of the Netherlands in order to secure a leading role for the country in the European knowledge economy in 2010 (Innovatieplatform, 2006, The Dutch Innovation Platform. Den Haag)

Also in recent years, researchers have become increasingly interested in innovation theory and the transfer of knowledge. The topic of innovation has been a fruitful source for publication. Innovation is thought to be the main driver for economic development and business competitiveness. In the light of economic recession, these two become more and more important.

According to the sustainable development concept, the direction for innovation and innovation policy should be aimed at improving on economic as well as environmental and social performance. New technologies must be developed to meet sustainability requirements set by society and government. Until now, sustainability innovation and sustainable entrepreneurship are mainly addressed and/or communicated by large companies.

However, the direction for sustainable innovation policy is unclear and under discussion. The main focus for innovation policy is sought in stimulating and facilitating large, often multinational, companies via highly subsidized R&D trajectories. Although these companies contribute significantly to the gross national product and employment rates within the country, the role and significance of small and medium sized enterprises (SME) should not be underestimated. SMEs employ between the 1 and 250 employees per company. They cover over 90% of the total number of enterprises in The Netherlands, accounting for 58% of the employment rates and 51, 5 % of the annual turnover (www.mkb.nl). Also, there are significant differences between large companies and SMEs in innovation processes. Policy AND theory

suited for large companies, does not necessarily lead to successful outcomes within SMEs. It is acknowledged by diverse actors (government, business networks, scholars, etc.) that specification for SMEs is necessary and wanted. For SMEs however, the translation of the sustainability concept into hands-on, daily business strategy and action, is scarce. The publication of 'High 5' by the Global Reporting Initiative in 2005 is one of the few guidelines specifically aimed at SMEs.

The aim of the present paper is to give more insight and empirical evidence on the translation of the generic approach for innovation for sustainability into a SME and sector specific assessment model and the transfer of knowledge on innovations for sustainability between SMEs and knowledge institutions. This will be done by presenting the results of the PRIMA (Prime innovation and sustainable entrepreneurship) project. The Global Reporting Initiative (GRI) guidelines for SMEs on sustainable entrepreneurship are the starting point of this translation and assessment model.

The relevance of this explorative research lies in the importance of innovation for economic growth and business competitiveness, but also a necessity and urge to integrate sustainability aspects in innovation processes, in order to address current and future stakeholder needs and demands. The PRIMA project was initiated by a unique consortium of knowledge institutions, companies and intermediate organisations, which deserves follow-ups.

The results of the present research will indicate that the PRIMA Barometer as a sector specific SME model, proved useful and successful to assess the status quo within SMEs of the Dutch rubber and plastics industry on sustainable innovation and entrepreneurship.

The remainder of the paper is organized in the following way. Section 2 forms the theoretical background of the research, focusing on innovation, SMEs and sustainable entrepreneurship. Section 3 discusses the research methodology and the construction of the zero assessment model. Section 4 discusses the empirical results and section 5 discusses the conclusions. In section 6 some suggestions for future research are provided.

2. Theory

In the following discussion the most prominent research in the field of innovation, SMEs and innovation for sustainability will be described and illustrated.

Innovation

It has commonly been assumed that innovation is the main driver for economic growth in macroeconomic terms. Innovation strengthens the competitiveness for countries as well as for sectors and individual companies. A continuous strive for improvement and renewal of a company's products, processes and organization will contribute to the profitability and continuity of the firm. It leads to quality improvement, increasing variation and diversification in products, increased productiveness and a positive influence on turnover, profitability and employment (Lever & Meijaard, 2003). Other advantages of innovation are protection or extension of market shares, improved operational efficiency, increased employee satisfaction, retraction and competencies, increased reputation and cost reduction. Innovation can either strengthen a firm's existing capabilities and market position, or it may be disruptive by rendering competencies

obsolete or reaching out to new customers and so-far unserved markets (Abernathy & Clark, 1985)

A theory of innovation is fundamentally a theory of change. Innovation research is typically concerned with understanding how innovation emerge, develop, grow, and are displaced by other innovations (Hockerts, 2003). Innovation studies regularly make citations on the work of Joseph Schumpeter, which is the representative of the Austrian school of Innovation theory. His 'Theory of Economic Development' (1934) delivers a broad interpretation of innovation: it comprehends the introduction of a new product, process method, the discovery of a new resource, material or semi-manufactured article, the conquest of new markets and the building of a new organization. Innovation is a process and outcome of 'creative destruction' and is directed at developing new combinations of resources. Whereas Schumpeter speaks of creative destruction, more recent researchers focus on utilizing chances (Kirzner, 1973), goal oriented innovation (Drucker, 1985) and risk taking behaviour (McGrath, 1999). Key to this tendency is that it does not differentiate between different kinds of innovations, the 'newness' of something suffices as discriminator. However, the newness of the innovation is less relevant than the fact that the ideas, practices or objects are new to the operational unit which is adopting them (Bhaskaran, 2006)

In order for an innovation to be effective, or even successful, it must result in a significant change, preferably an improvement in a real product, process or service compared with previous achievements (Harper & Becker, 2004; Amabile, 1997). That this is not an easy task proves that only 1 out of 7 ideas make it to the market (Gobelli & Brown, 1993)

Innovation theory does not just focus on quality improvement or cost reduction, but also on radical 'breakthrough' innovations. Innovation theorists have tended to draw a distinction between the mentioned 'newness' of innovations, which then distinguishes 'radical' and 'incremental' innovations. Incremental innovation introduces relatively minor changes to the existing product, exploits the potential of the established design, and often reinforces the dominance of established firms (Ettlie et al., 1984). Radical innovation, in contrast, is based on a different set of engineering and scientific principles and often opens up whole new markets and potential applications (Dewar & Dutton, 1986). Another issue that is consistently discussed in the literature pertains to measuring and quantifying innovative behaviour (Johannessan, 2001).

The debate on defining innovation is still ongoing and there are almost as many definitions as there are researchers. This underlines the importance of setting research boundaries when using 'innovation' in research. For use in this research, innovation is defined as the development and successful implementation of a new or improved product, process, service or organization, which is new to the company or the market, and is aimed at improving the profitability and competitiveness of the company.

SMEs

Most research on innovation applies to innovation processes in large companies. The innovation process for SMEs however, is different from that of large companies. In short: a SME is not a little big business. SME characteristics can be summarized as followed:

- Resource poverty in terms of capital, time and skilled personnel (knowledge)
- Focus on the short term

- Flexible organization capacities
- Dominant role of the entrepreneur/owner
- Performance measurement in terms of labour productivity rather than profit and growth
- Strong local and regional focus
- Large proportion of family enterprises
- Equipped for niche markets (Heunks, 1998; Welsh & White, 1981; Masurel et al., 2003).

Innovation & SMEs

More than large companies, innovations of SMEs tend to concentrate on applying basis technologies, implementing applied research results from university 'spill-overs', generating new inventions and occupying niche markets. When focusing on sales and marketing innovations, SME innovations are profitable and able to compete successfully with large businesses. Typically, SME innovations can be seen as incremental innovations, which also can lead to substantial competitive advantage (Bhaskaran, 2006).

As pointed out before, the SME is dominated by the entrepreneur/owner. The effectiveness of personal and business contact networks and relationship bonding with individuals in government, research and development corporations, universities and industry in the successful uptake of innovation has been extensively research and discussed in several studies (Merrilees et al., 2000; Barkema et al., 1997). The significant issue is that individuals vary in how they process and interpret knowledge and these variations may have significant but systematic impact on the decision to become an entrepreneur or the relative success of the endeavour (Acs, 2002). Therefore, the individual entrepreneur plays a vital role in the successful development and implementation of an innovation. To increase the chance for innovative success, cooperation with other actors is useful.

SMEs have advantages over large companies for innovating, because of their management structure (bureaucratic vs. small decision making body), their bureaucratic constraints free environment, their placement of innovative activity at the center of competitive strategy and their ability to use university laboratories spillovers for commercial exploitation (Acs, 2002).

Sustainable entrepreneurship

Many scientific publications within the sustainable development concept start with drawing the dramatic scene of a 'dying earth', or a composition of the state of the world which is at the least of mild concern. Many hot spot cases, such as the financial fraud at Enron and the 'battle' of the Brent Spar between Shell and Greenpeace are frequently referred to as incentives for companies to engage in new ways of doing business.

Reviewing the literature, there appears a clear demarcation line marking the beginning of the concept: 1987, with the publication of the report of the World Commission on Environmental Development (WCED, 1987). It defines sustainable development as "seeking to meet the needs and aspirations of the present, without compromising the ability to meet those of the future". The notion of sustainability was originally thought of as development that seeks to be continuous amidst worries that existing development will be resource constrained by the carrying capacity of Earth's natural resources and ecosystems. Elkington's book *Cannibals with Forks* (1997) delivered the now widespread idea of the triple bottom line for sustainable development: People -

Planet - Profit. It requires organisations to fundamentally rethink their position and act in terms of the complex societal context of which they are part (Van Marrewijk, 2002).

Just as with the definition for innovation, sustainable development for companies knows as many definitions as there are companies. Literature shows deficits on defining definitions AND direction for sustainable development. It ranges from doing something with the environment' to 'closing production chains and having no negative impact whatsoever.

Next to this definition problem, sustainable entrepreneurship has its critics. They point out the risk of window dressing within companies that use the concept as a promotional tool. There are also issues with measurability (which indicators to use), playing an important role in the present research. Also the notion that sustainable entrepreneurship knows no blue-prints for implementation, the often fragmental approach for this holistic concept, its Western cultural bias and acting beyond legal requirements, reveals these critiques (see Wilson & Olsen, 2003 for a descriptive overview).

However, the concept has attracted the attention of many, including business. Nowadays, there are a number of motivations that explain the relevance and importance of the concept for companies as summarized below:

- Strategic advantage
- Profitability
- Increasing stakeholder pressure
- Legal requirements
- Reputation concerns
- Environmental performance improvement
- Internal organisation improvements (Ranganathan, 1998; Van Marrewijk & Werre, 2002; Dunphy et al., 2003; Daily & Walker, 2000).

These motivations clearly resemble the advantages of innovation. Sustainability is an innovative and in potential transformative force that generates new products and processes that challenge existing practice.

Innovation for sustainability

Aiming to achieve a prosperous, profitable and accountable business future, there is clearly a need for fundamental industrial change that will depend on technological and social innovation, understood from the social, political and economic forces that shape it (Blum-Kusterer & Hussain, 2001). Sustainable innovations usually have a more radical or transformational character than conventional innovations (Rycroft & Kash, 2000). Sustainable innovations are based on the belief that, in order for an organization to survive, innovations must be introduced to create new opportunities, but with extra conditions, attached to their implementation. The same applies for their necessary contribution to a sustainable society, which has constantly changing requirements.

Whereas innovation in the present research is defined as the development and successful implementation of a new or improved product, process, service or organization, which is new to the company or the market, and is aimed at improving the profitability and competitiveness of the company, innovations for sustainability / sustainable innovations aim also on environmental

and social matters (Von Weizsäcker et al., 1997; Biondi & Iraldo, 2002; Alakeson & Sherwin, 2004). Innovation for sustainability is characterized by introducing and implementing new products, processes, services and organizations which improve the economic, environmental, technical and social performance of a company on the short and long term. It integrates stakeholder demands into decision making and aims at a transformational change of existing practice.

As with innovation within SMEs, research into sustainable entrepreneurship and innovation within SMEs is scarce. On the one hand, a number of scholars argue that SMEs are hardly active in the field of sustainable entrepreneurship (e.g. Hillary, 2000; Hutchinson & Hutchinson, 1996). On the other hand, there are scholars who oppose to this point of view (e.g. Petts et al., 1999). In the present research the assumption is made that advantages for SMEs to integrate sustainable entrepreneurship at the core of the company are comparable to those of large companies, thus indicating the same amount of necessity and urgency. However, there are some conflicting aspects of sustainability innovation within SMEs. On the positive side are the commitment, personal involvement, creativeness and flexibility of the SME, which favours sustainability innovation. On the other hand a resource scarcity (capital, time and knowledge) can be found within those same SMEs. Also the focus on the short term, instead of the long(er) term conflicts with the character of sustainability innovation. The incremental nature of most SME innovations also conflicts with the demanded transformational ability of sustainability innovations. In short: SMEs can be very innovative; the question remains whether their innovations can be marked as innovations for sustainability. When taking on the view that the future only comes nearer day by day, small steps in the direction of sustainability are maybe the highest possible expectancy towards SMEs.

3. Method of Research

As shown in the theoretic section, SMEs are not little big businesses. Therefore, guidelines and instruments developed and used for large companies must be translated into those for SMEs. To address this need for translation of generic guidelines and technological insight specifically on sustainability innovations within SMEs, the project PRIMA ('Prime' innovation and sustainable entrepreneurship) was carried out in the period October 2004 – December 2005 in the rubber and plastics industry. The project itself was aimed at:

- Developing an indicator scan (the PRIMA Barometer) to translate generic into sector specific sustainable innovation and entrepreneurship assessment indicators
- Circulation and transfer of (technological) knowledge on sustainability innovation between SMEs and knowledge institutions.

PRIMA has led to the constitution of a consortium of knowledge institutions including 4 schools of professional education (Windesheim, Zwolle; Avans, Breda; Fontys, Tilburg and InHolland, Alkmaar), Syntens, the Vrije Universiteit Amsterdam's Center for Innovation and Sustainable Entrepreneurship (CIMO), and the Federatie NRK (sector organization for the Dutch rubber & plastics industry). This constellation is fairly new and unique in its kind. The installation of the sustainability readerships in the schools of professional education made this consortium and cooperation possible.

In 1997 the GRI developed some 100 indicators for their reporting guidelines on sustainable entrepreneurship for large companies (www.gri.org). These guidelines have proven useful to indicate the performance on various sustainability issues today. Each change process must begin with the assessment of the status quo in order to be able to define improvement possibilities. When used as a starting point for indicating improvements on economic, environmental and social improvement, they can initiate innovation for sustainability. Recognizing the special characteristics and needs of SMEs, the GRI has recently published the “High 5” guidelines (2005) for these companies. They are a much needed translation to a more hands-on approach.

The present research aimed to develop a translation of the generic High 5 and GRI guidelines into a sector specific assessment model on sustainable entrepreneurship and innovation (the PRIMA Barometer). This is needed because of the assumption that context and entrepreneurship centrality play a vital part in sustainable innovations. The High 5 guidelines focus more on describing a 5 step plan to adjust the GRI guidelines (for larger companies!) to the specific business situation. The High 5 outlines are the following:

1. Prepare: getting started (form a sustainability reporting team/determine resources available/develop timeline for activities)
2. Plan: what to report (describe vision, activities and goals / map stakeholders and interests / set scope & reporting boundaries)
3. Assess: measure your performance (identify GRI indicators / collect information / set targets for next year)
4. Report: tell the news (choose communication method / write & distribute report)
5. Improve: strive for more (collect feedback for improvements).

High 5 is an approach for SMEs to do their own reporting on sustainability indicators. There were no new indicators developed for SMEs, based on SME characteristics. In other words: no real translation was made to the SME level. Another shortcoming in the GRI indicator set is the assumption that organizations have a formal structure based on disciplines (i.e. a logistic staff, an R&D staff, etc.). However, in SMEs there is usual an absence of these formal structures. Innovation and entrepreneurship are informally organized. A portion of the indicators of the GRI therefore cannot be applied, but that doesn't mean the sustainable innovation performance is consequently lower. The guidelines are also mainly intended to serve as a communication tool, rather than an organizational improvement instrument.

In the PRIMA project, the consortium, containing experts on innovation, sustainable entrepreneurship, SMEs and the rubber and plastics industry, discussed thoroughly during brain storm sessions, on how to approach the assessment of the companies on their innovation and sustainable entrepreneurship performance. Instruments which are available for assessment and change pathways, suited for use within the sustainable entrepreneurship context were studied. Starting with “High 5”, also a number of other implementation schemes, tools and instruments were studied (NOTE 1). A set of indicators was chosen as subjects for the assessment.

Another important factor in constructing the assessment model was the available time to conduct the assessment. The information gathering had to be done within the framework of a 2 to 3 hour interview between a student/lecturer and a representative of the participating company. The GRI

framework is not specifically time limited: the indicators and information can be gathered at the company's own speed.

Core elements of the PRIMA Barometer are strategy (organizational aspects), processes and products (including services). The Barometer resembles an interview guide, with open answer possibilities. Whereas many models choose to include answer categories, for instance based on Lickert-scales, the purpose of the PRIMA Barometer is not to 'score points', but indicate what is really going on. The background of this notion is that a 'good' score on (sets of) indicators does not stimulate the implementation of improvement programs, and that the allocated scores are often subjective and based on perception, not facts. For example, the ISO 14001 certification for an environmental management system may achieve high marks, but doesn't necessarily say anything of the state of environmental performance of a company. A company with certification doesn't necessarily outperform a company without one.

The design for the assessment model includes indicators which are derived from the "High 5" guidelines and are inspired by the instruments mentioned in note 1. The found indicators were inventoried and categorized, using mind-mapping techniques. The Barometer is formulated as an interview guide, including the following topics:

1. Company characteristics
2. Financial performance
3. Product quality
4. Working conditions & Safety
5. Environmental management
6. Ethics & transparency
7. Societal focus
8. Innovation
9. Product cycles & dematerialization
10. Renewable resources & energy

The PRIMA Barometer is used during company visits by the participating students and lecturers of the schools of professional education located in the three defined regions. They worked together with local representatives of Syntens and were advised by a representative of the Federatie NRK. A total number of 38 companies participated in the program. The visited companies received a report and analysis on their innovation and sustainable entrepreneurship status quo, alongside with advice on where to start sustainable innovation projects.

The PRIMA project also included an Award event as part of the celebration of the 65th birthday of the Federatie NRK, to pinpoint the Innovation and Sustainable Entrepreneurship Rubber & Plastic Company of the year. In two voting rounds, a regional and a national jury, presided by the chairman of the Federation NRK, awarded the Gold, Silver and Bronze PRIMA Award to three "Champion" companies, which were presented with their prize by the Prime Minister Balkenende during the National Innovation Event 2005.

4. Empirical Findings

This limited investigation ventures to demonstrate how the zero assessment model can be used for determining the status quo on sustainability innovations and entrepreneurship within SMEs of the rubber and plastics industry.

Sector description

Both innovation and sustainable entrepreneurship highly depend on the context for the shape in which they arise. Context characteristics refine the approach and possible outcomes of sustainability innovation. It hardly needs explanation that sustainable innovation for e.g. a financial institution or software company differs from that for an industrial company producing for instance plastic shopping bags.

The present research focuses on industrial SMEs, specifically within the rubber & plastics industry sector. The sector, including some 1100 companies, consists mainly of SMEs (95%) and has a strong export focus (about 65%). The overall turnover is about 6 billion euro. The companies produce and supply a variety of (semi) finished products to industry, building and construction, packaging and consumer products. In numbers: 37% of all plastics go to packaging, 24% to industrial purposes, 20% to consumer products and 19% to construction materials (www.nrk.nl, *Economisch Bureau ING, 2005*)

The relevance of the rubber & plastics industry is found in the fact that this high tech sector is awarded the title 'Most innovative sector in the Netherlands' by the EIM (Dutch Economic Institute for SMEs) in 2005. The sector is further characterized by the application of a diverse range of high tech production technologies, such as vacuum injected moulding, multi layered moulding, composite technology, extrusion, and biopolymers. The sector delivers high tech products, which serve innumerable markets. Companies within the industry are often suppliers in product chains. This leads to the ability to adapt to client demands and market pressures. Innovation within this industry is market-oriented. The necessity for innovation is clear from international competitiveness point of view. The state of the economy and production replacement to low-wages countries impose pressure on the industry to specialize and differentiate. A cost reduction prize-induced innovation strategy will not suffice to maintain a leading position on the market.

The response group of participating companies in the PRIMA project include a representative overview of the variety in company sizes (between 10 and 250, with 2 companies with more than 250 employees [350 and 550 employees respectively]), products, processes and markets served within the rubber & plastics industry.

Performance variance

- Strategy

The smaller companies in the research group do not have a formal innovation strategy which is documented in the organization. The larger companies (more than 100 employees) often have formulated innovation goals, such as targets for improvements on cost reduction, energy use,

innovative output and development of new products. Even without a written strategy, a number of the smaller companies have innovation ‘in the core’: it doesn’t need to be explicit, because innovation is core element of the company. This attitude is mostly found in the younger companies (>2000). Innovation strategy includes a proactive, creative, honest and trendsetting attitude towards markets. Products and services must create added value for the customers, e.g. total support systems, time and labour reductions and performance improvements.

What all companies studied have in common is the central motivation for (sustainable) innovation based on economic performance of the company. This is by itself not uncommon, because continuity requires an economical healthy business. Even so, economic motives for improvement and innovation processes are the main drivers for the companies. Environmental or social aspects are not by themselves drivers for innovation. They must be accompanied with economic advantages to be acted upon.

For some of the companies, innovation only takes place out of cost reduction motives, often demanded by clients. There are also companies which do not characterize themselves as innovative. Others are inspired by new market possibilities, material possibilities and integrated design. Most companies innovate from a product point of view. There were only two or three companies that innovate from an integral design concept, which is inspired by the intended use of the client and the possibilities of design in defining new functions of products.

It is common for the companies that reached the status of PRIMA Award Nominee in the research group to cooperate with horizontal or vertical related companies, knowledge institutions, design bureaus, industry contact groups and sector organizations. Here also the participation in government subsidized R&D programs can be found.

As pointed out in the theoretical section, the SMEs do not have a strong focus on the long term regarding their innovation strategy. The focus is survival, competitiveness and added value today and tomorrow, less on periods more than a year ahead. With this in mind, most innovations are not radical by nature, but incremental. Some do have transformation abilities, such as the replacement of resources by sustainable ones or renewables and the use of sustainable energy resources.

- Products

Most innovative products are innovative by design or function. Regarding the sustainability aspects of these product innovations, these improvements can be found in reduction in weight, energy or material use or because they improve recycle options in the waste phase of a product. Only a few companies have products with innovative material use, e.g. hemp fibre for composite applications or biopolymers as substitute for oil-based materials. Although a large portion of production is export-oriented, there are hardly products designed and developed for use in developing countries. One company in the research group specifically invented “universal glasses” for these countries. Still, this innovation was not a ‘core activity’ of the company.

- Processes

Innovation in processes is either focused on cost reduction (faster, bigger, more automation/robotization, improving internal logistic processes) or introduction of new

technologies (such as sheet layer moulding, vacuum injected moulding, composite technology, drape forming, gas-assisted moulding and micro-milling). When a fairly unique technology for the market is incorporated, it provides significantly competitive advantage.

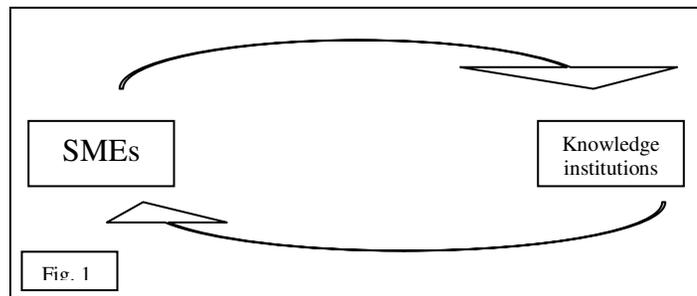
As a whole, the group of companies has their legal environmental and social requirements in working order. Although legal requirements can stimulate innovation, in this project is sought after other stimuli for innovation.

The sustainability focus is for the main group relatively low and usually covered within issues as environmental impact of emissions (to water, air, and soil). Only a few companies were sustainable 'at the core' and focused their innovation efforts in including environmental and social aspects in improving process elements. It seems again that the individual inclination to think from an integrated and sustainable starting point is the main discriminator between truly sustainable innovators and innovators with attention for environment and social aspects.

- Knowledge circulation

The interaction between the knowledge institutions and the companies proved fruitful. A circulation of knowledge between the companies and the schools of professional education as shown in fig. 1 emerged.

On the one hand the students learned a lot on how sustainability issues and innovation is handled within SMEs of the rubber and plastics industry. They enhanced their knowledge level on techniques and innovation approaches specific to this industry. On the other hand the companies in return got a fresh and outside look on their operations and often good starting points for improvement.



They provided the knowledge institute with specific information and by doing so, improved the definition of possible problem fields within the organization. This circulation process proved self-enhancing, because information and knowledge sharing enhanced the knowledge level on both sides.

The technological knowledge transfer was relatively low, mainly caused by the background of the students and lack of training in plastics-specific technology at their institution. Even so, the specialities of the lecturers involved gave useful insights in new technological developments in the fields. For the companies it is also a welcome communication line with possible future employees.

The assessment model proved useful in assessing the companies on their economic, environmental and social traits and performance in a detailed form. Although not intended to make rankings between participating companies, it was possible to select three Innovation & Sustainable Entrepreneurship Award winners. This could only be done with thorough discussion on the relative importance of the investigated performance parts. This indicates also one of the

weaknesses of the model: there is no weighing involved in the assessment. This is also its strong point, because weighing is only useful within the context and possibilities of the company.

6. Conclusion & Discussion

This descriptive and explorative study into the translation of generic guidelines into a sector specific zero assessment model for describing innovation and sustainable entrepreneurship within the rubber and plastics industry, has uncovered several important factors that are associated with the characteristics of both sustainable entrepreneurship and innovation within SMEs.

The results on the assessment model show that there is in fact a balancing act within the participating companies to integrate social, environmental and economic factors in innovation processes. They are mainly driven by economic advantages, but nevertheless in place. Innovation within the companies focuses generally on two aspects: product development (often incremental innovation) and process enhancement by the introduction of new technologies. Although some of the elements of innovation for sustainability are in place, such as combining and balancing economic, environmental and social elements within innovations, most innovations in the research group cannot be seen as ‘true’ sustainability innovations. The main ‘problem’ here is the incremental and short term character of innovations within the studied SMEs. In order for an innovation to be truly sustainable in nature, these elements must be included. However, it goes too far to say that there is no such thing as sustainability innovations within SMEs. The clue is in the size of the steps towards sustainability. In the end, sustainability is a dynamic concept: the dependence on future needs and stakeholder demands will shape the direction and improvements necessary to follow it. It can only become better. The PRIMA Barometer suited the purpose of the PRIMA project with its limited time resources very well and this is also one of its main advantages above the generic GRI guidelines: it does not take a lot of time to uncover sustainability performances of SMEs, which is a good thing, because SMEs also have limited amounts of time for ‘non-core’ activities (i.e. things that do not necessarily include organization productivity). An other advantage is the

The results on the knowledge circulation show that a self-enhancing communication on knowledge about sustainability innovation is developed, which provides a win-win situation for all parties involved. The consortium proved to be effective, but still will need maintenance in order to be sustainable itself. Regular contact moments are therefore required, accompanied with knowledge transfer and feedback.

7. Future Research

This issue deserves further empirical study, also because of the body of research on the subject of sustainable innovations within SMEs is fairly scarce and fragmented. Another promising line of research would be to carry out the same analysis in other sectors and to repeat the assessment within the rubber and plastics industry during the course of several years (maybe even decades) to uncover sector and time related developments and success variables for sustainability innovations.

Notes

1. Sources for implementation schemes, tools and instruments for assessing sustainable entrepreneurship and innovation include NGOs, Consultancy firms, Academic researchers, business councils, and knowledge institutions. For an overview, see Brouwers, 2004.

References

- Abernathy, W.J., Clark, K.B., 1985, Innovation: mapping the winds of creative destruction. *Research Policy*, vol. 14, pp. 3-22.
- Acs, Z.J., 2002, *Innovation and the growth of cities*. Edward Elgar Publishing Ltd., Cheltenham, UK.
- Alakeson, V., & C. Sherwin (2004) *Innovation for sustainable development*, www.forumforthefuture.org.uk.
- Amabile, T.M., 1997, Motivating creativity in organizations: on doing what you love and loving what you do. In: *California Management Review*, vol. 40, issue 1, pp. 39-58.
- Barkema, H.G., Bell, J.H.J., Pennings, J.M., 1996, Foreign entry, cultural barriers and learning. In: *Strategic Management Journal*, vol. 17, issue 2, pp. 151-166.
- Bhasrakan, S., 2006, Incremental innovations and business performance: small and medium-size food enterprises in a concentrated industry environment. In: *Journal of Small Business Management*, vol. 44, issue 1, pp. 64-80.
- Biondi, V., & F. Iraldo (2002) Achieving sustainability through environmental innovation: The role of SMEs. *International Journal of Technology Management*, 24 (5/6), 612-626
- Blum-Kusterer, M., & S.S. Hussain (2001) Innovation and corporate sustainability – an investigation into the process of change in the pharmaceutical industry. In: *Business strategy and the environment*, vol. 10, issue 5, pp. 300-316 .
- Brouwers, H.E.J., 2004, *Possible in practice: an analysis of possible approaches for the implementation of corporate sustainable development into a multinational corporation: a case study of Akzo Nobel Chemicals*. Master thesis, Katholieke Universiteit Nijmegen, Nijmegen.
- Daily, G.C., Walker, B.H., 2000, Seeking the great transition. In: *Nature*, no. 403, 2000, pp. 243-245.
- Dewar, R.D., Dutton, J.E., 1986, The adoption of radical and incremental innovations: an empirical analysis. In: *Management Science*, vol. 32, pp. 1422-1433.
- Drucker, P.F., 1985, *Innovation and entrepreneurship*. Harper Business, New York.
- Dunphy, D., Griffiths, A., Benn, S., 2003, *Organizational change for corporate sustainability*. Routledge, New York.
- Economisch Bureau ING, 2005, *Kunststofindustrie: sectorstudie*. ING Bank, Amsterdam.
- Elkington, J., 1997, *Cannibals with forks*. Capstone, Oxford UK
- Ettlie, J.E., Bridges, W.P., O'Keefe, R.D., 1984, Organizational strategy and structural differences for radical vs. incremental innovation. In: *Management Science*, vol. 30, pp. 682-695.
- Global Reporting Initiative, 2005, *High 5: communicating your business success through sustainability reporting*. www.gri.org
- Gobelli, D.H., Brown, D.J., 1993, Improving the process of product innovation. In: *Research Technology Management*, vol. 32, issue 2, pp. 38-44.
- Harper, S.M., Becker, S.W., 2004, On the leading edge of innovation: a comparative study of innovation practices. In: *Southern Business Review*, vol. 29, issue 2, pp. 1-15.

- Heunks, F.J., 1998, Innovation, creativity and success. In: *Small Business Economics*, vol. 10, issue 3, pp. 263-272.
- Hillary, R. (Ed.), 2000, *Small and medium-sized enterprises and the environment*. Greenleaf Publishing, Sheffield, UK.
- Hockerts, K.N., 2003, *Sustainability innovations: ecological and social entrepreneurship and the management of antagonistic assets*. Dissertation, University of St. Gallen, Germany.
- Hutchinson, A., Hutchinson, F., 1996, *Environmental business management*. McGrawHill, London, UK.
- Innovatieplatform, 2006, *The Dutch Innovation Platform*. Den Haag.
- Johannessen, J.A., Olsen, B., Lumpkin, G.T., 2001, Innovation as newness: what is new, how new, and new to whom? In: *European Journal of Innovation Management*, vol. 4, issue 1, pp. 20-31.
- Kirzner, I.M., 1973, *Competition and entrepreneurship*. University of Chicago Press, Chicago.
- Lever, M., Meijaard, J., 2003, Trends in het midden- en kleinbedrijf. In: Risseeuw, P., Thurik, R.(eds.), *Handboek ondernemers and adviseurs: management en economie van het midden- en kleinbedrijf*. Kluwer, Deventer.
- Marrewijk, van, M., Werre, M., 2002, *Multiple levels of corporate sustainability*. European Corporate Sustainability Framework. www.ecsf.info .
- Marrewijk, van, M., 2002, *Concepts and definitions of CSR and Corporate Sustainability: between agency and communion*. www.ecsf.info .
- Masurel, E., Montfort, van, C.A.G.M., Lentink, R., 2003, *SME innovation and the crucial role of the entrepreneur*. Research Memorandum, Vrije Universiteit Amsterdam, Amsterdam.
- McGrath, R.G., 1999, Falling forward: real options reasoning and entrepreneurial failure. In: *Academy of Management Review*, vol. 24, issue 1, pp. 13-31.
- Merrilees, B., Tiessen, J., Miller, D., 2000, Entrepreneurial internationalization: the role of distributor/client relationships. In: *Journal of Research in Marketing and Entrepreneurship*, vol. 2, issue 1, pp. 57-73.
- Petts, J., Herd, A., Gerrard, S., Horne, C., 1999, The climate and culture of environmental compliance within SMEs. In: *Business Strategy and the Environment*, vol. 8, issue 1, pp. 14-30.
- Ranganathan, J., 1998, Sustainability rulers – measuring corporate environmental and social performance. In: *Sustainable enterprise perspectives*, May 1998. World Resources Institute.
- Rycroft, R.W., & D.E. Kash (2000) Steering complex innovation, *Research Technology Management*, 43 (3), 13-18.
- Schumpeter, J.A., 1934, *The theory of economic development: an inquiry into profits, capital, credit, interest and the business cycle*. Harvard University Press, Cambridge, MA.
- WCED - World Commission on Environment and Development, 1987, *Our Common Future* ('The Brundtland Report'. Oxford University Press, Oxford, UK.
- Weizsäcker, von, E-U, A.B. Lovins & L.H. Lovins (1997), *Factor four – doubling wealth, halving resource use*. London: Earthscan.
- Welsh, J.A., White, J.F., 1981, A small business is not a little big business. In: *Harvard Business Review*, July-August, pp. 18-32.
- Wilson, A., Olsen, L., 2003, Corporate responsibility – who is responsible? In: *The Ashridge Journal*, spring issue, pp. 19-24.