

Negotiating innovation; Product renewal as the outcome of a complex bargaining process¹

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Negotiating innovation:

Product renewal as the outcome of a complex bargaining process

Abstract

In this paper, it is argued that innovation can be the result of a repetitive, multi-actor negotiation process. We present the case of an environment-related product innovation in a large multinational company which emerged as the outcome of a complex interaction process in which numerous external and internal actors negotiated to safeguard their own interests. This negotiation perspective challenges conventional economic views of innovations, in which new products and processes are regarded as exogenous variables, the outcomes of deliberately planned research, or the combination of technology (pushing) and market (pulling) inducements. Instead, innovation may be a non-linear, unpredictable process which involves multiple actors with divergent interests and which leads to outcomes that are collectively acceptable but not necessarily (sub)optimal.

Key words: Innovation process; Negotiation; Conflict of interests; Cooperation

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Over the past few decades, many firms have been engaged in an ongoing struggle to deal effectively with their rapidly changing technological and competitive environments (Duysters and De Man, 2003). In today's global industries, the main engine of economic change is often associated with technological progress. Technological change has posed major threats to incumbent organizations and opened up windows of opportunities for new entrants. Technology competition has, therefore, become one of the main themes on the agenda of corporate managers worldwide. In view of these developments, it is of eminent importance to thoroughly understand the specific characteristics and drivers of technological change.

For many years, the nature of technological change remained a 'black box' in the academic literature (Rosenberg, 1982). In an attempt to open up this 'black box', many innovation studies have examined technological change as a firm-controlled process. In this tradition, innovation scholars have described the dynamics of technological innovation (Dosi, 1984, 1988; Nelson and Winter, 1982). There is a growing consensus in the innovation literature that in order to understand the specific characteristics and drivers of technological dynamics, we need a deeper understanding of the underlying mechanisms which facilitate or hamper technological innovation.

The origin of technological innovation has long been debated in terms of 'technology push' versus 'demand pull'. Whereas up to the 1950s the innovation process was generally described in terms of technology push, in the 1960s and 1970s, much of the literature stressed technology pull factors as the most important drivers of innovation.

In the former case, organizations engage in research and development (R&D) which is driven by internal actors and which results in new products or processes. In the latter case, organizations respond to external inducements, such as new market demand or government regulation, to which no adequate responses can be formulated with their existing stocks of technical knowledge. More recently, we have witnessed increasing consensus in the innovation literature about the need for a combination of pull and push factors (Barabba, 1995; Dosi, 1982; Mowery and Rosenberg, 1979; Piper and Naghshpour, 1996).

In particular, it is increasingly recognized that we are moving away from the classical 'closed' model of innovation towards an 'open' innovation model in which the external environment (consumers as well as other companies) play an increasingly important role (see, e.g., Chesbrough, 2003). Open innovation arises from external acquisition of know-how by means of strategic alliances, spin-ins, but also by means of interaction with major customers. The recent innovation management literature has focused not only on the internal organization of innovation, stressing the importance of limited structure, low-cost trials, and good pacing (Brown and Eisenhardt, 1997), but has also highlighted the external acquisition of know-how by means of strategic alliances, mergers, and acquisitions (Duysters and De Man, 2003; Hagedoorn and Duysters, 2002; Vanhaverbeke, Noorderhaven, and Duysters, 2002) as well as the involvement of suppliers and customers in the innovation process (Jolly, 1997; Primo and Amundson, 2002).

In the business community, more attempts are being made to involve suppliers and customers in the early stages of the product development process (see, e.g., Wasti and Liker, 1999). The business community has become increasingly aware of the

important aspects of negotiations between major players in the innovation process. However, in spite of the widespread use of customer involvement in, for example, prototyping, and the involvement of suppliers in the innovation process, the academic literature still tends to ignore the specific aspects of negotiation as an important factor in the innovation process.

In order to fill this void, we present evidence of an environmentally benign product innovation in a large company that was shaped by a complex pattern of negotiations between a host of internal and external actors who were involved in different stages of the process that culminated in innovation.¹⁾ The present paper adds important insights to the innovation literature because it presents a novel perspective: innovation as the outcome of a negotiation process, a multi-faceted, continuous pushing and pulling among the external and internal actors involved.

We also add to the negotiation literature by addressing bargaining in the context of innovation. Business organizations have been represented as (shifting) coalitions of actors (Cyert and March, 1992; Mintzberg, 1983; Murnighan, 1986; Pearce, Stevenson, and Porter, 1986; Pfeffer, 1992) who often bargain collectively to enhance the promotion of their private interests. Companies also negotiate with their external environments (Cyert and March, 1992; Pfeffer and Salancik, 1978; Phillips, Lawrence, and Hardy, 2000). Negotiations in and around organizations are driven by divergent interests and are enabled by unevenly distributed information and uncertainty as to the distribution of outcomes (Bacharach and Lawler, 1998; Putnam, 1990). The bargaining dynamics of innovations, which are central to this paper, have not been previously addressed in the negotiation literature.

Product innovation shaped by a complex process of negotiations was the outcome of a study in which we focused on the interaction dynamics among actors involved in innovation. We were interested in knowing what actors in and around business organizations are directly and indirectly involved in innovations. Apart from identifying critical actors, we investigated how and why these actors interacted with one another. The extant literature tends to implicitly assume that innovations occur as the joint optimization of technological problems for which organizations need novel solutions (Inkpen and Crossan, 1996; Kogut, 1988). Our feeling was that internal and external actors involved in innovation do not necessarily cooperate willingly because they may have conflicting interests (Bacharach and Lawler, 1998; Cyert and March, 1992; Hardy and Phillips, 1998; Oliver, 1990).

We addressed our research questions through an extensive case study of an environmentally benign product innovation in a large company. The focal organization had a strong innovation track record. By focusing on environmental regulation that induced a large firm to engage in innovation, we considered the possibility of divergent interests. The case study is a suitable method to investigate such complex social interactions (Yin, 1994).

The paper is organized in three sections. First, we explain the empirical method applied and elucidate the selection of the case. Second, we describe relevant aspects of the focal organization: its general and environment-specific antecedents, its environmental management structure, and the innovation process. The antecedents and the management structure indicate the historical and structural context within which environmentally relevant innovations are embedded. Finally, we relate the

outcomes of the case study to the extant literature and make suggestions for an innovative research agenda.

EMPIRICAL METHOD

Our empirical investigation of the interaction dynamics of actors involved in negotiation consisted of an extensive case study. We adopted the case study method because of its suitability for analysing complex interactions of relevant factors. While the case study may present limitations in terms of analytical rigour, dealing with large numbers of observations, and generalising context-specific outcomes (Eisenhardt, 1989), it is a suitable method to observe the concurrence of multiple causal factors (Ragin, 1987), to contextualize these causes (March, 1979), and to trace the unfolding of processes (Yin, 1994).

The focal case was a multinational company, labelled as Eureka for reasons of confidentiality. The organization was selected because we expected that its very large size and its reputation as a technically advanced company would enable the observation of complex interaction patterns around innovations. We analysed the company at the divisional level because this was the highest echelon that was likely to show relatively coherent patterns of influence around particular innovations (Eureka's different divisions were involved in divergent businesses). The study focused on environmental management practices, the ways in which the selected division dealt with issues related to the environment. In the environmental arena, both conflict and cooperation are likely to occur (Lévêque and Nadaï, 1995; Westley and Vredenburg, 1991). Ecological and economic imperatives involve 'win-win' situations when companies redesign production processes to save inputs and thus prevent pollution

(Porter and Van der Linde, 1995) or seize new market opportunities stemming from the demand for environment-friendly products (Elkington and Burke, 1989). Firms also realise that their (long-term) performance is contingent on the congruence of the environmental impact of their activities with societal expectations (Hart, 1995). In the last thirty years, rising expectations have increasingly induced companies to be sensitive to environmental concerns in order to meet environmental legislation and to retain their societal legitimacy (Hoffman, 1997). Companies may thus engage in environmentally inspired actions for reasons of financial pay-off, regulative compliance, or societal legitimacy. Seizing 'win-win' opportunities, meeting legislative imperatives, or responding to calls for different business practices requires concerted actions by organizational actors, which may result in novel products or processes.

Interviews provided the main source of information. They are an effective means to collect sensitive, specific, unambiguous, and in-depth information (Mishler, 1986; Yin, 1994). The interviewer's physical proximity establishes a climate that is conducive to the transfer of confidential information. The direct interaction between interviewer and respondent enables the immediate clarification of ambiguous statements and the further elaboration of salient information. Interviews also allow for the empirical establishment of causal relationships (Eisenhardt, 1989; Miles and Huberman, 1994). Spurious relations can be ruled out by analysing at the micro level and by directly addressing the inducements of the actors involved. We conducted the interviews with the help of a semi-structured questionnaire, highlighting different aspects of a respondent's relationship with important actors inside and outside the focal organization. The first interview was conducted with the division's environmental coordinator. He was the central actor, the person who fulfilled a pivotal

role in environmental management on behalf of his division. The environmental coordinator named internal and external actors whom he perceived as important. Through this 'snowball sampling' (Simon and Burstein, 1985) or 'names generator' (Angot and Josserand, 1999) method, peripheral actors were identified. They were subsequently interviewed on their relationship with the central actor. Interviews were also conducted with other actors who were expected to have salient information. Overall, seven internal and three external actors were interviewed: two representatives of the divisional environmental department, three senior managers (of a major business unit, the divisional purchasing department, and the divisional marketing department), two representatives of a corporate research laboratory, a national government official, a representative of the European Commission, and a competitor. In-depth conversations of about one hour each were held with these respondents in the course of 2000. The interviews covered topics like the environment-related objectives pursued by the respondents, the environment-related importance they attributed to other actors, the nature and frequency of their contacts with others, the environmental claims or expectations they had regarding other parties, their own responsiveness to demands by others, the reasons for considering other actors, and the evolution of their environmental relationships with other parties. All the interviews were tape-recorded and transcribed. Personal observations, a visit to a research laboratory, and 37 secondary documents (including annual financial and environmental reports, brochures, governmental reports, and newspaper articles) provided additional information. Interesting non-verbal observations were also noted. Likewise, all passages from the archival data pertaining to environment-related innovations and interactions among major actors involved or providing generic background information were transcribed.

All the transcripts were analysed with the help of an effective qualitative software package, Atlas/ti (Weitzman and Miles, 1995). This package facilitates the selection, coding, bundling, and analysis of qualitative data. Chunks of text that we interpreted as relevant were electronically connected to pre-established, theoretically inspired codes (such as ‘acquisition of knowledge’ or ‘formal influence’) and ‘emerging’ codes (i.e., categories related to unexpected, salient evidence). For each code, Atlas/ti then grouped the earmarked passages from different sources; this facilitated the analysis of similarities, differences, and complementarities of data related to a particular issue. On the basis of the analysed passages of all the (pre-established and emerging) codes, a case report was written. This report was anonymised and converted into a case description.

An unexpected process of innovation clearly emerged out of the data. Emergent findings that are firmly grounded in the evidence can shed new light on the body of theoretical insights (Eisenhardt, 1989). The representation of innovation as the outcome of a bargaining process seems to provide such a novel perspective. We would like to emphasize that our focus is on incremental innovations. In the literature, it is generally acknowledged that, although customer interaction is important for incremental innovations, its role in determining radical innovations is much more contested (Christensen, 1997, Vercauteren, 2004). Several case studies have, however, pointed out that radical innovations may also be the result of the input of major users (Jolly, 1997; Vercauteren, 2004).

INNOVATION AS A NEGOTIATION

Antecedents

Eureka was created over a century ago. Starting out as a small, craftsmanly family business, it has evolved into a huge industrial corporation, with over 200,000 employees in 25 countries.²⁾ In its 200 subsidiaries, the company manufactures over 1,500 different product families for both professional and consumer markets. It has the public image of an innovative supplier of branded quality products. Eureka's products are sold all over the world. Europe is by far the most important market, followed by North America and Asia. Eureka's shares are traded on several stock exchanges. In the last ten years, the company has gone through several rounds of restructuring to improve its poor financial performance.

The focal division is the largest of Eureka's six divisions, representing 40% of the company's overall sales. Worldwide, the division is among the five largest in its sector. Its headquarters, which leave the impression of a typical bureaucracy, are situated in the Netherlands. All production activities take place in other countries. Though technical product performance is important in the division's markets, the sector has also witnessed an intensive price competition, involving structurally declining sales prices. Consequently, the division is very much focused on cost control. Eureka's division positions itself as a supplier of innovative quality products. The organization supports its quality image by presenting itself as a responsible corporate citizen that takes a progressive stance towards environmental issues.

Eureka has had an environmental focus since 1993. The company first took a fairly defensive position, aiming merely at legal environmental compliance. Afterwards, it focused on eco-efficiency: the realization of both internal cost reduction and

improved environmental product performance (for example by reducing the quantity of packaging materials). Recently, Eureka has also embraced the principle of 'green' marketing: promoting the sales of its products by pointing to their favourable environmental performance. Eureka's behaviour is — directly and indirectly — oriented towards customer satisfaction. A favourable environmental performance contributes to a positive customer assessment of Eureka's products, though market research by Eureka's national organizations has shown that only a minority (25%) of the division's customers attribute some importance to environmentally related characteristics. According to Eureka's current environmental mission statement, "the company is committed to continuously exploring solutions to successfully balance economy and ecology." Important environmental issues include energy consumption, toxicity of inputs, packaging, and solid waste. Eureka has established targets for each of these areas: a 25% improvement of the energy efficiency of its products in the year 2000 (as compared with reference year 1994), a 98% decrease of the most toxic inputs in 2002, a 15% reduction of packaging in 2000, and a 35% decrease of solid waste in 2002.

The environmental actions of Eureka's focal division initially consisted of end-of-pipe measures, such as placing filters to avoid uncontrolled emissions of its waste streams. Afterwards, it engaged in controlled production, involving measures of good housekeeping. At present, the organization has embraced the principle of 'green' product design. This implies re-conceiving product specifications with the objective of realizing a more favourable environmental impact. The division's action programme for the period 1998-2002 has taken products with an outstanding environmental performance as its cornerstone. Eureka's division started integrating environmental aspects into its marketing activities in 1999. It conducted

environmental market and SWOT analyses. The major production-related measures are efficient product design (aimed at minimizing the total environmental impact of products throughout their entire life cycles), the use of secondary rather than virgin materials, careful production planning, efficient engineering, good housekeeping, adopting a formal environmental management system (ISO 14001), and requiring the division's suppliers to abstain from supplying banned toxic substances.

The division's environmental performance in 2000 includes the following figures: a 50% reduction of energy consumption, a complete elimination of the most toxic substances, a 15% decrease in packaging, and a 60% reduction of solid waste (as compared with the reference year). Outsiders perceive the focal division as progressive, outperforming its competitors in the environmental field. Eureka has been a member of the World Business Council for Sustainable Development since 1993. It has published annual environmental reports since 1998.

Environmental management structure

Eureka's focal division consists of five business units. In conjunction with sales, which is organized according to geographical regions, and purchasing, which is structured functionally, this yields a three-dimensional matrix structure (see Figure 1).

The division's bottom-line responsibilities are geographical. Environmental responsibilities are part of line functions. The environmental strategy is crafted at the divisional level, while its implementation has been delegated to local levels.

Eureka's focal division has environmental coordinators at the divisional, business unit, national, and subsidiary levels. The divisional coordinator is the head of an environmental staff group of some ten technical experts, who prepare divisional environmental plans and who provide support (training, facilities, technical advice,

manuals) to business units and others in the division. The environmental staff group's revenues accrue from the sales of its environmental services to the different business units.

Steering groups are standing committees that consist of representatives from business units, the divisional environmental staff group, purchasing, and marketing. Steering group meetings are chaired by Management Team (MT) members of the business units involved. The steering groups initiate, coordinate, and evaluate divisional environmental initiatives. They consider the overall environmental progress and stumbling blocks from different perspectives. During the quarterly steering group meetings, the divisional environmental coordinator brings in environmental proposals. Environmental targets, such as a particular reduction of energy consumption, are discussed within the steering groups. These discussions are inspired by information from national marketing departments on the environmental interest of customers, which is a central concern of Eureka. Commonly established targets are incorporated for implementation into environmental action plans. In a complex organization like Eureka's focal division, action plans are an important tool for communicating between the different entities. They specify agreed targets, responsible persons, and time frames. The action plans are communicated throughout the division to all the internal actors involved.

Insert Figure 1 about here

To implement the action plans, the purchasing department holds biweekly plan-do-check-act meetings. They are necessary to initiate and evaluate the progress of environmentally inspired actions, such as requiring all of the division's 1,500 suppliers to provide technical evidence that they do not provide any banned toxic substances. Purchasing contracts are broken with suppliers of banned substances and with those who do not provide convincing negative evidence. Likewise, the division's 1,500 product developers, who come under the respective business units, have to incorporate the agreed environmental targets into their product specifications. They prescribe some 45,000 components for the division's different products. Product developers spend 5-10% of their time on environmentally oriented product design. Because of the important financial implications, product development is a routinized process in which there is little tolerance for surprises. Experts are made responsible for newly formulated environmental targets (such as a particular reduction of energy consumption) and create teams to achieve these targets. Project groups are in charge of the realization of environmentally improved products. During their biweekly meetings, they consider all relevant aspects (such as product development, purchasing, and finance) and develop short-term action plans. With the help of manuals, which show examples of good environmental practices, solutions are tailored to the existing situations. In case the available technical knowledge falls short, a business unit addresses itself to one of the corporate research laboratories.

These laboratories, employing some 3,000 persons, focus mainly on break-through innovations in a particular area (for instance, energy consumption). The laboratories are paid on a project basis by the different business units. Once a year, laboratory managers discuss quantitative research objectives with MT members of the respective business units. The objectives on which agreement is reached are then specified in

action plans. Progress is evaluated on a quarterly basis. These reviews regularly lead to the adjustment of established targets (for example, because innovations take more time or financial resources than expected). At the outset of a project, an extensive pre-screening — involving a literature study and the tracing of patents — takes place. If no external solutions to the existing problems are available, an ad hoc research team of technical specialists from a variety of fields gathers to brainstorm on possible solutions. The team evaluates the different options on the basis of three relevant factors: cost, utility, and risk. Decisions on the most promising ideas are taken by consensus. One or two persons subsequently become responsible for their elaboration. This occurs by means of physical experimentation and, increasingly, through computer simulation. The laboratory end products consist of measurement results, innovative concepts, and prototypes. They are documented for application throughout the company. Innovation projects take some two to three years, of which 5% is dedicated to the generation of new ideas and the rest to their elaboration. About 30% of all research outcomes are eventually applied in new products or processes. Inventions serve as inputs for product developers, who integrate and fine-tune them before coming to new product specifications. These specifications are written down in bills of materials, which purchasing and manufacturing departments have to respect when procuring inputs and producing outputs.

The innovation process

The sequence of events that eventually result in an innovation is highlighted in this subsection. We focus on one issue, the reduction of energy consumption, to describe the process of interaction among major external and internal constituencies that culminated in a product innovation.

External interactions

In order to reduce the pace of global climate change induced by human intervention, the European Union (EU) and its member states have formally committed themselves to the reduction of 'greenhouse gas' emissions, in particular through the Kyoto Protocol (concluded in 1997). The products of Eureka's focal division consume energy when used by their customers. As they contribute to global climate change, they are thus eligible for regulation. The European Commission (EC) takes regulative initiatives on behalf of the EU. Legislation is the conventional regulative mode, which has clear advantages in terms of committing all EU subjects and imposing relatively strict measures. But legislation is a lengthy, costly, and restrictive process. It takes several years, involves the consent or consultation of many parties (including EU member states, the European Parliament, and non-governmental organizations), and lacks flexibility (by imposing specific environmental measures). Moreover, legislation may not deteriorate the competitiveness of European industry. Therefore, the EC prefers concluding covenants with industry. This 'soft' regulation — which the EC calls 'negotiated agreements' — consists of performance-related targets (such as a particular percentage of energy reduction by a particular date) to which an industry commits itself. In return, industry has the flexibility of choosing measures and is exempted from (stricter) legislation.

Before starting negotiations, the EC has to perform a study on the effects of the envisaged measures on the focal sector. This study is conducted by external experts, but requires input from industry (technical and financial data). While this renders the EC dependent on industry's willingness to provide full and unbiased information, an EC representative trusts that industry understands its own interest in operating

transparently. Once the study is concluded, the EC consults with certain constituencies (such as environmental pressure groups and customer associations). After considering the interests of these interest groups, the EC sets desirable targets. This triggers a process of negotiation. The EC representative: “Ideally, you [the EC] want industry to agree with whatever measure you propose, but it’s never reality. So you always know that industry is trying to pull the other one down, to reduce the levels, and is never overenthusiastic. It is just a matter of negotiation with them.” Eureka’s divisional environmental coordinator shares this view: “With government, everything is a negotiation game.”

The EC never negotiates with individual companies, only with supranational trade associations. The challenge of industry is to align the interests of companies with different technical and financial capabilities, visions, and cultural backgrounds. Hence, measures that involve unevenly distributed (technical) capabilities may lead to competitive disparities. Besides, the trade association has to gain support from a large majority of industry, because ‘free riders’ (i.e., non-participating companies) avoid legislation while having a competitive advantage due to their abstention from (costly) environmental measures. This disparity issue is particularly important in the focal sector because intensive competition has led to structurally declining sales prices and low profit margins. Thus, industry’s interest was to involve a large majority of suppliers and to obtain technically feasible measures that did not entail high additional costs. This common interest was stressed during the intensive negotiations that were conducted between the different suppliers; company-specific situations were not discussed. According to the representative of a company involved: “Where we think to outperform the competitor, we just remain silent about it, try to realize it with our products, and take a headstart in the market. (...) Only common threats are

discussable.” After a year of negotiations, 16 companies (covering 80% of the focal market) aligned themselves and signed an agreement with the EC to reduce the energy consumption of particular products by about 30% in 2000 (as compared with the reference year 1995).

The environmental coordinator of Eureka’s focal division chairs the EU trade association. His intensive commitment, involving two days a week, stems from three motives. First, Eureka is in favour of harmonized European regulation. The division sells in all EU countries and wants to avoid country-specific technical standards (involving costly product adaptations).³⁾ Second, Eureka is trying to establish the public image as an environmentally proactive company which takes measures that go beyond mere legislative compliance. By taking ‘voluntary measures’, the company thinks it can build a favourable environmental image, which fosters the sales of its products. The environmental coordinator: “We try to come to an agreement with them [the EC], so that there is a positive image of the company. This is transmitted through government to the [customer]. (...) We do everything for the [customer], but government is the means.” Third, active involvement offers the coordinator the possibility to steer regulation into a direction that is not unfavourable to the division’s interests.

Internal commitment

The realization of an external agreement does not necessarily bring about internal commitment. Major internal actors with different interests have to give their consent in the respective steering groups. This implies that the divisional environmental coordinator had to defend the externally negotiated agreement within his division to

show that the agreement was compatible with critical internal interests. The importance of presenting a convincing argument is obvious to the coordinator: “When I communicate very well, they go along. When I communicate very poorly, they quickly send me back home. I really regard it as a sales story. If I want to achieve something [in my division], I have to sell it very well. (...) Selling, in this case, means that I am capable of visualizing or quantifying the advantages for [Eureka].”

The business unit MT is a crucial internal actor, whose support is indispensable. Profit is the business unit’s main objective; environmental initiatives should not thwart its realization. An MT member: “I stress profit; environment is a boundary condition with which I have to live.” This implies that the reduction of energy consumption should not significantly raise the cost price of the focal products (as sales price increases in the highly competitive markets were virtually excluded). Besides, the envisaged environmental measure was only one of the many new features that had to be incorporated into the new product conception cycle and that had to be technically compatible with one another. Thus, the business unit’s negotiation objective was to accept only measures that were expected to be technically feasible and not costly.

The environmental agreement also had implications for the purchasing department. As the specifications of the focal product would change, the department had to procure other components. This change could involve a mixed environmental record. For example, an alternative component that reduces energy consumption may contain (banned) toxic substances. The purchasing department takes a cooperative stance in realizing environmentally benign measures. Purchasing was willing to procure components that allow for better energy performance, but did not want to face technical barriers (such as a poor toxicity record) or significant cost price increases. For such cases, the purchasing department had negotiated an escape clause that allows

for the (temporary) procurement of components with (specific) negative environmental aspects for which no alternatives were available at reasonably low prices.

The marketing department is in favour of measures that foster a 'green' public image. Marketing argues that a highly visible company like Eureka cannot afford not to be in the lead in the environmental field. When customers can choose between two similar products, a significant number of them (25%) prefer the one with the superior environmental performance. So environmentally relevant features support sales, though the environmental sensitivity of customers varies from country to country. Energy consumption is also important for the marketing department because it is part of the product tests that customer associations regularly conduct. Products that perform poorly as to energy consumption cannot achieve the 'best buy' label, to which many customers are sensitive. Furthermore, environmental pressure groups try to dissuade customers from buying products with a poor environmental performance. Consequently, the marketing department supports environmentally benign initiatives like reduced energy consumption. For example, selected products with a very favourable environmental performance are more intensively promoted than other items. At the same time, marketing objects to measures that entail sales price increases because of the competitive markets on which the focal products are sold.

Thus, the environmental coordinator's room to manoeuvre is limited. He also has to operate delicately because his environmental staff group is financially dependent on the different business units, whose contributions to the staff group are negotiated on an annual basis. Yet, the divisional coordinator manages to skilfully walk the environmental tightrope. The business unit MT representative in the focal steering group: "[The environmental coordinator] really stands for environment, which he

radiates. He does it in a very realistic way. He understands that our organization cannot only take care of environment, that there should be a balance between profit and environmental awareness. Given [these constraints], he constantly pushes towards the environment. I find this very good.” According to the senior manager who represents the purchasing department in the steering group: “[The environmental coordinator] has the obligation to represent [our division] in the outside world, which is already a big fight of compromises. On the other hand, within [the division] there is also a fight of compromises between costs, market requirements, and environmental requirements. (...) His empowerment to enforce things within the organization is, of course, very low. (...) He needs diplomacy, politics, and optimal senior management involvement to keep the [environmental] objectives standing.” The senior marketing manager resumes: “[The environmental coordinator] pushes us like hell [in the steering group]. He is very good at that.”

The quest for new technology

The environmental coordinator finally succeeded in ‘selling’ the external agreement. The steering group adopted the energy-reduction target, suspecting that it would not entail high costs or insurmountable technical barriers. The target was incorporated into the divisional action plan. When a newly adopted target goes beyond existing technical capacities (as was the case with the energy-reduction objective), the business unit in charge of its implementation identifies a research need. After a bottom-up process to take stock of the different needs, the business unit then evaluates and prioritizes the different options, and decides on the available research budgets. The business unit subsequently contacts one of the corporate research laboratories (in this case the one specializing in energy consumption). The laboratory and the business

unit negotiate the future research programme on an annual basis. Both the business unit and the laboratory present proposals for new research projects to which the respective parties attach importance. When a business unit makes a proposal (like the energy reduction project), the laboratory discusses how much the research costs are and how high it estimates the technical feasibility. For the business unit, an important condition for accepting the focal research project was that a technical solution could be found without significant cost price increases. A laboratory representative: “This is a fundamental parameter, what it may cost, already when agreeing upon the research programme. (...) To come to a low-cost solution, of which our colleagues from [the focal business unit] think that it will be accepted by the market. (...) [If not,] we could have difficulties to get such a research programme supported here.” The business unit and the laboratory finally agreed upon a research programme. Once the two parties come to terms, they specify their agreement as much as possible in quantitative targets. The laboratory starts generating and filtering possible solutions. It discusses the technical and financial implications of the most viable options on a quarterly basis with the business unit, which decides if it is still prepared to continue. It may also occur that altered external conditions (for example new market developments or other regulations) lead to a reformulation (and renegotiation) of the research targets.

In the present case, the laboratory was allowed to proceed until it had elaborated a novel concept. This concept enabled a substantial reduction of the focal products’ energy consumption “under the very difficult boundary condition of cost [control]”, as a laboratory representative stated. The concept was passed on to the development department of the business unit, which applied it to the focal products. It should be noted that the realization of a low-cost solution was facilitated by the fact that the market demand for the components needed to reduce energy consumption had risen

enormously. Eureka's competitors, committed to the same agreement with the EC, had engineered similar solutions and also started massively demanding similar components. This upsurge led to an important fall in the purchase price of these components, thus facilitating the realization of technical improvement without a substantial cost price increase.

By incorporating the novel concept into the standard product specifications, the innovation became institutionalized in the division's 'ordinary' economic activities. Owing to this product innovation, the relevant energy consumption of the focal products of Eureka's division had dropped by more than 80% in 2000, well above the externally negotiated target of 30%. Figure 2 summarizes the process of interactions that led to the innovation.

Insert Figure 2 about here

DISCUSSION AND CONCLUSION

The focal product innovation was the result of an interaction process among major external and internal actors. Many of their interactions consisted of negotiations, during which the respective parties tried to realize their own objectives as much as possible. The negotiation process critically shaped the ensuing product innovation. At many stages of this complex process, different options were open. They could have

led to different paths, many of which would have been fruitless. First, the EC could have chosen to impose legislation instead of negotiating a ‘voluntary’ agreement. Legislation is a more lengthy process, which would have postponed the trigger to engage in the search for product renewal. More importantly, legislation would have been much more restrictive regarding the technical options open to companies like Eureka to realize lower energy consumption. The legislative path would have involved prescriptions as to the type of technology to be implemented. Given the very dynamic technological environment and the numerous unknown technical parameters at the outset of the regulative process, prescription would have been a delicate choice. Eureka’s focal division would not have had the discretion to search for and realize a technically and economically very efficient solution, which clearly outperformed the initial expectations of all parties involved in the regulative process.

Second, the outcome of the negotiations within the supranational trade association was critical to the regulative mode that the EC considered. The suppliers had partially divergent interests — owing to different objectives and capabilities — and certain companies were tempted to expose free-rider behaviour. Yet, industry managed to align 16 companies, representing 80% of all sales within the EU. If the trade association had not succeeded in mobilizing the support of a sufficient critical mass, the EC would have decided to proceed to legislation (despite the EC’s preference for a negotiated agreement).

Third, the interactions within Eureka’s focal steering group were crucial to the division’s actions. The steering group had the formal power to reject the externally negotiated agreement, in which case the search for an innovation would not have been started. The purchasing department could have argued that no alternative components were on the market, thus precluding the possibility of material substitution. The

marketing department could have stated that environmental considerations played no significant role for customers, so that no efforts were needed. The focal business unit could have pointed to the competitiveness of the market, which did not allow for environmental measures entailing substantial cost increases. Rejection of the agreement with the EC was a real option because it was not legally binding. The steering group could also have redirected or further restricted the implementation of the agreement, for example, by excluding or imposing the use of particular components or technologies. Obviously, this would have had implications for the subsequently embraced (innovative) solution.

Fourth, the negotiations between the focal business unit and the laboratory specialized in energy issues might have led to no research project. The business unit might have devoted too few resources to the research project, while the laboratory might have preferred to focus on other projects (as the laboratory also performed research for other business units and divisions). The research could also have been halted before bearing its fruits (for example, because the estimated probability of success was too low). Obviously, the failure to bring the research process to an end would not have led to product innovation.

Our study has focused on one environmentally benign product innovation in a large company in a specific sector. We argue that our findings are also likely to hold in other settings. Many innovations have gone beyond the stage of the entrepreneurial inventor, who operates on a solitary basis. They often take place in large business organizations and involve many different actors. The involvement of a variety of internal actors stems from the complexity of the knowledge required to realize innovations, the important financial resources absorbed by R&D, as well as the

necessity to integrate requirements from purchasing, production, and marketing departments. Integration and alignment of behaviour requires motivated employees and shared norms, as Hargadon and Sutton (1997) showed for high-tech firms; it is likely that the establishment of common purposes and norms involves negotiations among employees, especially when high personal interests are involved. Likewise, communities of practice that share values in order to learn — which is a prerequisite for innovation — are exposed to power relations (Contu and Willmott, 2003); when actors are powerful but interdependent, negotiations are also likely to occur (cf. Gray, 1999).

Many innovations also call for the consideration of external parties. New products are often developed in alliances with other companies (Hagedoorn and Duysters, 2002); it is most likely that allies negotiate extensively before committing significant resources to such common projects. Standards shape product or process requirements throughout an industry (Brunsson and Jacobsson, 2000) and thus exert an important influence on the generation and diffusion of innovations; given the high stakes for the companies concerned, it is hard to conceive that these standards are established without extensive negotiations. New products also need outlets, which may involve consultations or negotiations with customers (Jolly, 1997; Vercauteren, 2004). Finally, novel processes or products have to be compatible with prevailing regulative frameworks; regulations are often the outcomes of protracted negotiations between authorities and companies (Lévêque and Nadaï, 1995). Whether innovations in complex settings involve internal and/or external parties, there seems to be an inherent tendency towards the creation of a new order following processes of, often intensive, negotiations (Latour and Woolgar, 1979).

The generalizable underlying mechanism for innovation as a complex negotiation process seems to be the interdependence of multiple, cognitively bounded actors who, despite their divergent interests, are engaged in direct interactions to exploit the available common ground as to the generation and application of new technology. The different parties hold unique resources that are all required to realize the innovation. The actors pursue their own objectives but also consider other parties, either because they are needed to realize the own goals or because they are unavoidable. The different actors ignore the exact extent to which others are prepared to compromise and, consequently, the overall outcome of the negotiation process in which they are engaged. Yet, the different actors realize that their own interests are best served by providing the inputs that are needed for the innovation at hand. The extent to which the innovation is shaped by the different parties depends on the prevailing distribution of power, which is reflected by their willingness to give and take in the negotiation process.

A major implication of our study is that the outcome of an innovation process may be neither optimal, in the sense that it leads to the technically most advanced solution for a given amount of inputs, nor ‘satisficing’, in the sense that the optimal result is merely thwarted by limitations of time and cognition. Our study shows that innovation may be a non-linear, unpredictable process, the result of which is shaped at best by the largest common denominator. At different stages and loci of the innovation process, negotiations take place, which may be protracted and iterative. As the contingent outcomes of sub-level bargaining processes constitute inputs to other sub-level negotiations, the course of events may change during any stage of the negotiations (though several sub-level bargaining processes may take place simultaneously), after which the rest of the innovation process and its possible

outcomes are redirected; the process may even halt at any stage. As the different interactions are not aligned, the ensuing innovation — which is acceptable to all major parties involved — may be well below the solution that is (boundedly) optimal.

The complex, dynamic negotiation process with contingent outcomes that leads to an innovation like the present one has not, or at least insufficiently, been highlighted in the literature. Companies have been described as collections of stakeholders with conflicting interests, in search of acceptable internal practices and external control of negotiated business environments (Cyert and March, 1992; Mintzberg, 1983; Pfeffer, 1992; Pfeffer and Salancik, 1978). These stakeholders often join forces with others, although the different members of coalitions may share only specific interests at particular points in time (Bacharach and Lawler, 1998; Murnighan, 1986; Pearce, Stevenson, and Porter, 1986). Stakeholders are continuously engaged in distributive and/or integrative bargaining to advance their own interests (Putnam, 1990). Actors involved in distributive bargaining compete for the largest possible share of a given collective outcome by exposing contentious behaviour and concealing relevant information. Those who bargain on an integrative basis aim at enlarging the overall payoff through collaboration, including collective brainstorming and open information sharing. The present case shows evidence of (coalitions of) stakeholders with divergent interests involved in both types of bargaining.

While the behavioural perspective has offered rich insights, it has not directly addressed innovations that are shaped by stakeholders. Government-induced innovations have been described, but their triggers have been approached as ‘facts of life’. Innovative solutions have merely been represented as compliant responses to these inducements (cf. Kemp, 1997). Neither does the literature, especially in the field

of management, sufficiently discriminate between different types of regulation (including legislation and covenants) for innovation-related organizational behaviour. Furthermore, the relationship between the negotiations on regulative issues among companies within an industry and the innovative behaviour of companies has not been clearly established. For example, Porter and Van der Linde (1995) argued that strict environmental regulation induces companies to innovate their products and processes. Their starting point is stringent regulation, thus ignoring the preceding interactions between government and industry, as well as negotiations among companies in the same sector. Their analysis fails to differentiate between legislation and forms of regulation with more discretion, which has an impact on the direction of (innovative) solutions.

The representation of the internal dynamics that lead to innovations also tends to be overly simplified. The literature tends to dichotomize as to the origin of innovations. On the one hand, relatively autonomous laboratories establish their own research agendas and ‘push’ new technologies on the market. On the other hand, business units respond to market incentives and ‘pull’ new products or processes from corporate laboratories. In more recent work, the combination of push and pull factors is given more attention. Furthermore, we find a growing number of publications that point at the importance of a combination of internal (R&D laboratories) and external (alliances, mergers, and acquisitions) knowledge acquisition for innovative renewal. However, with a few notable exceptions, the innovation literature fails to paint an overall picture in which the specific drivers and the role of particular internal and external actors in the innovation process are addressed. In an interesting contribution, Rothwell (1994) described the evolution of innovation along five key models. First-

generation innovation is characterized by technology push, while need pull inducements are central to second-generation innovation. Third-generation innovation consists of coupling the formerly separate issues of push and pull. Fourth-generation innovation shows an integrated model with tight coupling between marketing and R&D departments, as well as strong linkages with key suppliers and leading customers. Finally, fifth-generation innovation is characterized by systems integration and networking models. This model includes strategic alliances with many other actors as well as the use of sophisticated expert systems. In spite of its major contribution, even this last representation of the innovation model fails to identify the many internal actors involved and the multi-faceted negotiations in which these actors are engaged at different stages.

In conclusion, we have challenged conventional economic views of innovation by showing that a product innovation can emerge as the result of a complex bargaining process among a variety of external and internal actors with largely divergent interests. Such a representation of negotiated innovation seems to be unprecedented in the extant literature. Our argument was grounded in one extensive case study. Future research, focusing on external and internal interactions, may show whether this negotiation pattern recurs in other innovative settings. A further investigation into the 'negotiated order' (Strauss, 1978) within the 'black box' of technology (Rosenberg, 1982) seems to be necessary in order to come up with an increased understanding of the complex dynamics of innovation systems.

Notes

- 1) Throughout this paper, the term ‘environment’ refers to the natural environment, unless preceded by an adjective (for example business environment).
- 2) Unless indicated otherwise, the case description pertains to the situation in the year 2000.
- 3) For the same reason, Eureka concluded an alliance with a national government in another environmental field (waste recycling) to get a national environmental law accepted at the EU level. Eureka mobilized support within industry, while national government lobbied other governments. The allies succeeded in turning the national law into EU legislation.

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Figure 1: Eureka's environmental management structure

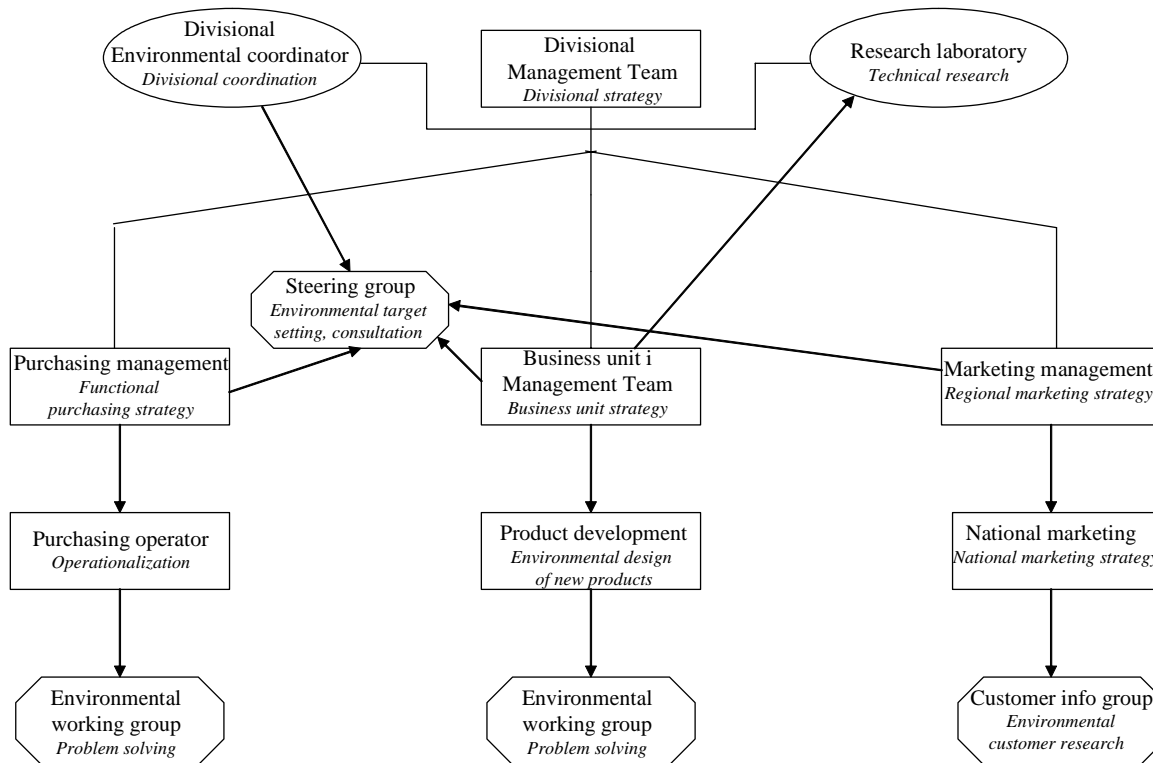


Figure 2: Eureka's innovation process

