

# Organizing product-oriented environmental management from a firm's perspective

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## Abstract

Environmental characteristics of products are increasingly investigated. Much research focuses on environmental implications of design decisions and on methods to determine and influence products' environmental impacts. Less attention is paid to the organizational consequences of such insights. This paper aims to contribute to this discussion by describing and analyzing organizational aspects of product-oriented environmental management (POEM) from an individual firm's perspective. Important motives for firms to engage in POEM are addressing stakeholder interests and obtaining a competitive advantage. Specific capabilities are required to organize POEM. In the process of building such capabilities, managerial decision-makers play an important role. Two case studies from the chemical industry provide interesting viewpoints on the organization of POEM: creating sufficient flexibility, a broad involvement across functions, and a managerial ability to identify and build the required capabilities are proposed as important factors in the process of organizing POEM. © 2002 Elsevier Science Ltd. All rights reserved.

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## 1. Introduction

The relationship between business and the environment can be regarded as a dynamic one. In business, the biophysical environment has long been seen as an external factor; first neglected and later on slowly taken up as an obligatory issue, forced to comply with by legislation. During the last decades the environment is increasingly being acknowledged as a critical business concern, as society and governmental agencies demand an improved environmental performance. A growing number of industries have started to see opportunities for corporate environmental management, meanwhile looking for competitive advantages [1–4].

The approach to corporate environmental management has changed over time as, next to cleaning technologies

and pollution prevention, forms of product-oriented environmental management have been developed. Kärnä [5] identified four reasons for this broadening attention towards products:

1. Products could be regarded as sources of environmental burden;
2. environmental policies are increasingly focusing on products;
3. a variety of different stakeholders in product life cycles influence products' environmental characteristics;
4. as do manufacturing firms themselves.

The number of firms working on the environmental performance of their products is becoming higher, and more firms have begun directing their environmental efforts earlier in the product chain. Over the last decade, a variety of studies into products and the environment have been conducted, applying concepts such as Design for Environment, Extended Producer Responsibility, or

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ecodesign [6–9]. Regarding the environmental characteristics of products, much work is done on developing information systems and methodologies, such as life cycle assessments, while environmental management systems (EMS) could consider product-related issues as well. Using such methodologies and systems could assist in determining at which positions in the product life cycle actions would need to be taken to improve products' environmental performance. However, little attention has been paid yet to organizational consequences of such insights at an individual firm level [10,11]. Therefore it is useful to integrate product-related environmental knowledge resources into a firm's organizational processes, and to explicitly consider aspects of implementation [10].

This paper aims for understanding organizational implications of managing products' environmental characteristics. Therefore we employ the concept of Product-Oriented Environmental Management (POEM), which is defined as a systematic approach to organizing a firm in such a way that improving the environmental performance of its products across their product life cycles becomes an integrated part of operations and strategy [12]. Applying POEM thus involves the integration of different functions, continually looking across the borders of the individual firm into the product chain, and systematically trying to decrease the environmental impact of a product throughout its life cycle. Research on organizational aspects of POEM could contribute to an improved understanding of these consequences for individual firms.

Elements of POEM have been studied before [13,14], also through closely related concepts such as Life Cycle Management [15], or Product Stewardship [16,17]. Central to these concepts is the consideration of products' environmental characteristics throughout their life cycles<sup>1</sup>. Many of such studies consider an aggregated level, providing viewpoints on the interrelatedness of various actors in processes of organizing environmental management, mainly from a chain perspective<sup>2</sup>. In this paper we focus on an *individual* firm level, offering insights from case studies on product-oriented environmental management within a chemical firm. Aspects of POEM are addressed there as part of the Product Stewardship concept, as discussed further in Section 4.

In studying the organizational process of POEM, links

between the short and longer term must be emphasized, addressing both operational and strategic dimensions, while the interplay between system-technical (structural) arrangements and instruments and social-dynamic (cultural) processes has to be considered as well to get a more complete view [12]. Although attention for 'products and the environment' up till now mainly focuses on the development of system-technical approaches such as instruments and systems, ample attention to social-dynamic processes of organizing for this new product requirement is also needed. POEM might strike a balance between these different requirements.

To consider the way a firm deals with organizational aspects of POEM, we first look briefly into the motives a firm can have to engage in this type of environmental management. In Section 2, issues of competitiveness and stakeholder interests therefore are addressed, as is the proactive stance that we expect to be taken by firms working on the organization of POEM. To theoretically explore the 'how question', in Section 3 we consider several 'resource-based' approaches to the organization of POEM, in order to review the process of developing idiosyncratic organizational solutions. In Section 4 our theoretical assumptions are confronted with the empirical results from two case studies in the chemical industry, leading to a discussion and concluding remarks in Section 5.

## 2. Pro-activity, competitiveness and stakeholders

To consider reasons for a firm to engage in POEM, it is necessary to look at what kind of firms are interested in this topic. To classify firms' attitudes towards environmental issues, many different typologies and classifications have been proposed [20]. Actively involving aspects of POEM is currently done mainly on firms' own initiatives, although stimulated by regulation and policy<sup>3</sup>. Proactive behavior can be defined as "organising one's business so as to be able to use the company's potential to benefit from opportunities and to avert threats, which may be anticipated in the environmental field" [23, p. 201]. Proactivity thus emphasizes a firm's *own* initiatives in environmental management. We are especially interested in such proactive firms.

Berry and Rondinelli [4] identify four forces as driving proactive environmental management: regulatory demands, a stakeholder focus, cost factors, and competitive requirements. We consider regulatory demands as a specific stakeholder interest, since regulation is an important driving force for corporate environmental

<sup>1</sup> Previous research, for instance, considered chain management as a coordination problem between firms in a product life cycle [18], or analyzed product-oriented environmental management issues from an institutional perspective [19].

<sup>2</sup> For example, the Product-Oriented Environmental Management Systems (POEMS) concept [13,14] considers product systems, thus encompassing several companies. "The environmental effects of a product are a result of decisions made by several actors in the production chain of which producers form the essential part" [13, p. 448].

<sup>3</sup> A variety of product-oriented environmental policy initiatives are developed [e.g. [21,22]]. In many of these approaches the responsibility of individual firms is emphasized.

management, and because, together with customers, firms often regard regulators as crucial stakeholders [1,24]. Meanwhile, cost factors can be related to competitive requirements, as getting a better view on cost structure could improve a firm's competitive position. It is for instance claimed that positive effects of proactivity on developing environmental approaches define a new area of possible competitive advantage [25]. Building on such findings, we expect that firms will engage in a proactive environmental issue like POEM because of anticipated stakeholder pressures and/or because they expect to obtain a competitive advantage. In the remainder of this section we will briefly discuss these two types of motives and, thereby, emphasize the central position of managerial decision-makers in the dynamic process of organizing POEM.

The relationship between environmental management issues and *competitiveness* is increasingly studied [26–29]. The effects of managing environmental issues on firm performance are often expressed in terms of financial results (e.g. [27,28]). According to some research, better answering or anticipating stakeholder demands could lead to an improved firm performance [30]. POEM focuses on products, which live through an entire life cycle, and hence the concept connects stakeholder interests throughout this cycle. If stakeholders demonstrate a growing environmental concern, better addressing such demands might lead to an improved firm performance and to a competitive advantage.

In addressing products' environmental characteristics, various interests are involved. A *stakeholder focus* then is crucial: does a product meet the requirements of the stakeholders over its life cycle? According to Henriques and Sadorsky [24], firms with more proactive profiles differ from less environmentally committed firms in their perception of stakeholders' relative importance. For the organization of POEM this means that a firm should try to get an overview of what is happening to its products throughout their life cycles. Which internal and external stakeholder demands are involved; how to determine a firm's environmental performance [31]; and how should the stakeholder demands be served<sup>4</sup>. Important attributes of stakeholders are power, legitimacy and urgency [32]. In balancing these attributes, the position of managerial decision-makers is central, as "managers are viewed as crucial mediators of stakeholder influence; how they identify, define and construct stakeholders is an important feature of the meaning of greening and an industry's subsequent response" [33, p. 715]. Such a viewpoint is useful in considering the organization of POEM. Firms' responses to issues such as POEM and

the way they do (or don't) organize for this requirement are likely to be guided by the managerial perceptions of the issue at stake. Seeing decision-makers in firms as mediators of such issues thus could elucidate a firm's motivations to engage in POEM, and hence also the way these motivations are brought into practice. In the organization of POEM, a variety of functions within a firm are likely to be involved. To uncover organizational aspects of POEM, approaching managers in such different functions therefore is a useful research strategy. As Mitchell et al. [32, p. 855] indicated accordingly, a stakeholder approach intends "to broaden management's vision of its roles and responsibilities beyond the profit maximization function to include interests and claims of non-stockholding groups".

### 3. Resource-based approaches to products and the environment

To further examine the relationship between products and environmental management, we turn to the resource-based view of the firm (RBV), which posits that differences between firms' performances are the result of differences in their resource endowments. We specifically consider two applications of the RBV: a 'natural resource-based view of the firm' [34] to address environmental management issues, and an application of the RBV to product development [35,36] to consider capability building processes. Combining these applications could offer further insight in the organization of POEM.

#### 3.1. A brief outline of the resource-based view

The RBV [37–41] argues that differences in competitive positions of firms can be understood from knowing firm-specific resources. Over the last fifteen years, this view of the firm generated much literature<sup>5</sup>. Focus generally is "on the idiosyncratic, costly-to-copy resources controlled by an individual firm - resources whose exploitation may give the firm a competitive advantage" [39, p. 142]. In accordance with the RBV, one could suggest that a product's environmental performance could assist in creating such a competitive advantage. As focus here is on POEM, we will not extensively discuss RBV literature here, limiting ourselves to a capability perspective.

In the RBV, firms are considered as 'bundles of resources' [37]. In this paper, we define *resources* widely as all assets and capabilities of a firm. A *capability* we define as the ability to coordinate, deploy and legitimate resources to perform tasks. We include the notion of legitimization to emphasize the important

<sup>4</sup> These questions could also be dealt with by using insights from Total Quality Management [12]. In this paper, we have chosen to focus on the relationship between capability building, a stakeholder orientation and competitiveness.

<sup>5</sup> Several reviews of RBV literature are available (e.g. [38–41]).

relation with mediating stakeholder interests and legitimating decisions. Collis and Montgomery [42] reserved the term ‘organizational capability’ to describe the complex combination of people, assets, and processes that organizations use to transform inputs into outputs. Organizing POEM might be regarded as a process of developing and maintaining specific organizational capabilities. Therefore, in the next sub-section, we will briefly characterize the relationship between environmental management and the RBV.

### 3.2. A natural resource-based view

To include environmental considerations within the RBV, in a conceptual paper Hart [34] proposed a ‘natural resource-based view of the firm’: a view of competitive advantage based upon the firm’s relationship with the natural environment. Central to his argument was that natural resources would increasingly be constrained in the future. Firms that better handle this constraint will command a sustainable competitive advantage [30]. Organizing POEM might help dealing with such constraints and could hence lead to a competitive advantage. As Hart argued [34, p. 1001]: “Firms that adopt product-stewardship strategies will evidence inclusion of external stakeholders in product-development and planning processes”. Product Stewardship comprises POEM, looking at products’ environmental, health and safety aspects, as will be discussed in the next section. Furthermore, “firms with demonstrated capability in cross-functional management (socially complex skills) will be able to accumulate the resources necessary for product stewardship more quickly than firms without such prior capability [34, p. 1001]. Such statements are supportive to the choice to broaden our view beyond system-technical towards social-dynamic elements of organizing POEM.

Recently, several more empirical studies appeared, applying similar ideas. Judge and Douglas [29] empirically tested the assumption that firms with a better-developed capability of integrating environmental issues into the strategic planning process yield superior financial and social outcomes. Other research applying a RBV in environmental management, for instance, includes work on financial performance [43], or on competitively valuable organizational capabilities [26]. A process of developing and maintaining organizational capabilities is discussed in the next section.

### 3.3. Applying a capability building perspective

POEM deals with products’ environmental characteristics. Literature considering product development from a resource-based view could therefore offer further insights in relationships between firms’ different organizational capabilities and the outcomes of product development [36].

Based on studies in product development, Iansiti and Clark [35] developed a capability building process model which has also been applied to environmental management [12,18]. The model distinguishes between a concept development and an implementation phase in building capabilities. In the *concept development* phase, problem framing takes place, comparing different possible solutions to perceived problems. This can be triggered by a gap between desired and actual performance [35]. The capabilities perceived necessary are compared with already present ones in order to determine which of them should be renewed, or newly developed, to solve the problem experienced. In the *implementation* phase the actual development and implementation of selected solutions occurs, leading to new or renewed capabilities. The separation between concept development and implementation is relevant here because, “environmental strategies may differ among firms in the same industry that face the same issue, because these firms assess differently a set of potential solutions” [18, p. 79]. Due to the proactive, not directly regulated approach, it can be expected that firms will develop their own idiosyncratic modes of organizing POEM, depending on the way they frame the problem, their existing capabilities, and the way new capabilities are (to be) developed and implemented<sup>6</sup>.

To acknowledge stakeholder interests, legitimization will form an important element in this process. In environmental problem framing, not only managerial decision-makers try to conceptualize their environment, but also the stakeholders involved develop their own points of view. The way a firm can legitimize its (planned) activities is likely to influence its stakeholders’ replies. Environmentally proactive firms for instance will probably view a range of stakeholders as important, and will actively address those stakeholders [24].

In addition, Verona [36] proposed an ‘agent-resource model’, in which managerial decision-makers are seen as agents, who play an important role in the concept development and implementation phases of capability building. Although we will not discuss agency theory here, this theory matches an approach in which managers are seen as mediators of stakeholder interests. This again suggests that by focusing on managerial decision-makers, motivations for a firm to engage in POEM can be found, as well as information on how perceived problems could lead to the selection, development and legitimization of the required capabilities.

<sup>6</sup> Although there are similarities in the ways in which different firms organize their product development function (e.g. [44]), the specific environmental characteristics of their products and the way they respond to these problems are likely to differ across firms, for instance through differences in the capability-building process.

### 3.4. Combining insights

After the discussion of different theoretical insights, we now combine these insights to guide us in the empirical part of our research. As argued, a proactive stance towards products' environmental characteristics currently can be expected from firms that engage in POEM. Important motivations for such a stance can be found in expectations of a *competitive advantage* and in responding to *stakeholder demands*. In line with the two applications of the RBV sketched out before, we argue that in the process of organizing POEM, managerial decision-makers form a suitable starting point, because they act as mediators of stakeholder interests. The process of organizing POEM therefore could be investigated by addressing these managers, especially if they are closely involved in product-related activities. They are likely to hold positions such as 'product manager', 'environmental manager' or 'manufacturing manager'. As these managers are important in the *capability building* process, they can provide an insight in how their firm deals with these organizational aspects, both in the concept development and the implementation phase. Competitiveness, a stakeholder focus and capability building therefore are selected here as three dimensions to analyze the case study findings on.

## 4. Product Stewardship at ResinMaker—two case studies

To examine our theoretical assumptions, we carried out two case studies within a business group of a multinational chemical industry group, ChemFirm. ChemFirm is organized in business groups and, at the time of the case studies (1998–1999), employed well over 20,000 people. In the chemical industry POEM is carried out as part of Product Stewardship (PS), which is an element of the Responsible Care program. This Responsible Care program is a chemical industry voluntary initiative, consisting of six codes of practice, aimed at continuously improving performance, and communicating this improved performance [17]. PS can be defined as the management of environmental, health and safety effects of products throughout their entire life cycle. Although its scope is broader, studying the organization of PS could deliver valuable insights in organizational aspects of POEM, because both concepts are closely related. Within ChemFirm, the Responsible Care program was supported strongly. In the next sub-sections, we will first discuss some methodological aspects and then describe and analyze the two case studies on the organization of PS.

### 4.1. Methodology

To consider the organization of POEM, case studies are an appropriate methodology, because they are empirical inquiries that examine "a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" [45, p. 13]. Our case studies focused on a business group of ChemFirm that specializes mainly in the development, manufacturing and sales of resins. We call this group ResinMaker. The case studies were carried out at the head office and at a production plant. At the head office, business group management, most of business unit management and a technical center were located. Each case study consisted of 11 interviews, document study and observations. Interviews were semi-structured, addressing topics related to organizing POEM, including stakeholder demands and issues of competitiveness. Most of the interviewees were in senior or middle management positions (e.g., product managers, R&D managers or manufacturing directors) and to some degree involved in the organization of PS. We identified interviewees in cooperation with the process facilitators, who organized the PS implementation process within their respective part of the case study firm. This identification was confirmed through cross-reference. Interviewees could comment on the interview transcripts to assure verification of the data.

### 4.2. General case characteristics

First we will briefly characterize the case studies. Although our studies were taken from two different business units, they were part of one business group (ResinMaker), producing related types of products and applying comparable technologies. A good basis for comparison thus was available. In Table 1 an overview of general business characteristics is presented to provide an impression of both business units studied.

The first case study focuses on a product-market combination (pmc) within ResinMaker, Powder Coating Resins. Such resins form an important ingredient of this polymeric coating type. Their market is a growth market, often offering an alternative for solvent-based coatings, which are increasingly under scrutiny for their environmental and health characteristics [46]. To improve cooperation between product development, manufacturing and marketing, 'operational teams' (OT's) had recently been installed in this pmc. These teams consist of functional representatives of R&D, marketing/sales, purchasing, manufacturing and logistics, and controlling. They bear profit and loss responsibility and focus on short- to mid-term operational decisions. This pmc has a strong market position, is among the world leaders in powder coating resins and aims for a further growth, for which technological developments and market growth account.

Table 1  
General case study characteristics

Case parameter	Powder coating resins	Structural resins
Activities	Intermediate products	Intermediate products
Market share	Large	Large
Market position	Strong	Strong in segments
Market state	Growth market	Mature market
Market composition	Mainly larger customers	Small to large customers
Organization structure	Matrix structure (operational teams)	Functional organization
Technological position	Strong through R&D	Strong through partnering

Quality and price of these resins are among the strong points, as is their worldwide availability through the large sales structure. Delivery time reliability however needs improvement.

The second case study focuses on the pmc Structural Resins, which are unsaturated polyester resins that are used in composites. Although the resin types involved bear some clear similarities, the second case is more complex than the first one, where a dedicated team serves a pmc. The pmc Structural Resins is organized differently, applying a more functional approach. Variation in types of activities, products and size of customers is large in this pmc. Marketing activities are clustered centrally around sub-pmc's, while sales and manufacturing are organized more regionally. The pmc operates in a mature market where acquisitions and mergers are the main growth mechanisms. Market positions vary among the sub-pmc's, while Structural Resins had recently been involved in a large merger, causing several important changes. Hence, at the time of our study strategy was not aimed at pursuing further growth but at settlement of these changes.

As noted in Table 1, both cases' activities are in intermediate products, having a large market share and mainly strong market positions, while both are working towards an improved market orientation. Both also have a strong technological position. Structural Resins for instance has strategic partnerships with other manufacturers that allow them access to a valuable pool of technological knowledge. At Powder Coating Resins a long-standing tradition of research and development in their field forms a strong capability. Such knowledge arrangements can provide the pmc's with a competitive advantage. Differences between the two cases include the state of their markets, its composition and the pmc's organizational structures. These differences could also affect the pmc's possibilities for organizing PS, as we will examine in the next section.

#### 4.3. Comparing the cases on product stewardship

In this section the experiences with the organization of PS in both case studies are presented, followed by an analysis based on the central notions described before:

competitiveness, a stakeholder focus and capability building.

At Powder Coating Resins, responsibility for PS is given to the operational team. This PS project served as a pilot project within ChemFirm to get acquainted with PS, hence providing senior management support. The team manager co-operated with the technology manager in developing a PS approach for his team, following ChemFirm's corporate methodology. Through workshops with team members and the environmental manager, seven PS projects were defined. Most team members were assigned a project and deadlines were determined. Nearly all projects were externally oriented, aiming at customers and suppliers because communication and risk management were seen as key issues. The pmc's products already had a fairly good environmental reputation, which was used as a selling point in competition with other types of coating resins. After senior management approved this approach, the PS process got halted for half a year due to personnel shifts. After that, the project was taken up again, partly by new people. Our study took place while the first experiences with the selected approach were being assessed. In terms of the capability building process model, this case study hence considered the *implementation* phase.

Structural Resins, the second pmc, started to work on the organization of PS later on, following the experiences at Powder Coating Resins. At the time of this case study the scope of the PS project was to be defined. The business unit's technology transfer manager facilitated this process. In several workshop sessions functional representatives of the different (sub-)pmc's gathered to try and define concrete PS projects. Different opinions on the relevance of PS existed, making its formulation and eventual implementation harder. A smaller group of representatives therefore would first aggregate different possibilities, which was to be followed by a new workshop. Due to this unexpected delay, these activities fell beyond the time frame of our case study. Yet, in this case study parts of the project definition stage and especially the ex ante expectations of key players in this capability building process could be studied. In terms of capability building, this case thus considered the problem framing or *concept development* phase.

Table 2 presents case study characteristics regarding PS which were discussed in the interviews. In the remainder of this section we will interpret our findings in the light of our three central notions.

*Competitiveness*—A first observation regarding competitiveness and PS is the fact that both pmc's are part of ChemFirm. This is relevant because of the group's strong involvement with the European Chemical Industry Council (CEFIC). This induced the PS process by providing senior management commitment for participation in the Responsible Care program. The image of the firm, and of the chemical industry as a whole, was considered an important driver in this. Other reasons for the pmc's to engage in PS included getting acquainted with the concept, being proactive and obtaining a possible strategic advantage. Interviewees at both cases expected environmental issues to increase as competitive factors, leading to more environmental pressure.

Market characteristics appeared to be important in the organization of PS. As Powder Coating Resins operated in a growth market, product differentiation and competing on products' environmental characteristics was considered an attractive opportunity. For Structural Resins this was more difficult as their markets were mainly mature, hence dominated by costs. Furthermore Powder Coating Resins's customers structure also made implementation of PS easier than at Structural Resins. Most of Powder Coating Resins' larger customers were members of CEFIC, or similar organizations, hence ensuring peer-pressure to organize PS.

Differences in organizational structure are also likely to make a difference in facilitating the organization of PS. The cross-functional OT structure at Powder Coating Resins enhanced regular cooperation and communication. Regarding the organization of PS, the cooperation between the OT manager and the technology manager to jointly act as process facilitators created support among the team members. At Structural Resins, the technology manager acted as the sole facilitator, facing dif-

ficulties in convincing several functional representatives, which in turn were not organized as closely in a team structure as their colleagues at Powder Coating Resins.

Finally, environmental product characteristics also played a role in competitiveness. Powder Coating Resins sold its products partly on basis of their environmental performance. Structural Resins produced a number of resins that are among the more disputed on environmental grounds because of the use of certain solvents. Alternative resins had been developed but were often sold only, at a surplus price, if customers were enforced to apply such alternatives.

*Stakeholder focus*—The importance of environmental issues to the pmc's customers varied. Environmental characteristics of powder coatings were one of their major selling points, while for Structural Resins' customers, environmental characteristics were mainly important if strong governmental regulation applied. Yet, stronger regulation could put Structural Resins in a dual position: on the one hand they were involved in voluntary agreements (such as Responsible Care) and mostly in favor of such agreements; on the other hand could stronger regulation improve market opportunities for their 'alternative' products. In the longer run, the environmental pressure from this solvent issue was regarded as a serious threat to this industry. There was no real co-operation with competitors on environmental topics. Each firm tried to develop their own individual mode of dealing with PS. Overall stakeholder involvement in organizing PS we therefore view as being modest.

On stakeholder interests involved, there was little unanimity among the interviewees. This confirms that in determining stakeholder interests, perception is important: opinions on the relative importance and influence of different stakeholders varied among interviewees, just like ideas on ResinMaker's influence on their chain partners regarding environmental issues. At Powder Coating Resins this influence was regarded rela-

Table 2  
Case study characteristics—product stewardship

Case parameter	Powder coating resins	Structural resins
Capability building phase PS facilitator	Implementation Technology manager & Operational Team manager	Concept development Technology manager
Environmental product characteristics	Strength	Threat
Environmental pressure	Modest to high	High
Stakeholder involvement	Modest	Modest
Influence in chain	High	Modest
Added value of PS	Insight in own products Improving image	Insight in own products Industry survival Improving image
Main stimuli	Corporate guidelines CEFIC involvement Stakeholder influence Image Market demands	Corporate guidelines CEFIC involvement Regulatory demands Image Market demands
Main barriers	Time/resource allocation Firm culture	Time/resource allocation Firm culture

tively high, both towards customers and suppliers. Still it appeared difficult to get a good overview of the entire product chain. Suppliers for instance were reluctant to disclose information about their production processes, afraid as they were of disclosing cost structures. At Structural Resins this influence on suppliers was regarded less because the quantities of materials this pmc purchased were relatively small, compared to what their suppliers sold to other industries. In general, there was not much active exchange of information yet with suppliers and customers on PS related issues. To some extent, stakeholders such as local communities, the (corporate) shareholder or governments were considered in the firm's environmental management, but not on a pro-active basis: mainly they were informed in general terms.

*Capability building process*—At the time of the case study, at Powder Coating Resins projects had been defined and these were being implemented and evaluated. In terms of the capability building process, this pmc was in the implementation phase. Important capabilities in the preceding concept development phase had been cross-functional cooperation (ensured by the OT structure) and technological knowledge, providing insights in the products' environmental characteristics. The strong market position enabled an active stance to PS. The main concern at this pmc will be to keep the process going, overcoming barriers of resource allocation and turning this specific capability building process into a continuous effort to address the dynamics of PS.

At Structural Resins the organization process was in its start-up phase, conceptualizing the problems, and convincing representatives from different functional areas of the relevance of PS. Hence, there the issue needs to be framed and agreed upon further before solutions and projects can be implemented. Maintaining sufficient attention for this product-oriented environmental issue, while many other urgent problems arise, will be an important challenge.

In general, interviewees in both cases were reasonably well aware of PS and its main characteristics. The chain perspective, pro-activity and taking responsibility were often indicated during interviews. The main stimuli and barriers to organize PS appeared to be nearly identical in both cases. Some interviewees also stressed their own moral considerations or referred to business ethics, thereby supporting our presumption that legitimization is an important element in this capability building process. Most interviewees expected the importance of PS to increase, while some stressed its ongoing character. They regarded PS more as a process of gradual, continuous improvement. Continually reassessing the capability-base, meanwhile continuing day-to-day operational activities then are relevant.

## 5. Discussion and concluding remarks

In this paper we set out to describe and analyze the organization of POEM from an individual firm's perspective. Viewing proactive environmental management as based on competitiveness and a stakeholder focus, and taking into account two specific applications of the RBV, we considered managerial decision-makers a good starting point to investigate the organization of POEM within a firm. These decision-makers provide a view of the capability building process, as illustrated by our empirical findings from the organization of PS at ResinMaker. We will now end with some issues for discussion and some concluding remarks.

### 5.1. Discussion

The two case studies in the chemical industry confirmed our assumption that expecting to gain some form of competitive advantage is an important motive for managers to engage in product stewardship. Such an advantage could be in improving the firm's image, in strengthening bonds with customers, or in getting a better knowledge of the own products and processes, hence improving transparency.

A resource-based view emphasizes the role of firm specific organizational resources and capabilities in firms' competitive positions. Barriers to imitability are one mechanism to keep such resources firm specific. For pollution prevention technologies in environmental management, Christmann [47] found two barriers to imitability: unique historical conditions and social complexity. In the chemical industry unique conditions are demonstrated by the fact that many production processes in this industry are custom built and have developed differently over time, making most processes unique [47]. Social complexity refers to the many different functions that might be involved in the implementation of such technologies. For POEM probably some additional barriers can be found. However, in our cases the importance of the applied technologies and knowledge evident. Structural Resins acquired additional knowledge through technological partnerships with other manufacturers, while Powder Coating Resins had built a strong technological knowledge base more independently. The social complexity and a need for cross-functional cooperation were demonstrated in both cases, as differences in cross-functional cooperation appeared to affect the organization of PS among the two pmc's.

Although we raised the issue of competitiveness and found that the interviewees expected to obtain some form of competitive advantage from organizing PS, we have not compared our cases' performances with that of competitors as we focused on an individual firm level rather than on a sector level. Such performance could be expressed in various ways. Given our focus on decision-



makers and their role in both mediating stakeholder interests and in capability building processes, research on managerial capabilities to assess stakeholder interests could be helpful here. Further research could compare performance with the presence of the capabilities to address stakeholder interests across competing firms. Gathering more quantitative data about the process of capability building in POEM, just like in product development [36,48], could improve comparability across firms.

A related limitation of the research could be in the number of empirical data: we conducted two case studies within one part of a single firm. Still, we think that these cases provide a good orientation on the many issues involved in organizing POEM. Regarding the limited number of cases, we could argue that both pmc's are among the leaders in their markets and are therefore of influence in these markets. Furthermore, we consider it useful to study a firm that is trying to find its way into organizing POEM, instead of looking at well-known, often studied 'best practices'. As Christmann [47] demonstrated, regarding pollution prevention strategies even such 'best practices' often are rather idiosyncratic. Therefore, studying a different practice might deliver just as valuable results, at least if that practice demonstrates a pro-active involvement. Finally, our two cases are also of interest because they regard intermediate products. Characteristics of these products thus could affect the products of ResinMaker's customers. These cases thus demonstrate the chain perspective of organizing POEM. In further research, taking a broader scope and following a product throughout its life cycle, could deliver valuable information on how capabilities and interests are matched in consecutive 'links' in the product chain:<sup>7</sup>

### 5.2. Concluding remarks

In addition to demonstrating the relevance on the capability building process model, this research strengthened our ideas on the dynamics involved. Creating sufficient flexibility, a broad involvement across functions, and a managerial ability to identify and build the required capabilities are considered to be relevant factors in the organization of POEM. The process of continuously assessing a firm's capability base, and taking actions upon this assessment if necessary, requires strategic flexibility. Meanwhile, as POEM involves many different functions, within a firm *and* within a product chain, maintaining an eye on operational aspects remains important. These ideas fit in with the capability building process: in order to frame a problem, ample information

is needed, while implementation of a solution also needs a good interplay between structural and cultural elements [12]. A continuous effort to maintain and improve the firm's capability base in addressing the interests of stakeholders perceived relevant is a crucial element of organizing POEM.

To conclude, we turn once more to the position of managerial decision-makers. These are crucial players in the process of organizing POEM, by deciding which stakeholders' interests to address. This is done through framing problems according to these interests. Henriques and Sadorsky [24, p. 97] noted that if a firm "wishes to make environmental issues a priority, it may want to hire managers who react positively to stakeholders who represent the values the company wants to espouse". To this statement, we add that these managers also need to possess an ability to build capabilities. If POEM is to be advanced, they are the persons to be addressed, either by regulatory stakeholders or others. Raising these managers' awareness of their role in the process of building capabilities regarding POEM seems to be a fruitful approach. Further research providing a better insight in this organizational process could enhance this awareness.

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<sup>7</sup> On sustainable technology development, for instance, such research has been conducted in the coatings chain before [23].

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