

Towards a Theory of Managing Information in New Product Development

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*To Åsa and Filippa, who
walk the sunny side of the
street*

THESIS FOR THE DOCTORAL DEGREE

This thesis consists of two main parts: An introductory text of about 40 pages, and the following six papers appended in full:

Paper I

Frishammar, J. (2005). Managing Information in New Product Development: A Literature Review. *International Journal of Innovation and Technology Management*, 2(3): 259-275.

Paper II

Frishammar, J. and Hörte, S.Å. (2005). The Role of Market- and Entrepreneurial Orientation for NPD Performance in Manufacturing Firms¹. Short version presented at the 12th International product development management conference in Copenhagen, June 12-14, 2005. Full paper submitted to *Research Policy*.

Paper III

Frishammar, J. and Hörte, S.Å. (2005). Managing External Information in Manufacturing Firms: The Impact on Innovation Performance². *Journal of Product Innovation Management*, 22(3): 251-266.

Paper IV

Frishammar, J. (2002). Characteristics in Information Processing Approaches. *International Journal of Information Management*, 22(2): 143-156.

Paper V

Frishammar, J. (2005). Organizational Environment Revisited: A Conceptual Review and Integration. Forthcoming in *International Studies of Management & Organization*.

Paper VI

Frishammar, J. (2003). Information Use in Strategic Decision-making³. *Management Decision*, 41(4): 318-326.

¹ English version of research instrument within the paper; Swedish version of research instrument appended separately.

² English version of research instrument within the paper; Swedish version of research instrument appended separately.

³ English and Swedish version of research instrument appended separately.

ACKNOWLEDGEMENTS & PREFACE

Finally, here it is. My thesis in print. The ambiguous, chaotic and disruptive process of research nicely packaged between coversheets. When writing this preface, a quotation by the famous Scottish physicist James Clark Maxwell comes to mind. Maxwell once stated, *What is done by what is called myself is, I feel, done by something greater than myself in me*. The question is justifiable. Did I really do this? Did I really manage to get it all together? It feels so awkward – almost 5 years of work – and this is it!?! It almost feels like a product by somebody else. Written by someone other than myself in me.

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Needless to say, the usual disclaimer applies.

Halmstad/Luleå in November 2005

Johan Frishammar

ABSTRACT

This thesis deals with various information aspects of new product development (NPD). In total, the thesis consists of 6 research articles appended in full, and an introductory text that integrates and theorizes with and from these papers.

The first paper is a review article examining the literature on and role of information in NPD. The main argument put forward here is that information processing can be understood in terms of three steps: acquiring, sharing, and using information. The second paper is a large-scale survey that examines the relationship between market and entrepreneurial orientation and performance in NPD. A market orientation is to a large extent about acquiring, disseminating and using market information, while an entrepreneurial orientation partly is about ignoring such information, and instead trying to be innovative, proactive, and take risks. The results show that a market orientation and innovativeness are positively related to NPD performance, and that neither product nor environmental characteristics moderate these relationships. The third paper is also a survey, and investigates the extent to which management of external information is associated with innovation performance. The main findings are that scanning the technological sector of the environment was positively associated with innovation performance, while scanning customers, suppliers, and competitors proved to be negatively correlated with innovation performance. Cross-functional integration in the form of collaboration as well as using information from the industry environment also proved to be positively related to innovation performance.

The last three papers have a centre of gravity in “management of information & environment”, and not so much in new product development *per se*. Paper four describes and compares different information processing approaches (e.g. environmental scanning, marketing research) in order to identify their similarities and differences, but also their underlying concepts and the course of events they represent. The main conclusion is that differences exist primarily in terms of focus and scope. Paper five is a review and tentative integration of different perspectives in organization – environment research: the adaptive, the resource-dependence, the cognitive and the population-ecology perspective. The review identifies differences and similarities among these perspectives, suggests tentative conclusions on why the adaptive perspective is so frequently utilized at the expense of the other three, and suggests constructivism as a feasible avenue for combining and integrating these perspectives. Finally, the sixth and final paper deals with information use in the context of strategic decision-making. With a case-study approach, the questions of why information is used, what kind of information is used, where it is obtained, and how it is obtained were addressed, and the results from this paper are mainly descriptive.

The purpose of the introductory text is two-fold. In addition to providing integration of the appended papers, the main purpose is theory construction (i.e. elicitation of constructs and propositions). In the introduction, all six appended papers together with a new literature search and a new pilot case study are used to generate propositions about management of information, information sources, and the need for cross-functional integration in three different phases of the NPD process. In addition, suggestions regarding theoretical connections are made. The introduction text concludes with reflections, managerial implications, limitations, and future research.

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1. Background

There are at least three generic ways of writing the introductory text of a non-monographic doctoral thesis. The most common (and many people would probably say the most straightforward) way of doing it is to write a text that summarizes, describes, clarifies and integrates the contents of the appended papers. That is, overall purpose of the thesis, frame of reference, method(s), and so forth [see e.g. Florén (2005) or Zobel (2005) for examples of this design]. A second option is to write this text as a review of key aspects or concepts central to the research conducted (e.g. Barth, 2004). A third option is a text that draws on new data, new and previously used literature and all the appended papers with the explicit purpose of “theorizing”. This last approach is the avenue taken here, and this short background is intended to provide an account of why this particular approach was chosen. Clearly, all three ways of writing the introductory text stated above have their specific advantages and disadvantages, but the following reasons lay behind my choice of the “theorizing” design.

First, when the process was started approximately five years ago, my intention was to write a thesis on environmental scanning in the context of strategy formulation, with a special focus on the link between scanning activities and competitive advantage. The end result is a thesis with a centre of gravity in “information aspects of product development and innovation” (Papers I – III and the introduction), and three papers focusing on “management of information & environment” more broadly (Papers IV – VI). Even though the original aim was to write highly interrelated papers, the ideas and suggestions of editors, reviewers, supervisor and colleagues (together with a large portion of serendipity, I might add!) pushed them into other trajectories. Therefore, the fact that the papers are so straggling added largely to the choice of this design.

Second, this design possesses a higher degree of “product newness” than a traditional introductory text as it contains new conceptual writings and ideas as well as new data not found elsewhere in the appended papers. Thirdly, the contribution to knowledge is potentially greater with this design as it primarily focuses on other issues than description and summarization, which occupy a large part of a more “traditional” introductory text. This text is also designed to help fill a knowledge gap identified in the literature (this point is further elaborated in the next chapter). Furthermore, it creates a better balance between “theory” and data in this particular case. All in all, the thesis now contains two case studies, two large-scale surveys and three conceptual papers.

Last but not least, a final reason that contributed to the selection of this design was the fact that it alleviated some of the distress and boredom that I think all doctoral students experience when trying to write up their theses. As noted by Folger & Turillo (1999), Weick (1989) and others, theorizing takes scientists on mental journeys. Such travelling really appeared promising and fruitful, considering the alternative of “squeezing the pieces of the puzzle” into a form for which they were not fit. The next section should give a better idea of the actual aims, scope and purpose of the introductory text but before moving there it is important to point out that this introduction is not part of some incomplete empirical work previously conducted. Hence, it was designed specifically to suite the present purposes.

2. Introduction

New product development (NPD) – the transformation of a market opportunity into a product available for sale (Krishnan & Ulrich, 2001), is central to business prosperity for firms active on a market characterized by competition. Potential benefits of NPD efforts include improved market position (e.g. when new products open up new markets), improved resource utilization (e.g. when capitalizing on prior R&D investments), and renewal and transformation of the organization (Wheelwright & Clark, 1992). The ideal outcome of NPD is high performing products; products that achieve stipulated market share, sales growth, customer use, and profit objectives. Ultimately, high-performing products contributes to competitive advantage and, subsequently, high financial performance.

The extant literature states that NPD is a process, and that many different conceptualizations of this process exist. Despite conceptual differences among authors, a majority of scholars claim that NPD starts with an idea and ends with market launch and commercialization¹. During this process, different kinds of activities are carried out. Figure 1 below reviews the activities suggested by several different scholars².

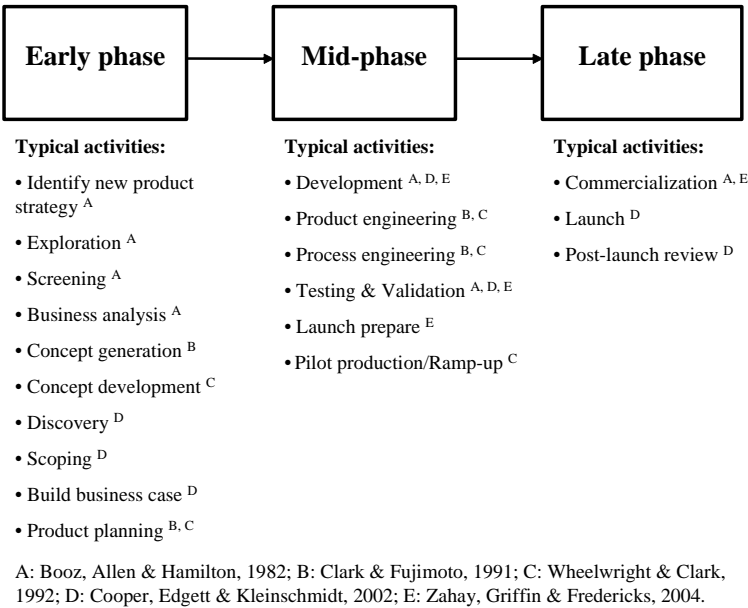


Figure 1: A simplified version of the new product development process.

¹ Assuming that the product is developed with an external customer in mind and not with the objective of internal use only.

² For reasons of simplicity, parsimony and for making communication with respondents less complicated during the interviews in subsequent empirical steps, this three-step version of the NPD process was created for the purposes of this introductory text. As noted by Clark & Fujimoto (1991) and others, a development process has many loops and parallel steps when studied at a detailed level. But for purposes of description, the process is portrayed as sequential and linear here.

The first step of this simplified NPD process is named “the early phase”, and corresponds roughly to what Smith & Reinertsen (1998), Zahay, Griffin & Fredericks (2004) and others call *the fuzzy front end*: the activities performed between the identification of an opportunity and when serious efforts are spent on a development project. Typical activities identified by several authors include screening among ideas and development of product concepts. The second phase is named “the mid-phase”, and includes activities such as actual development, testing and validating products, and so forth. The last phase is named “the late phase”, and contains activities such as market launch/commercialization. The boundary between the steps might be obscure and fuzzy, and some activities are indeed harder to classify than others. For example, pilot production/ramp-up may be part of the late phase as well as the mid-phase.

To be able to carry out the activities identified in figure 1 in an efficient and effective manner, firms depend on many different resources and capabilities. One such resource is information and one such capability is how information is managed during NPD. On a general level, effective information processing is a prerequisite for knowledge creation (Cohen & Levinthal, 1990). Information can also reduce uncertainty, equivocality and ambiguity among participants in NPD (Kyriakopoulos & deRuyter, 2004; Paper I). Furthermore, sharing information among functions and departments is very important for NPD performance (Griffin & Hauser, 1996; Moenaert & Souder, 1990). In addition, previous research has shown that the use of market information correlates positively with different measures of NPD performance (Atuahene-Gima, 1995; Jaworski & Kohli, 1993; Slater & Narver, 1994; Paper II). In short, the gathering, sharing, and use of information “plays a pivotal role in determining the success or failure” of new products³ (Ottum & Moore, 1997: 258).

Despite the importance of information and management of information to NPD, very little is known about what kind of information that is needed in each phase of the NPD process, where this information comes from, and in what form it arrives to NPD participants (Zahay, Griffin & Fredericks, 2004; Paper I). In fact, much of the existing knowledge about the role of information in NPD draws on survey data. Although such studies have many advantages, they often lack detail and do not pay sufficient attention to what is happening within the NPD process. Significant examples of this kind of research are provided by Atuahene-Gima (1995), Atuahene-Gima & Ko (2001), Gattignon & Xuereb (1997), Lukas & Ferrell (2000) and Paper III. Lack of detail is a problem because new product development is a process, and knowledge about what is happening *within* the process is needed in order to manage it better. Other studies (e.g. Zahay, Griffin & Fredericks, 2004) are purely descriptive, thus focusing the question of *what*. This type of research design is also problematic but for another reason: what-questions aim to describe empirical patterns but generally fail to explain them.

In fact, very little is known about *why* different kinds of information and information sources are needed in different phases of the NPD process. Knowledge about why

³ Information might not be all to the good, however. There are also those who claim that for example customer information can have an unfavourable influence on NPD or innovation performance since such information constrains innovative thinking (Christensen & Bower, 1996; Trott, 2001; Paper III). Too much information can also lead to problems with information overload (Edmunds & Morris, 2000).

information sharing among functions and departments is phase-contingent is also severely limited. The introduction to this thesis is designed as a first step towards helping to fill this knowledge gap.

2.1 Purpose

The overall purpose of this introductory text is two-tailed. The first purpose is theory construction, i.e. elicitation of constructs and propositions. The second purpose is to provide integration of the appended papers.

For the first purpose of theory construction, the text focuses on three different sub-areas regarding the role of information in NPD. That is, management of information in each respective phase of the NPD process, the information sources utilized in each phase, and the relative importance of cross-functional integration practices in each phase. In addition, suggestions regarding appropriate theoretical connections for this area of research are stated. These sub-areas could easily have provided descriptive research questions at the outset, but, as Bacharach (1989) points out, the goal of description is to answer the question of *what* rather than those of the more theoretical *how* and *why*, which are the main objective here. Theory construction is, of course, not a goal in itself, but rather a means to an end: to create new knowledge.

The second purpose of providing integration of the appended papers is addressed in a somewhat unconventional manner. Rather than describing a frame of reference common to the papers, the set of data they draw upon, the overall purpose that unites them, the ideas and results in these papers are used as building blocks for the creation of something new. So, the papers are integrated by providing a large part of the foundation for theory construction (as pointed out in the background, new and existing literature and new data provide the rest of this foundation).

The reminder of this text starts by describing the methods employed, drawing attention to both the literature search and field interviews conducted. The following section reviews and elaborates the management of information in NPD, and clarifies and defines central concepts. The following section uses previous findings and present data to derive research propositions about the role of information in NPD. Based on these propositions, a theory of the middle range is constructed. Such a theory is a theory applicable to a limited conceptual range (Merton, 1968). The following section reflects and discusses the theory proposed. The text concludes with implications for managers, limitations, and suggestions for further research.

3. Method and research approach

In order to aid in deriving propositions, a pilot case study as well as a literature search was performed. Both these procedures are described below.

3.1 The pilot case study

All in all, four cases were handpicked by means of judgment sampling (Churchill, 1999), simply because they were believed to offer different perspectives valuable to the research purpose of theory construction. The criteria for choosing these four cases were that they were manufacturing firms with in-house product development, mid-sized in terms of employees, and active on a market characterized by competition. Furthermore, it was made sure that all four firms were “different” in terms of scope and specific products to allow diversity of answers. Simultaneously, these firms are also to some extent “similar”, as they all operate in a business-to-business setting, competing with assembled physical products. A final selection criterion used was the fact that all four firms were skilful at NPD, an important criterion given that the propositions are concerned with the variable NPD performance. In fact, product development is a core capability and an important factor for competitive advantage in all of these four firms. To assure anonymity, the four cases are hereafter labelled *Alpha*, *Beta*, *Gamma* and *Delta*.

- *Alpha* has approximately 200 employees, and supplies the construction industry with specialized building products in steel and aluminium such as roofing sheets, systems for rainwater transportation, and wall cassettes. Two interviews were made at *Alpha*, with the chief technology officer and with a product & marketing manager.
- *Beta* has approximately 250 employees and develops and manufactures both standardized and custom-built equipment for vertical transportation, mainly for industrial environments. Two interviews were made at *Beta*, with the manager for product development & design, and with the marketing & sales director.
- *Gamma* has approximately 180 employees, and develops and manufactures pre-fabricated pods for new building projects as well as for renovation of older ones. One interview was made at *Gamma*, with the co-coordinator for product development, who is also the chairman in this firm.
- *Delta* has approximately 200 employees, and develops and manufactures care products, for example lifting systems and transfer devices. Three interviews were made at *Delta*, with the R&D manager/chairman, with the R&D coordinator, and with the technical manager.

All in all, eight interviews were made during the fall of 2005 where data was collected via semi-structured, one-to-one interviews lasting between 50 minutes and two hours. Most of the questions discussed with respondents were made from scratch, al-

though some were adopted from previous research (see appendices A and B for English and Swedish versions of the interview guide, respectively). Each interview was recorded and included in a case-study protocol for each firm (Yin, 1994). Documentation in the form of product brochures complemented the interview data. Delta was the only firm that had constructed and documented a self-made conceptual model of its NPD process, and a part of this documentation was also studied in detail. Furthermore, Delta was also the only firm that had an NPD process resembling the stage/gate approach. Thus, the overall degree of formalization of NPD activities in the remaining three firms was low.

Needless to say, eight interviews are far from sufficient for *testing* statements of relationships, but this was not the idea here. Rather, the idea was to use data and the extant literature to *derive* propositions. The approach employed here thus differs from the one suggested by Eisenhardt (1989) on building theory from case study research, in the sense that literature enters the theory construction process early instead of late. The early use of literature can potentially prohibit the theory created from being too narrow and idiosyncratic, while the data simultaneously allowed for some empirical grounding. Thus, data *and* the extant literature were used throughout the process. Weick (1989) describes the process of theory construction as sense-making, and both data and the literature have been crucial components in this sense-making process.

3.2 The literature search

Most of the literature used for the introduction was used previously in the appended papers, but a new literature search was also performed. This search was restricted to the *Business Source Elite* database, simply because the highest ranked journals in the field of technology innovation management are all listed there [see e.g. table 4 in Linton & Thongpapanl's (2004) ranking of the journals in this field]. These include the leading specialty journals such as the *Journal of Product Innovation Management*, *Research Policy*, and *R&D Management* but also more general ones such as *Strategic Management Journal*, *Academy of Management Review*, *Organization Science*, and *Administrative Science Quarterly*, where articles on product development appear regularly but less frequently.

The keywords of information, information sources, communication, integration, collaboration, knowledge and data were used in combination with product development or innovation. This literature search generated the articles by Atuahene-Gima, Slater & Olson (2005), Di Benedetto (1999), Harada (2003), Helfat & Raubitschek (2000), Kyriakopoulos & deRuyter (2004), Narver, Slater & MacLachlan (2004), Ravindranath & Grover (1998) and Tsoukas & Vladimirou (2001). Suggestions of literature for this introduction were also given by colleagues, by means of a snowball technique (i.e. checking reference lists of other authors' previous work) and through conference proceedings.

4. Information and management of information in NPD

The introduction stated that “information” but also “management of information” is important if effective and efficient NPD is the objective. This section spells out more clearly what is meant by information, and what management of information really means.

A distinction is often made among data, information and knowledge (Richtnér, 2004). As noticed by Tsoukas & Vladimirou (2001: 976), data requires “minimal human judgement, whereas knowledge requires maximum judgement”. In between these two concepts, we find information. Thus, these three concepts (data, information, knowledge) may be ordered on a continuum depending on how much human involvement they reflect (Tsoukas & Vladimirou, 2001). In practice, however, the boundaries between these concepts are blurred and all but clear, and they are seldom defined in the NPD literature (see Paper I). The relationships between them may actually be all but linear, so the picture provided here is a simplification of reality. Kogut & Zander (1992), for example, argue that information may be viewed as one kind of knowledge (i.e. knowing what something means).

For the purpose of this thesis, it might be useful to think of information as “...data, which, when presented in a particular manner and at an appropriate time, improves the knowledge of the person receiving it in such a way that he/she is better able to undertake a particular activity or make a particular decision” (Galliers, 1987: 4). This definition is advantageous, because it points to the differences among the concepts of data, information, and knowledge while simultaneously noticing their interrelationships. Thus, as Nonaka & Takeuchi (1995: 58) observe, “information is a flow of messages, while knowledge is created by that very flow of information”.

In addition to being defined, the title of the thesis and several of the appended papers imply that information needs to be *managed*. Webster’s dictionary states that *manage* means ‘handle or direct with a degree of skill’. The definition of the word *manage* thus suggests that firms may vary in their skills when trying to handle something, for example information. Thus, firms can be *more effective* (handling or directing with a higher degree of skill) or *less effective* (handling or directing with a lower degree of skill) when managing information.

Thus, “managing information” is a capability, but probably not a single one-dimensional construct. In the context of this thesis, *managing information* means ‘acquiring, sharing and using information’. As such it is similar to Cohen & Levinthal’s (1990) *absorptive capacity*, defined as the capability to recognize the value of new and external information, absorb it, and apply it productively. It also has key features in common with Kohli & Jaworski’s (1990) conceptualization of a market orientation, characterized by the generation and dissemination of and responsiveness to market intelligence.

Acquiring information means gathering the information necessary to make the NPD process effective and efficient. This can be accomplished through a variety of means, for example informally via gatekeepers (Allen, 1977; Papers I and III), by means of market orientation (Atuahene-Gima, 1995; Papers I, II and IV), or through broader environmental scanning (Howell & Shea, 2001; Papers I, III, VI). To trust in and use lead-users is another option (von Hippel, 1988). In the context of NPD, information

acquisition is important for many reasons. For example, new information can provide new product ideas, can help fine-tune product concepts, and make firms aware of upcoming technical trends.

Information, however, is acquired or generated by individuals and departments throughout an organization. As Kohli & Jaworski (1990: 5) observe, firms need mechanisms in place for information “generated at one location to be disseminated effectively to other parts of an organization”. *Sharing information* means transferring information across boundaries of departments and functions and among organizational members, something that is mainly accomplished via cross-functional integration practices. Cross-functional integration may be performed in terms of structural and formally coordinated activities among functions and departments (referred to as interaction) or through a more unstructured process that stresses continuous relationships, which is referred to as collaboration. (Kahn, 1996; Papers I and III)

Using information is somewhat similar to the responsiveness component of a market orientation (cf. Kohli & Jaworski, 1990), and means responding or taking action on information that has been acquired and shared. Using information is central to many activities in NPD. For example, in the early phase of the NPD process, information needs to be used when generating and developing product concepts. In the mid-phase, using information is central to testing, validation, and process engineering. In the late phase, information needs to be used for example when commercialization plans are designed. In the upcoming section, the concept of information and the capability of “managing” information are used as essential building blocks in the process of theory construction.

5. Antecedents, research propositions and consequences

This section is organized into three parts. First, a section describing the antecedents is provided, i.e. what are the organizational factors facilitating successful management of information? Then there follows a couple of sections where propositions regarding the role of information in NPD are derived and constructed. Finally, a section discussing the consequences is provided, i.e. what are the outcomes expected for firms skilful at managing information in NPD?

5.1 Antecedents

Several organizational mechanisms or factors are posited to facilitate the acquisition, sharing and use of information during NPD. First, a work organization that is decentralized, “flat” or organic (Burns & Stalker, 1961; Ottum & Moore, 1997) is likely to be advantageous, simply because it facilitates communication, exchange and use of information. Such a structure also facilitates the willingness to take on external ideas, and information can flow in all directions and not just top-down (Ahmed, 1998). In a similar vein, Kohli & Jaworski (1990) suggest that too much formalization (i.e. the degree to which rules define communication, norms and procedures) and centralization might be harmful to information generation and dissemination. Another important factor is co-location/physical proximity. As the frequency of communication and information sharing among people normally decreases with increased physical separation (Allen, 1977), this aspect is important to consider for example when assigning individuals to a development project.

Finally, some of the attributes that Ahmed (1998) claims to be associated with innovation are also likely to facilitate the acquisition, sharing and use of information. An external orientation with focus on e.g. customers and other external actors should be important and facilitate information acquisition. Another important cultural attribute is trust and openness, making information acquisition and sharing easier. These are some of the most important antecedents facilitating the acquisition, sharing and use of information, although this list is by no means complete.

5.2 Propositions regarding management of information

In the NPD literature, there is one type of information that has been extensively debated and that deserves specific attention: information from customers. There is disagreement in the literature on whether customer information fosters or hinders new product development (see papers I & II for a discussion in detail). In short, one view claims that such information leads to commonality and bland new products, because customers are restricted to the familiar, they do not know what is technologically possible, and are not informed about the latest market trends (with the possible exception of so-called lead-users). The other view claims that customer information is central to NPD performance, and that customer information should be used throughout the NPD process to increase success and performance (e.g. Hill, 1988; Lukas & Ferrell, 2000).

The avenue taken here is that customer information might be bad for innovation performance (see Paper III) but is central for NPD performance (Papers I and II). In-

novation performance or firm innovativeness is an important antecedent to NPD performance (see Paper II), but the two terms do not describe the same construct, and the relationship between innovation- and NPD performance does not converge in the literature⁴.

Understanding the customer is indeed central to NPD performance, but firms cannot just rely on expressed customer wants. Griffin (1996) makes this point clear. She suggests that customers will never tell firms exactly what products to develop, and that customers cannot provide reliable information about things they have not experienced or are not familiar with. Therefore, to act upon information from unknowledgeable customers is risky. Griffin (1996) suggests, however, that customers can provide information on problems they have, on things they are familiar with, what products will meet their needs, and so forth. Thus, a focus on customer needs and problems rather than customer solutions and expressed wants seems central. A quotation from one of the respondents captures a key point of Griffin (1996) and Slater & Narver (1998): firms must have a long-term focus on understanding tacit needs of customers and not just their expressed wants.

"You should not listen to the solutions of customers but rather... you have to perform a deeper analysis. You need to dig deeper and get behind what the customer thinks is the solution, and make the customer focus on the problem. What does the problem look like, really? Often, an experienced team of developers can generate a much better solution to the problem than can customers, because they lack experience in that area. Customers are usually not trained to perform that kind of tasks" (R&D manager, Delta).

The idea in this quotation also corresponds roughly to Narver, Slater & MacLachlan's (2004) distinction between a proactive and responsive market orientation, where the former addresses the latent needs of customers and the latter addresses customers' expressed needs. In sum, these authors found that a responsive market orientation is not sufficient, and that a proactive market orientation plays a crucial role for NPD performance.

In sum, two suggestions emerge from the discussion above. First, it is suggested that management of information about customer solutions and expressed wants is not sufficient for NPD performance, and such information is not related in any specific way – positively or negatively – to NPD performance. And second, as long as one recognizes that there is some information that customers cannot (and should not) provide, the acquisition, sharing and use of information pertaining to customer problems and latent needs should be good for NPD performance. The following proposition is suggested:

P₁: Irrespective of phase in the NPD process, more effective management of information about customer needs and problems is associated with higher NPD performance.

⁴ Cooper (1996) hypothesizes a u-shaped relationship between innovativeness and high performance in NPD, suggesting that new products with low innovativeness as well as truly innovative products often perform high, while "moderately" innovative products often suffer in terms of performance. Support for this hypothesis cannot, however, be found using the data of Paper II.

In principle, it is possible to argue that every type of information has at least *some* importance in each phase of the NPD process. The argument put forward in the three propositions below suggests, however, that the type of information needed varies depending on the phase in the NPD process. That is not to say that all types of information not mentioned in these propositions are totally unimportant. Rather, the propositions postulate a centre of gravity by focusing on the most important types, thereby ignoring those of peripheral value.

To acquire, share and use several different types of information seem especially important activities in the early phase of the NPD process. The product development “funnel” suggested by Wheelwright & Clark (1992) can help us understand why this is the case. The Wheelwright & Clark “funnel” is a conceptual tool for structuring thinking about generation and screening among alternative options or ideas for NPD, and the subsequent processing of some of these options or ideas into product concepts. Ideally, a variety of different ideas should enter the funnel for investigation, although only a fraction of these will eventually survive. According to Wheelwright & Clark, a key objective of effective development is to widen the mouth of this funnel. This has important implications for management of information, because it implies that firms should acquire, share and use different kinds of information to increase the variety, diversity and creativity of new product ideas.

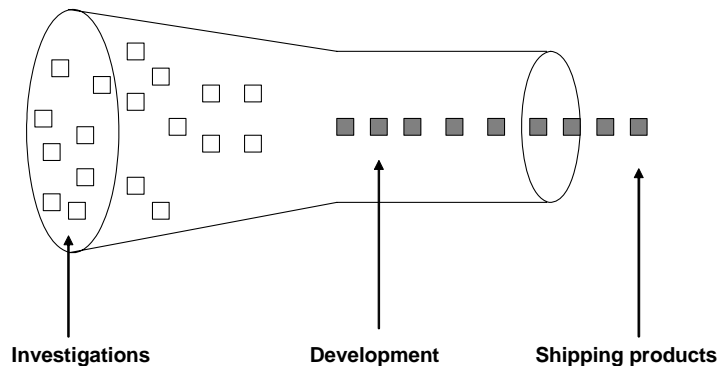


Figure 2: The development funnel. Adapted from Wheelwright & Clark (1992: 112).

According to Cooper & Kleinschmidt (1987), Griffin & Hauser (1996) and others, firms need information about customer needs and problems that a new product should solve early on in the NPD process. From the empirical side, all respondents emphasize the importance of early access to and use of customer information for effective NPD. Firms also need technical information in the early phase, information about what the firm can do technically but also information about technological developments outside the firm (Zahay, Griffin & Fredericks, 2004). The findings of Paper III also indicate that this type of information is paramount, as do the findings of Lichtenthaler (2004) and a clear majority of the respondents. Furthermore, firms also need information about competition (e.g. understanding competitors’ products and their current posi-

tions). Information about competing products is important, as such information might affect design specifications and product positioning. Information about regulatory issues (e.g. about pollution regulations, performance requirements, safety issues) is also important, since regulatory information can impact on pollution or performance requirements (Zahay, Griffin & Fredericks, 2004). Hence, the third proposition states:

P₂: More effective management of information about customer needs and problems as well as technical, competitive and regulatory information is associated with higher NPD performance in the early phase.

In the mid-phase, where the activities associated with actual development are carried out, the need for multiple types of information decreases. In fact, a majority of the respondents claim that technical information is the only type of information needed here. One of the respondents expressed an opinion common among the others:

“If the goals of product development set in the early phase are clear and unambiguous, reliance on technical information in the mid-phase will do it” (Marketing & Sales director, Beta).

Thus, technical information is very important when the physical development and engineering work are carried out. Technical information is necessary for turning a product concept into development, and when testing and validating prototypes, just to mention two examples. Customer information is perhaps less important here than in the early phase but definitely not unimportant, because information about customer needs must be used throughout the NPD process to ensure a product that meets customer requirements (see e.g. Griffin & Hauser, 1996; Zahay, Griffin & Fredericks, 2004; Paper I). Too much processing of other kinds of information in this phase may stifle and delay the process, however, because processing information requires both time and resources. If much information of other types is still needed, this might be a sign of ineffective gates (i.e. letting a project enter the development phase without being ready for it) or, in firms where a stage-gate approach to NPD is lacking, a sign of ineffective decision-making during or after the early phase of the NPD process. Thus, to conclude:

P₃: More effective management of technical information as well as information about customer needs and problems is associated with higher NPD performance in the mid-phase.

In the late phase, customer information again comes into play. Such information is important in the late phase, because commercialization and launch activities require information about customer behaviour, segment sizes, and so forth. A majority of the respondents mention customer information as the most important type during this phase. Firms also need information about competitors, for example on how competitors are likely to respond to a launch (Stryker, 1996). As most of the development work is completed in this phase, the need for technical and other types of information should be low. Therefore:

P₄: More effective management of information about customer needs and problems as well as competitor information is associated with higher NPD performance in the late phase.

To summarize, different types of information are needed in different phases of the NPD process. But this information must come from somewhere. The following section derives propositions on the role of information sources in the early, mid- and late phases of the NPD process respectively.

5.3 Propositions regarding information sources

Information sources may be classified as being external or internal. An external source originates outside the boundaries of an organization while an internal source originates within an organization⁵. These sources may then be further divided into personal and impersonal sources, where personal sources refer to direct human contact and impersonal sources are written/non-verbal by nature (Aguilar, 1967; Paper VI). In principle, it is possible to obtain almost any kind of information from whatever source. Often, however, a specific kind of source is associated with a specific kind of information (e.g. information about customers often comes from the source “customers”). A list of different information sources is provided in Table II in Paper VI. Analogous with the propositions regarding management of information in each phase of the NPD process, the propositions on information sources also articulate a centre of gravity by focusing on the most important types of sources, thereby ignoring those of peripheral value.

Lonsdale, Noel & Stasch (1996) report that Peter Drucker once said that innovative ideas are like frogs’ eggs; of a thousand hatched, only one or two survive to maturity. If this claim proves true, it will have important implications for the selection of information sources. Analogous to the proposition concerning management of information in the early phase, the claim suggests that a variety of sources should be necessary to widen Wheelwright & Clark’s “funnel” in order to obtain a variety of ideas in the early phase. In fact, a variety of sources are suggested both by the literature and by the respondents at the four firms studied.

First, a key source for acquiring and sharing external information relevant to new product development is gatekeepers. According to Tushman & Katz (1980), gatekeepers are key individuals internal to the firm who are strongly connected to colleagues while simultaneously being strongly linked to external domains. As gatekeepers often read more of the “harder” literature (e.g. technical and scientific journals) and maintain broad-ranging and long-term relationships with others outside their own organization (Allen & Cohen, 1969), they are indeed important sources for screening of ideas and for development of product concepts in the early phase. None of the respondents in the studied firms use the term gatekeeper, but a majority mentioned “internal key persons” with the characteristics of a gatekeeper.

Another important source in the early phase is customers. The benefit of customers as a source of information is profoundly rooted in the NPD literature. Cooper (1996)

⁵ This assumption presupposes a view of “organization” and “environment” different from that of the cognitive perspective. For a detailed discussion, see the section on the cognitive perspective in Paper V.

suggests, for example, that focus groups with customers or other forms of market research are particularly important during the early phase of product development. Lonsdale, Noel & Stasch (1996) further suggest that dissatisfied customers are one of the best sources of new product ideas, as such customers may be motivated to come up with improved versions of current products. Other examples of the importance of customers in the early phase of NPD are found in von Hippel's (1988) or Herstatt's (2002) writings on specifically qualified customers in the search for innovations (so-called lead-users). Yet another important source of customer information is a firm's sales-force. Several respondents mention customers as an important source, which is supported by Pavia's (1991) findings, according to which firms place heavy reliance on customers as a source of product development, and that firms often develop products in response to customer problems.

Howell & Shea's (2001) findings further suggest that when searching for new product ideas, the personal network inside and outside the firm is of great importance. Despite its importance, however, only two out of eight respondents mention this source. Finally, another important source in the early phase mentioned by several respondents is government agencies, as these often provide standards and requirements for product quality, safety, and pollution. Needless to say, many more sources may be relevant, but these are the most important ones in the early phase.

P₅: The utilization of gatekeepers, customers, sales force, personal network, and government agencies as information sources is positively associated with NPD performance in the early phase.

As a project moves from the early phase to the mid-phase, the types of information needed typically decrease. Most likely, the types of information sources needed will also decrease. As technical information is the most important type of information in this phase, the most important information source is likely to be that of the gatekeeper. The gatekeeper is an example of an internal/personal source that is particularly valuable in the mid-phase, simply because s/he is primarily concerned with technical information. Gatekeepers can translate different languages and coding schemes and make sense of external information to more internally oriented colleagues (Allen, 1977; Macdonald & Williams, 1993; Paper I). They can also synthesize complex ideas and communicate these ideas to others, thus facilitating technical problem solving and allowing a higher NPD performance (Harada, 2003). The source "gatekeeper" and the source "personal network" are not mutually exclusive, because a gatekeeper can indeed be a part of a network. Several respondents also point to the importance of the personal network in this phase. A quotation from one of the respondents articulated a common opinion:

"People from all over are needed here. To be able to develop a successful product, you need input from all directions. Everybody had the right to an opinion... input from various directions are necessary for the product to fulfil all requirements put on it" (Product & marketing manager, Alpha).

The value of the personal network as a source is also supported by the findings of Paper VI: this source has the advantage of speed, but may in addition also provide advice and interpretation of information. The value of sharing information in and through a personal network is also supported by Brown & Eisenhardt's (1989) review of product development as a "communication web". Therefore:

P₆: The utilization of gatekeepers and personal network as information sources is positively associated with NPD performance in the mid-phase.

The late phase of NPD is focused on commercializing a new product on the market and it usually begins after a new product has been produced, although full-scale production is often achieved at a later point in time. The volume of academic literature on product commercialization and launch is, however, relatively small (Di Benedetto, 1999). Stryker (1996) suggests that customer information is central to managing the launch, because the product needs to be positioned versus customers' needs, and key product benefits need to be communicated to the customer. Di Benedetto's (1999) findings also point to the importance of customer information, and suggest that for example customer feedback is an important antecedent to successful launches. This information is likely to come from the *source* customers, but also from the marketing function/department within the firm. As suggested by several of the respondents, competitor information (often accessed via the source competitors' websites) is also important, because information on competitors and their product offerings is needed when trying to understand their marketplace momentum, and their responses to a launch.

P₇: The utilization of customers, the marketing function/department and competitors' websites as information sources is positively associated with NPD performance in the late phase.

5.4 Propositions regarding cross-functional integration

New product development is a process that consists of different interrelated phases. To perform the activities at these phases successfully, input from multiple departments and functions is required (Olsson, 1976). In fact, "outstanding development requires effective action from all of the major functions in the business" (Wheelwright & Clark, 1991: 165), because individual members or one individual function cannot efficiently provide all the necessary information and knowledge (Ravindranath & Grover, 1998). Cross-functional integration contains the two sub-dimensions of interaction and collaboration, and the exchange of information among functions and departments is the most important factor for achieving integration (Moenaert & Souder, 1990; Paper I). Earlier research as well as the interview data indicates that the degree of integration (and thus information sharing) required among functions and departments is contingent on the specific phase in the NPD process, although all functions and departments are needed in each phase at least to some extent.

In the early phase of the NPD process, integration between the functions of marketing and research & development (R&D) is crucial. The rationale is that these functions often share responsibility for setting NPD goals, for identifying opportunities for prod-

uct improvements, and for understanding customer requirements (Sherman, Souder & Jenssen, 2000; Paper III). In all firms studied, one of these two functions is also the one who “owns” a project during NPD. Furthermore, marketing usually has knowledge of customer preferences and competitive offerings, important factors in deciding on design and positioning of the product being developed. R&D, on the other hand, bears the primary responsibility for translating available technology into a product with desirable performance and features (Olson et al., 2001), also important in the early phase. Looking at the empirical data, all respondents claim that these functions and/or departments are the most important ones in the early phase, although some respondents mention other participating departments or functions as well (e.g. production, purchasing). Thus:

P₈: Integration of Marketing and R&D is the most important type in the early phase in order to facilitate high NPD performance.

As the process continues to the mid-phase, the activities performed shift from fuzzy to more concrete. Here, product and process engineering, actual development, and testing and validating product prototypes are significant activities. Many of the activities performed in this phase fall outside of marketing and R&D (Olson et al., 2001; Paper III). Typically, the manufacturing function plays a crucial role in developing production methods, and achieving the desired level of quality. Manufacturing is also responsible for transforming conceptual designs – artefacts of R&D – into producible products (Olson et al., 2001). A clear majority of the respondents are of the opinion that R&D *per se* is the most important function in this phase. Half of the respondents claim that R&D – Manufacturing integration is the most important one, but several respondents also point to the importance of having marketing involved in this phase as well. Other functions/departments such as purchasing and logistics are also mentioned, but integration between manufacturing and R&D seems most crucial to achieve.

P₉: Integration of Manufacturing and R&D is the most important type in the mid-phase in order to facilitate high NPD performance.

For the last phase, the empirical patterns are more scattered. The literature suggests that the marketing function is responsible for developing an effective marketing program at the later stages of the NPD process. This includes communicating product benefits to the target market, stimulating demand, and achieving adequate distribution (Olson et al., 2001). A majority of respondents also claim that marketing is the most important function/department in this phase. Simultaneously, manufacturing has the main responsibility for pilot production and other activities necessary for the eventual reach of large-scale production. Several respondents also state that integration of marketing and manufacturing is the most important aspect. Another reason pointing to this type of integration being the most important one is that the overall level of cooperation tends to be higher at the end compared to at the front. Thus, the conceptual parameters tend to be decided at the front of the process, but at the end these need to be converted into a physical product that “can be efficiently manufactured and effectively marketed” (Olsen et al., 2001: 261). Therefore:

P₁₀: Integration of Manufacturing and Marketing is the most important type in the late phase in order to facilitate high NPD performance.

Integration is often depicted as a two-dimensional construct containing the sub-dimensions of interaction and collaboration⁶ (Kahn, 1996; Papers I and III). The interaction dimension represents formally coordinated and structured activities among departments, for example routine meetings and flow of standard documentation. Collaboration, on the other hand, represents the more unstructured and affective nature of relationships and involves working together, having a common vision and sharing resources, where departments and functions achieve goals together (Kahn, 1996). Too much collaboration might, however, lead to major changes in climate and culture, and employees becoming confused about their roles, as collaboration is unstructured by nature. Company performance may also suffer in the short run.

Many empirical studies, however, single out collaboration as the more important dimension for enhancing innovation or NPD performance (e.g. Maltz & Kohli, 1996; Fisher, Maltz & Jaworski, 1997; Paper III). Thus, interaction might be necessary to some extent, but collaboration often appears to make the difference between low and high performance. This is likely to be due to the fact that the collaboration philosophy encourages departments to achieve goals together, work informally together, have a common vision, and share ideas and resources. Surprisingly, many respondents had difficulties in answering this question and discriminating between these two sub-constructs during the interviews, so the following proposition is mainly theoretically driven:

P₁₁: Irrespective of phase, collaboration is more important than interaction for achieving high NPD performance.

The proposition stated above is the last one that the theory suggested here contains. This last proposition and all the previously stated ones are summarized in figure 3. The nine propositions connected with a specific phase are shown “inside” figure 3. The remaining two propositions are not connected to a specific phase in the NPD process, and lie “outside” the phases of the figure.

⁶ The factor analysis performed in paper 3 indicates that the interaction dimension, by itself, may contain two dimensions. In Paper III these were labeled personal- and impersonal interaction.

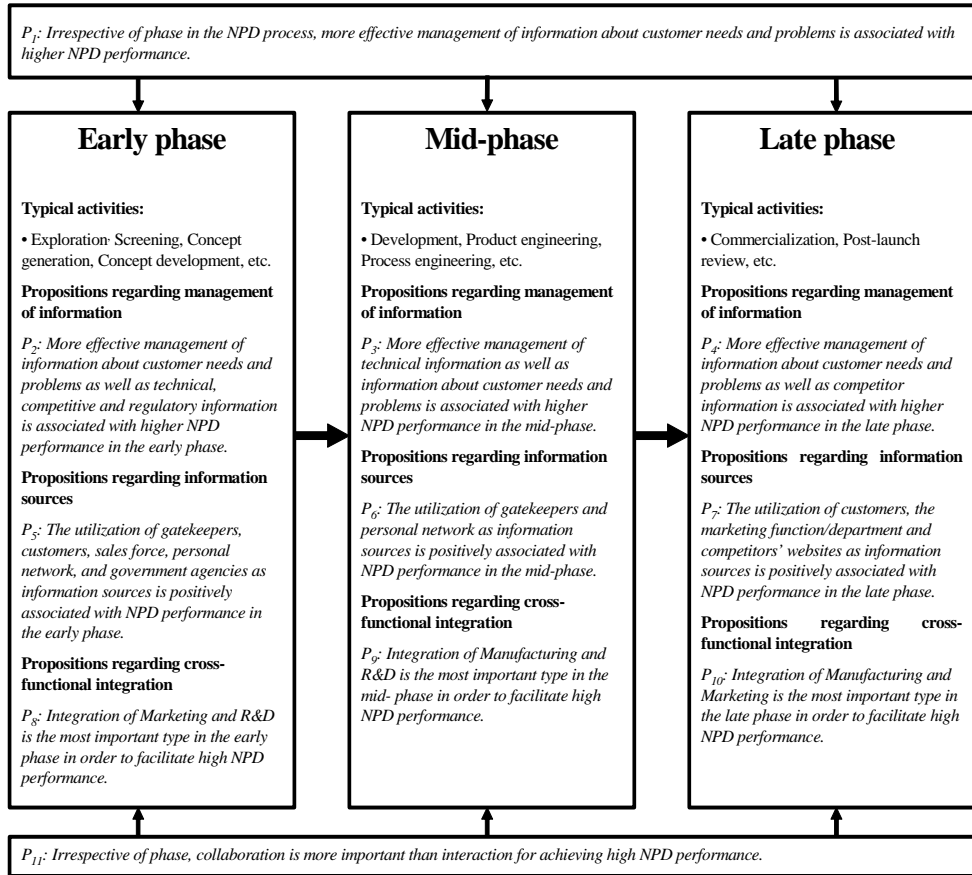


Figure 3: A summary of the propositions stated.

5.5 Consequences

The main claim made here is that firms that are more effective in using certain types of information and information sources, and that has created certain types of cross-functional patterns among functions and departments will gain in terms of NPD performance, all other things being equal. That is, the better firms are at these activities in the context of NPD, the higher their NPD performance should be. A problem is, however, that there is little or no consensus in the literature on *how* to measure NPD performance, and *what* to actually measure (Söderquist & Godener, 2004; Paper II). Thus, NPD performance can be measured in many different ways. The exploratory research of Godener & Söderquist (2004) suggests at least four different areas of measurement.

- Financial measures (e.g. returns on NPD).
- Measures focusing on customer satisfaction (e.g. high performance means satisfying or exceeding customer expectations).

- Process management measures (e.g. lead time, total product quality).
- Innovation measures (e.g. number of patents generated).

These four categories give a rough idea of different domains in which NPD performance can be measured, but say less about specific metrics. So, for the purposes of this introduction, it might be useful to think of NPD performance in terms of how it was measured in paper II. This measure, adopted from Atuehene-Gima & Ko (2001), measures to what extent new products are perceived to meet their market share, sales and customer use, sales growth, and profit objectives. This measure has the advantage of spanning several of the categories identified by Godener & Söderquist (2004), while remaining one-dimensional when subjected to an exploratory factor analysis. NPD performance, in turn, is often pictured as an important antecedent to competitive advantage, which in turn should allow for high financial performance (e.g. in terms of return on investment). Competitive advantage and financial performance are exogenous to the theory presented here, however, and no claims to include or explain these variables are being raised.

5.6 Connections with theoretical perspectives

Early in the introduction, it was stated that information is a resource and that management of information is a capability. Putting the 11 propositions together in figure 3, the questions arise concerning what “information in NPD” and “management of information in NPD” are special cases “of”. Below, it is suggested that the resource-based view (RBV) and dynamic capabilities frameworks can further our understanding of “information in NPD” and “management of information in NPD” respectively.

Resources are tangible and intangible input factors owned or controlled by a firm that are entered into the development of goods and services (Amit & Schoemaker, 1993; Lado & Wilson, 1994) and information is one example of such a resource (Barney, 1991; Paper V). The RBV, in turn, holds that these resources need to be *imperfectly mobile* and *significantly heterogeneous* across firms to allow competitive advantage (Barney, 1991; Peteraf, 1993; Verona, 1999; Paper I). Hence, according to the RBV logic, competitive advantage lies “upstream” of products and rests on firms’ idiosyncratic and difficult-to-imitate resources. Accordingly, most resources can be used in several products (Wernerfelt, 1984).

Imperfectly mobile resources cannot easily be bought or sold in the market place. Such resources are sometimes tradable, but more valuable to the firm that is currently utilizing them than to other firms. Information utilized in NPD fits the requirement of imperfect mobility. For example, firms utilize internally generated information in the form of financial reports and budgets, information about factors in the firm’s industry environment (e.g. about customers and competitors), but also information from the general environmental sector (e.g. about technological development and new regulations) [see Paper V]. Such information is idiosyncratic because it is internally generated or externally acquired for specific purposes: with specific products or product lines in mind, in a firm with a specific product/market strategy, with a specific work organization and work processes, and so forth. Therefore, as Peteraf (1993) remarks, imperfectly mobile resources are characterized by being specialized to firm-specific

needs. Furthermore, some of this information is actually *perfectly immobile* rather than *imperfectly mobile*, as such information has no other use or value outside a specific firm.

With regard to the “significantly heterogeneous” requirement, information is significantly heterogeneous across firms, mainly since firms differ in their capability of managing information, i.e. acquiring, sharing and using it. Accordingly, *information in NPD can, in line with the RBV, be described as a resource that may allow for high NPD performance and, subsequently, competitive advantage.*

But resources *per se* are not sufficient. Firms also need capabilities to build and configure resources. Teece, Pisano & Shuen (1997) suggest that the source of competitive advantage lies in some of a firm’s managerial and organizational processes, referred to as its *dynamic capabilities*. Capabilities are defined as “socially complex routines that determine the efficiency with which firms transform inputs into outputs” (Collis, 1994: 145) and refer to a firm’s capacity to acquire, develop and deploy resources⁷ (Dierickx & Cool, 1989; Makadok, 2001). These dynamic capabilities arise from learning (Verona, 1999; Zollo & Winter, 2002), and if market dynamism is not too high, dynamic capabilities are complicated and detailed processes that rely on existing knowledge to produce predictable outcomes (Eisenhardt & Martin, 2001).

Several previous researchers have suggested that product development is a dynamic capability (e.g. Eisenhardt & Martin, 2001; Helfat & Raubitschek, 2000), but the argument put forward here is that managing information in the context of NPD is a dynamic capability *in itself*. This capability is socially complex because it involves multiple persons from different functions and departments, who acquire, share and use information. If these activities are carried out in a more effective way (i.e. *handled or directed with a higher degree of skill* as expressed under section 4), they can have a large impact on NPD performance, since products are the manifestation of capabilities, and capabilities “can be molded into a variety of products” (Teece, Pisano and Shuen, 1997: 529)

There is, however, disagreement in the literature on whether dynamic capabilities *per se* are a source of sustainable competitive advantage. Teece, Pisano & Shuen (1997) and Verona (1999) claim that capabilities are the primary sources of rent since they accumulate over time and are strictly idiosyncratic. Eisenhardt & Martin (2001) argue convincingly, however, that while dynamic capabilities are different or even idiosyncratic in their details, they must also have key features in common that enable effectiveness (such as the use of cross-functional teams in NPD). Accordingly, firms do not necessarily have to imitate other firms to acquire a specific capability, because virtually every capability can be obtained from many paths and independently of other firms. Thus, firms can discover and learn specific dynamic capabilities themselves. Therefore, dynamic capabilities are sources of advantage, but perhaps not sustainable competitive advantage as capabilities to some extent have key features, so-called “commonalities”, in common. Considerable advantage lies, however, in using capa-

⁷ The distinction between capabilities and resources is somewhat artificial, as capabilities may be viewed as specific kinds of resources. Makadok (2001) suggests, for example, that two features distinguish capabilities from other kinds of resources: (1) Capabilities are firm-specific since they are embedded in the organization and its processes, and (2) the primary purpose of a capability is to enhance productivity of other resources possessed by a firm.

bilities “...sooner, more astutely, or more fortuitously than the competition to create resource configurations” (Eisenhardt & Martin, 2001: 1117). Hence, *management of information in NPD is a dynamic capability that may allow for high NPD performance and, subsequently, competitive advantage*. The statements on resources and capabilities are not articulated as explicit propositions, simply because of the fact that empirical testing of these is extremely difficult (if not impossible).

After reading the text on resources and capabilities above, a question that might arise is the following one: If information in NPD is a resource in line with the RBV, and management of information can be considered a dynamic capability, why is that important to know? It is important to know because both the RBV and the dynamic capabilities framework yield powerful managerial implications, outlined in a coming section.

6. Reflections: Towards a theory of managing information in NPD

At the outset, it was stated that one of the objectives of the introductory text was theory construction. The paramount question here thus reads: Have we arrived at a theory of acquiring, sharing and using information in new product development? According to Weick (1995), “theory” is a dimension rather than a category, and can be used to label the *interim struggles* and not just *the final product*. Although the theory of managing information presented here fulfils many of the criteria required of a theory, these are the interim struggles rather than the final product, a fact also reflected in the word “towards” found in the title of the thesis.

What then is a theory? Bacharach (1989: 498) suggests that a theory can be described as “...a system of constructs and variables in which the constructs are related to each other by propositions and the variables are related to each other by hypotheses”. This system of constructs and variables are bounded by different assumptions, for example regarding space and time (see figure 3). Theory is primarily about answers to queries of *why* (Sutton & Staw, 1995), although the questions of *what* (i.e. variables, constructs) and *how* (e.g. using “arrows” to connect the “boxes”) are also essential components (Whetten, 1989).

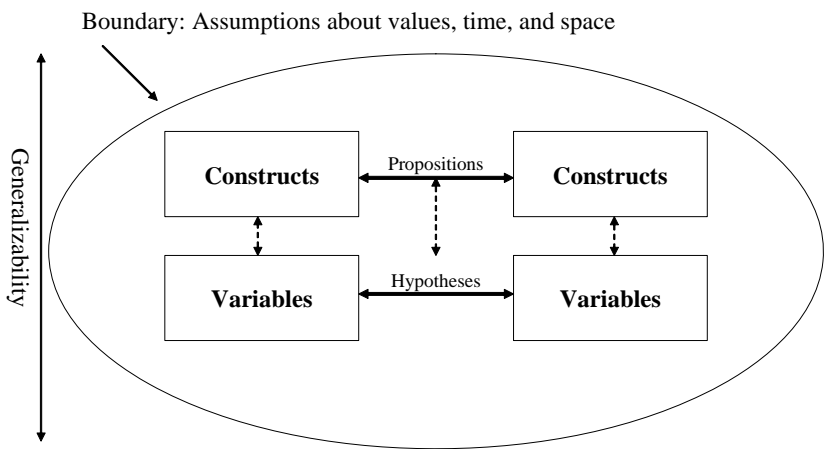


Figure 4: Components of a theory. Adapted from Bacharach (1989, p. 499).

According to Bacharach (1989), *values* are the idiosyncratic product of a theorist’s creative imagination or ideological orientation, and values thus cannot serve as a base for evaluation of a theory or comparison across theories. An example of such an assumption made here is the one of ontological realism (see Paper V). The spatial (*space*) and temporal (*time*) assumptions have to do with empirical generalizability, and are somewhat easier to spot. The theory suggested here is intended to apply to medium-sized manufacturing firms with in-house product development, active in a business-to-business setting in Sweden, with manufacturing and development of assembled products. This is the specific *unit of analysis* to which this theory applies. No attempts at historical applicability are being made, so the theory suggested applies mainly to the current time period. Thus, the propositions a theory generates are bounded by temporal

and contextual factors, such as *who*, *where*, *when* (Whetten, 1989), in this case medium-sized firms with in-house product development of assembled goods, in Sweden, during the current time setting. These temporal and contextual factors thus set the range of the theory. This does not mean, however, that this theory is irrelevant or does not apply to other settings as well, but managers of firms outside this population must draw their own conclusions by way of analogy and be careful when doing so.

Looking inside the figure, propositions state relations among constructs. Hypotheses – derived from propositions – specify relations between variables on a somewhat more concrete level. Thus, the primary difference between propositions and hypotheses is “that propositions involve concepts, whereas hypotheses require measures” (Whetten, 1989: 491). Bacharach (1989: 500) defines constructs as “terms which, though not observational either directly or indirectly, may be applied or even defined on the basis of the observables”. Examples of constructs in this theory are NPD performance, interaction and collaboration. A variable, on the other hand, can be defined as a set of values that forms a classification (Galtung, 1967; Stinchcombe, 1968). Thus, variables are operational configurations derived from constructs.

Propositions and hypotheses are both statements of relationships, but hypotheses are more concrete and operational. These hypotheses have not yet been developed, although this can easily be made, as summated scales exist in the literature for measuring most of these constructs (see e.g. the appendix of paper III). Therefore, since one of the components suggested by Bacharach (1989) is lacking in the theory presented here, this suggested theory is more similar to how a theory is defined by Starbuck (2003: 143): as “a coherent group of general propositions used as principles of explanation”.

6.1 How do we evaluate the theory proposed?

Bacharach (1989) suggests two primary criteria for evaluating theories: *falsifiability* and *utility*. The falsifiability criterion has to do with whether the theory is designed so that empirical refutation is possible. This criterion has to do with Popper’s (1959) suggestion that theories can never actually be proven, only disproven. As this is a theory of the middle range (i.e. a theory about specific phenomena) stated in an explicit way, empirical refutation is indeed possible as constructs can easily be turned into variables that can be connected through hypotheses and tested in subsequent research efforts. In addition, the variables *per se* are capable of disconfirmation for reasons of validity and/or reliability, and hypotheses can be disconfirmed in subsequent steps by using e.g. multiple regression techniques.

The utility criterion, in turn, has to do with the usefulness of a theoretical system and suggests that a theory is useful if it can *predict* and *explain* (Folger & Turillo, 1999), in this case predict and explain NPD performance. According to Bacharach (1989: 501), “An *explanation* establishes the substantive meaning of constructs, variables, and their linkages, while a *prediction* tests that substantive meaning by comparing it to empirical evidence” (*italics added*). The criteria of prediction and explanation are very difficult to handle in a non-speculative way, because this theory is not tested; the theory presented here represents the interim struggles rather than the final product. After all, a theory need not be tested but must be testable (Bacharach, 1989).

Finally, a good theory should be limited and fairly precise, and when one begins to map out the conceptual landscape, it is a good idea not to include too many factors, because over time original ideas will be refined (Whetten, 1989). That is, a theory should not cover everything but instead be designed so that it is parsimonious (Eisenhardt, 1989; Poole & Van De Ven, 1989). Thus, *parsimony* (i.e. deleting or removing factors that add little value to our understanding) is one important criterion for judging whether the right factors or constructs are included in a theory. The other criterion is *comprehensiveness*, i.e. are all relevant factors included? (Whetten, 1989). There is clearly a trade-off between parsimony and comprehensiveness, and judging whether the “right” variables have been included should be easier in subsequent steps of research aimed at validation rather than artificial selection. However, if one imagines a research design similar to the one in paper III [thus viewing this theory as a “variance theory” in Langley’s (1999) terms], one can imagine an R^2 -value of about .35 for the propositions on managing information. Thus, in subsequent research steps, the percentage of variance in NPD performance, explained uniquely or jointly by the variables of acquiring, sharing and using information, should be significant. It is likely (but speculative) that the variables suggested in the propositions presented here should have a profound impact on NPD performance.

7. Managerial implications

The 11 propositions stated in section 5 and summarized in figure 3 have direct managerial implications, although these are tentative by nature, as further testing and validation of the theory proposed is necessary. Furthermore, the writings on resources and capabilities also yield managerial implications. Together these implications apply in part to top management, whose decisions can affect organizational design, but in part also to product managers, R&D-, marketing, and other functional managers. Some implications also apply to NPD team leaders and members, who are more directly involved in the actual development work.

First, this research suggests that managing information in new product development is a very important capability that may explain a significant amount of variance in NPD performance. Another implication is that information in NPD should be considered a key resource of firms, as it is imperfectly mobile and significantly heterogeneous across firms. Furthermore, it is also suggested that many of the factors that facilitate the acquisition, sharing and use of information can be controlled by management, who can alter them in order to improve their firm's capability of managing information. Hence, to facilitate the capability of managing information, top managers should strive for a flat or organic work organization, avoid too much formalization, aim for decentralized decision-making, and design facilities so that their development staff are co-located and in close contact with each other. Top managers should also encourage an external orientation and promote cultural attributes such as trust and openness. Overall, this research gives managers an overview of what is meant by managing information, advice on different ways to attain it, and the consequences likely to appear once this capability has been sufficiently attained.

Another implication suggested is that the capability of managing information can be learned. Despite the fact that the capability of managing information is likely to be idiosyncratic when studied in detail at the firm level, this capability also exhibits commonalities that exist across firms (e.g. the use of multiple types of information in the early phase of NPD, a strong reliance on technical information in the mid-phase, and more effective management of information about customer needs and problems throughout the whole process). Thus, as Eisenhardt & Martin (2001) suggest, commonalities or key attributes (i.e. "best practice") exist across firms, and even though the capability of managing information is path-dependent, it can be obtained from many different starting points and along different paths.

At a more detailed level, it is suggested that high NPD performance is associated with the acquisition, sharing, and use of several different kinds of information in order to increase the variety, diversity and creativity of new product ideas in the early phase. Specifically, information about customer needs and problems and technical, competitive and regulatory information is important in the early phase of the NPD process. In the mid-phase the need for multiple types of information decreases, and high NPD performance is here associated with more effective management of technical information and information about customer needs and problems. In the late phase, the two types of information most strongly associated with NPD performance are information about customer needs and problems and competitor information. Thus, the tentative results imply that the types of information firms need to manage are contingent on the specific

phase of the NPD process, and that managers or team members directly involved with development activities can increase NPD performance by focusing their attention on specific types of information in each phase of the NPD process.

As with management of information in the early phase, the results imply that utilizing several different sources of information is positively associated with NPD performance in the early phase. Specifically, managers and/or team members should focus the information acquisition efforts of their organizations in the early phase towards gatekeepers, customers, sales force, personal networks, and government agencies. In the mid-phase the need for multiple sources of information decreases, and gatekeepers and personal networks are the most important sources for NPD performance. In the late phase where activities are focused on commercialization, customers of the firm as well as the marketing function/department and competitor's websites are sources positively associated with high NPD performance.

Implications suggesting that the degree of integration among departments is contingent on the specific phase of the NPD process are also outlined. Specifically, managers should specifically encourage marketing – R&D integration in the early phase, manufacturing – R&D integration in the mid-phase, and manufacturing – marketing integration in the late phase in order to increase NPD performance in their firms. In addition, managers should facilitate and encourage personal communication and information exchange among functions and departments, specifically in the form of collaboration.

8. Limitations and further research

An obvious limitation is that the theory presented here is not tested. Thus, empirical studies are needed to see if the propositions suggested are robust and valid. As Weick (1989) has remarked, the theorist is the source of both variation and selection during the theory construction process, which makes the process resemble artificial rather than natural selection. In later empirical steps, data rather than the theorist decides whether propositions are sound or not. Clearly, the lack of empirical grounding in the form of e.g. survey data is a limitation, although the qualitative interviews were performed partly in order to assure at least some empirical grounding. Turning to survey methodology in subsequent steps is a first suggestion for further research.

Another limitation is that this theory is limited to “supply side aspects”, and thus ignores issues such as the storage and credibility of information. The theory is also focused on the “people-side” of managing information, and thus ignores information technology aspects such as the use of MIS systems (see also Paper I). Further research should pay attention to these aspects as well. Still another limitation or weakness is the way in which the propositions are stated. As Bacharach (1989) notes, relationships between antecedents and consequences are often assumed to be linear in organization research. Assumptions of linearity are often naive, however. The emerging research of Atuahene-Gima, Slater & Olson (2005) is a good example of authors questioning the assumptions of linearity, in this case in the context of market orientation and new product program performance. Some of the relationships proposed here might indeed be all but linear, but this is also an issue for further research. Furthermore, and in a similar vein, a point will eventually be reached where more information of a specific kind does not add any value (or at least not a value offsetting the costs associated with acquiring, sharing and using it). Therefore, problems associated with information overload are also worth considering. Failure to discuss these matters does not mean that they are irrelevant; rather, they were disregarded on the parsimony criterion. Future research may want to consider these issues as well.

A cluster of limitations has to do with the question of *when*, i.e. the timing of events. Several limitations can be identified here. First, does use of information presuppose the sharing of information, and should sharing of information be preceded by acquisition of information to allow high performance? Or, alternatively, can the activities of acquiring, sharing and using information be performed fairly independently of one another? A second limitation in the “when-domain” has to do with the intensity of each sub-dimension of managing information. For example, is acquisition of information most important in the early phase? Is actual use also most important in the early phase, when design specifications are set? Is sharing of information most important in the mid-phase, where the actual engineering work is carried out? And is the intensity of integration most important in the late phase, as some earlier contributors have claimed? These questions are both interesting and relevant, and further in-depth case studies as well as the use of quantitative data and software for structural equations modelling might shed light on this issue.

Another important limitation that turns into a suggestion for further research is the fact that the theory presented here does not control for or include the concept of product radicalness. For example, in the context of incremental product development, the

overall need for cross-functional integration is low. Presumably, the diversity of information needed and the capability of managing information should not be as important under such conditions either. In the context of radical product development, where the degree of product newness is much higher, several different kinds of information are likely to be crucial, as should the capability of managing information also be. Further research needs to investigate these two ideal-type situations more closely. A related limitation briefly discussed in the method and reflections sections is the fact that all firms investigated in the empirical part are business-to-business firms that manufacture assembled products. That is, the propositions stated apply mainly to firms under such conditions, and reformulation of these propositions will probably have to be made, if studies of service providers or firms active on the consumer market are to be performed.

Still another limitation is that the theory presented here ignores a crucial and after all quite obvious question: what type of information do decision-makers use at gates located in the NPD process? Cooper, Edgett & Kleinschmidt (2002) suggest that gates (i.e. Go/Kill decision-making points) must be built into the NPD process, in order to carefully scrutinize projects and eliminate weak ones. Thus, a stage-gate process should get rid of poor projects at the gates, but also provide better information on projects. An interesting question is what kind of information underpins such decisions and why? Do decision-makers rely on soft or hard information? What sources do they use? The main reason for leaving this question out was that only one of the firms had an NPD process resembling the stage-gate approach in place. As the literature on this topic is very limited, theoretical propositions without empirical grounding were not an alternative either. Future studies may want to focus on this issue in firms where the NPD processes are characterized by a higher degree of "stage-gateness".

Furthermore, there are also limitations in the choice of theoretical connections. Some authors claim, for example, that single resources *per se* do not generate rents; rather, a bundle of resources does. If this is true, an interesting follow-up question is what other resources must be in place if we want to consider information in NPD as a resource in line with the RBV? Similar questions arise by scrutinizing the capabilities framework. Teece, Pisano & Shuen (1997) suggest that capabilities can provide competitive advantage and generate rents only if they are based on a collection of routines, skills, and complementary assets that are difficult to imitate. Hence, for the managing information capability, what are those routines, skills and complementary assets?

Finally, two more suggestions for further research need to be highlighted. The first one is to construct a framework for addressing the use (and misuse) of customer information. Although customer information is mainly a good thing, more research is needed in this area. For example, under what specific circumstances is it wise to use (or ignore) customer information? How much faith can be put in customers? When and how does a market orientation turn into being customer led? How should firms balance market pull and technology push in their NPD work? There is indeed a great deal of literature in this area, but no comprehensive framework that integrates this knowledge seems to exist. A last fruitful avenue for further research is the use of on-line communities as a source of information in NPD. Some exploratory research on this topic has been done (Teitz & Herstatt, 2005), but the use of the Internet in general (and on-line communities in particular) seems underdeveloped for NPD purposes.

9. Is there a contribution in all this?

Keeping all the limitations in mind, the introduction to this thesis contributes to clarifying what is meant by management of information in NPD. The introduction further highlights some of the organizational factors that facilitate more effective management of information (antecedents) and demonstrates the consequences likely to appear once the capability of managing information has been sufficiently attained (i.e. high NPD performance).

For the purpose of theory construction, 11 propositions were derived. When doing so, this text focused on three different phases in the NPD process, thus contributing knowledge of what type of information needs to be managed during each NPD phase, where this information comes from (information sources), and what kind of cross-functional integration is most important in each respective phase. These propositions are perhaps an incremental contribution *per se*, but they are important first steps in the process of building a theory of managing information in NPD. As pointed out earlier, however, the knowledge generated here is tentative, as the purpose of the introductory text is theory construction rather than theory testing.

With regard to the appended papers, Paper I contributes a review of the literature on the subject of “information in NPD”. The paper provides an overview of the field, an analysis of the contents, and outlines important policy implications for NPD practitioners. Paper II makes several contributions. This paper is one of a small number of studies that consider the impact of multiple strategic orientations on NPD performance. The paper also contributes by investigating how different interaction terms affect proposed relationships, and by providing data from smaller firms in a setting where this kind of research has not previously been conducted. The third appended paper (Paper III) contributes to the literature by considering multiple environmental factors and their impact on innovation performance. At the same time the article also focuses on the activities of acquiring, sharing and using information and draws on new data from an empirical setting previously unexplored, which is another contribution to knowledge.

Paper IV contributes by clarifying some of the conceptual ambiguity associated with acquiring, sharing and using information. By addressing how terms, concepts and courses of events interrelate for several different approaches to processing information, the paper makes a contribution to both theory and practice. Paper V makes several contributions. First, by making an exhaustive and systematic review of environmental perspectives, it makes this literature more accessible. The article further contributes to knowledge by showing why one of the perspectives reviewed is so popular and frequently utilized. Finally, this paper also contributes with remedies to overcome the limitations of using a single-frame approach to understanding the environment. Finally, Paper VI contributes to knowledge by integrating several descriptive and previously investigated research questions into a single research design, thus updating knowledge in this area.

10. Evolution and summary of papers

The first paper that I wrote as a doctoral student is appended as paper IV in this thesis. The motive for writing it was the plethora of different terms used to describe the acquisition, sharing and use of information that existed in the literature. As I needed to understand what these terms meant for future research efforts, it was a logical entry point into the field. Back then, in the years of 2001 and 2002, I was firmly convinced that I was writing a thesis on environmental scanning in the context of strategy formulation. To get a better feeling for the role of information in strategic decision-making, the second decision was to write paper VI. The contribution of this paper to the literature is limited as it is mainly descriptive, but it contributed significantly to my personal knowledge and development. Talking with top executives about the questions addressed in the paper was very rewarding, and I was still convinced that I was writing a thesis on scanning & strategy formulation.

The next two papers produced were papers III and V and they co-evolved. Paper V was written with the aim of trying to understand the concept of environment. It bothered me that all scanning literature was talking about “external information” and “to acquire external information from the environment” without ever talking about what “the environment” really was. As no books or review articles that explained it to me sufficiently and exhaustively was found, the decision to write a review paper on the topic was taken. Paper III, written in the context of innovation and new product development, took its starting point in a doctoral course in innovation management that I took during the spring of 2001. It took us (me and Sven Åke Hörte) more than a year to go from idea to a first draft, and meanwhile I became seriously interested in innovation and NPD. I was further encouraged when JPIM liked the paper, and decided then to let innovation/NPD become the main theme of the doctoral thesis, thus pushing it away from the scanning/strategy formulation trajectory.

Papers I and II co-evolved also. As the ideas about “acquiring, sharing, and using information” was moved from one context (strategy formulation) to another (new product development), it was more or less necessary to review the literature in this domain. The outcome of this review process is paper I. A key theme in the literature on “information in NPD” is the controversy surrounding the use (and misuse) of customer information. Paper II was written in part with the aim of better trying to understand and shed light on that issue, and in part to see if other strategic orientations or capabilities are important to performance in NPD. Paper II is the outcome of this last research effort. Looking in the rear-view mirror and using the terms of Mintzberg & Waters (1985), I realize that my work is the outcome of a strategy described as *emergent* rather than *intended*. Still, I hope that it makes more sense now after taking part of the information about when, how and why the appended papers were written.

Finally, the papers are appended in an order different from the one in which they were written. There is no specific motive behind this choice, other than the fact that I think that it provides a better structure to the thesis. The rest of this chapter now presents a summary of the appended papers.

10.1 Paper I: Managing information in new product development: A literature review

An overview of the success/failure literature on new product development (NPD) reveals a long list of critical success factors, and one of these factors is the pivotal role attributed to information in NPD. On a general level, the importance of effectively managing information derives from the fact that organizational knowledge creation relies upon the information processing capacities of the organization. Drawing on prior knowledge in the development of future new products can increase NPD success and long-term competitive advantage. This paper, published in the *International Journal of Innovation and Technology Management*, argues that we can understand the process of managing information in NPD in terms of three steps: acquiring, sharing, and using information. Since no review that spans this area exists, the aim of this paper is to help close this knowledge gap. The purpose is simple and straightforward: to review the literature on “information in NPD”, thus providing an overview of the field, an analysis of the contents, as well as outlining policy implications for practitioners involved with NPD.

The paper suggests that information may be acquired formally and informally. Informal information acquisition means relying on gatekeepers, defined as key individuals who are strongly connected to internal colleagues and strongly linked to external domains. Gatekeepers are able to understand and translate different languages, conceptual frameworks and coding schemes. That is, they can understand external information, but also make sense of it to their more internally oriented colleagues. Firms may also choose to engage in more formal information acquisition activities, for example via environmental scanning or market orientation. In the NPD context, information is shared via cross-functional integration practices. Integration means linking functionally specialized departments (e.g. marketing, R&D, manufacturing) through information transfer while preserving their individual orientations. Integration enhances NPD performance and facilitates learning, encourages concurrent problem solving, etc. As a construct, integration consists of two dimensions. Structurally and formally coordinated activities such as routine meetings and flow of standard documentation are labelled interaction, while the more unstructured ones such as “having mutual understanding” or “sharing a common vision” are labelled collaboration. Finally, information needs to be used in NPD decision-making activities.

The results of the reviewed literature suggest consistency in the sense that information is important for NPD success. Other features highlighted in the discussion section of the paper are the lack of a framework for this area of research, and the carelessness with which the concept of information is treated in the literature reviewed. In terms of implications, the paper suggests that managing information is a crucial factor for NPD success and performance, as it is a key to achieving both integration among functions and departments, and organization – environment alignment. To achieve external fit, managers need to promote gatekeeper behaviour but also engage in more formal means of information acquisition, since scanning or market orientation can generate new product ideas, etc. Furthermore, information must be shared among functions and departments via cross-functional integration practices, especially in the form of collaboration. Information must also be used, for example when setting design specifica-

tions or when launching new products. The paper further suggests that “management of information in NPD” should be viewed as a dynamic capability, since it allows a firm to create new products and processes. And finally, information by itself should be considered a resource since “information in NPD” is often significantly heterogeneous across firms and imperfectly mobile and thus a prerequisite for long-term competitive advantage.

10.2 Paper II: The role of market- and entrepreneurial orientation for NPD performance in manufacturing firms

The original idea of this paper was born after reading literature on the role of market information in the context of new product development. Market information, especially information coming from customers, is viewed as both facilitating and prohibiting the development of successful new products. The initial question asked was whether firms should be market oriented, or if firms instead need to be entrepreneurially oriented (i.e. innovative, proactive, and inclined to take risks) in their NPD work? Or, perhaps, a combination of both? We view market and entrepreneurial orientation as two separate but complementary strategic orientations or business philosophies that can co-exist, and the overall purpose of this article is to examine the relationship between these two strategic orientations and NPD performance in mid-sized manufacturing firms. This overall purpose was broken down into seven hypotheses for further empirical testing.

The method used was a mail survey, and data was collected between November 2004 and February 2005. The survey was targeted towards CEOs of firms classified as manufacturers with 50-250 employees. All in all, 224 completed questionnaires were received, which corresponds to an effective response rate of 57.7%. For testing hypotheses, different forms of multiple regression equations were used – with and without interaction terms. The paper contributes to the literature in several ways. First, this paper is one of a very small number that deal with multiple strategic orientations and their impact on NPD performance. Second, the paper focuses on smaller firms. Furthermore, data was collected from Swedish firms where this kind of empirical research had not yet been conducted. And finally, the paper looks at how different environmental conditions as well as product characteristics affect proposed relationships.

Our results show that market orientation and innovativeness were positively related to NPD performance, while proactiveness and risk-taking show no such relationship. The results further provide no support for either product characteristics or environmental dimensions moderating the market orientation/entrepreneurial orientation – NPD performance relationships. Overall, the results show that different strategic competencies contribute to NPD performance. On the one hand, firms need to be sensitive to customer information, make incremental adjustments of product and product lines, and (at least partially) base NPD decision-making on information about customer needs and wants – activities associated with a market orientation. Simultaneously, firms need also to engage in more bold moves, to some extent ignore customer information, engage in experiments, create a culture that fosters creativity, and support creative processes – activities associated with innovativeness.

The absence of correlations between risk-taking and proactiveness, on the one hand, and NPD performance, on the other, is explained by focusing on resources. We argue that smaller firms generally have a limited resource-base and that large resource commitments with costly failures as possible outcomes might have a serious impact on profits or possibly jeopardize the future of the firm. Consequently, smaller firms might choose NPD projects with a lower degree of risk. Furthermore, due to limitations in size and resource base, the majority of firms in our sample cannot be proactive and shape the environment by introducing new products ahead of competition. Thus, even if they have the will and foresight to seize new opportunities, they may not possess the resources and capabilities needed to exploit them.

Finally, the outcomes of testing the hypothesis with interaction terms suggest that neither product nor environmental characteristics moderate the market orientation – NPD performance relationships. A plausible interpretation is that the benefits of a market orientation or innovativeness are long-term and independent of product and environmental characteristics. A market or entrepreneurial orientation is likely to be operationally manifest once in place, and changing these capabilities may be very difficult for reasons of cost and inertia. The major implications of this paper are that managers should push their organizations to become more market oriented and promote cultural norms associated with innovativeness.

10.3 Paper III: Managing external information in manufacturing firms: The impact on innovation performance

There is an increasing interest in the literature on the importance of changes in the organizational environment, and in firms' attempts to understand and cope with these changes in the context of new product development (NPD). Overall, this interest stems from the fact that NPD is not an activity performed in a social vacuum. The actions of competitors, customers and suppliers as well as broader changes in the general environment constrain possible courses of action, and affect decision-making processes in NPD. This fact has led firms to engage in environmental scanning activities, conducted with the aim of securing important information on external events. This article, published in the *Journal of Product Innovation Management*, examines the link between innovation performance and management (i.e. gathering, sharing and using) of information, with a special focus on external information. The overall purpose of the article is to examine whether or not those organizations that are better at managing external information are also those that are the better innovators.

More specifically, the paper examines scanning in two sectors of the environment (the industrial and the general environment), the extent to which firms share information among functions and departments (via cross-functional integration practices), and the extent to which they use environmental information in decision-making in an NPD context. The research strategy used was a survey, and data was collected via mail questionnaires. Empirically, a sample of 206 medium-sized manufacturing firms with in-house product development is drawn upon (with a 62.4% response rate). Hypotheses were tested by interpreting the outcome of a linear multiple regression analysis.

The results show that scanning the technological sector of the environment was positively associated with innovation performance. Scanning of customers, suppliers,

and competitors proved to be negatively correlated with innovation performance. Cross-functional integration in the form of collaboration also proved to be significantly correlated with innovation performance, while interaction showed no such relationship. Further, decision-making based on information from the industry environment correlated significantly with innovation performance.

The major implications of this research are that firms need to closely monitor changes in the technological sector of their environment. To rely on gatekeepers for this is a feasible option, as they seem particularly useful in securing this kind of information. It is not suggested that firms should avoid scanning customers, suppliers and competitors. Indeed, this kind of information may be very useful, but not if innovation is the primary goal. With regard to integration, management should especially encourage personal communication and information exchange in the form of collaboration. Finally, information needs to be used in making decisions – in particular in so-called non-programmed decision-making – situations which are unfamiliar, to some extent novel, and have not been encountered in quite the same way before.

10.4 Paper IV: Characteristics in information processing approaches

There are several different terms used to describe how information is collected, interpreted, analysed and distributed. In this paper, published in the *International Journal of Information Management*, the purpose was to identify similarities and differences among these terms and to relate them to and compare them with one another, but also to try to identify their underlying concepts and the course of events they represent. A term (word or sign) is believed to represent a certain object or a course of events (i.e. domain). The object or course of events is contained in a certain concept; the term means this concept. In this paper, marketing research is an example of a term. The term is represented by the marketing research process, which is a course of events or a domain. Marketing research may be defined as “the function that links the consumer, customer, and public to the marketer through information”, which is the concept that the term *marketing research* denotes.

The approaches that are compared and contrasted are environmental scanning, business, competitive, competitor, market and political intelligence, marketing research, and information management. It was found that all these approaches are future oriented in the sense that they aim at generating insight into future developments. Further, the approaches differ in their foci. While all intelligence approaches emphasize the interpretation of information, they focus on different sectors in the environment. Marketing research is obviously focused on marketing issues, while environmental scanning and information management have a broader focus.

Furthermore, the approaches differ in terms of methodology, i.e. how the activities are carried out. All intelligence approaches are based on the intelligence cycle, environmental scanning on the scanning process, and marketing research on the marketing research process. For information management, no specific methodology was found. Also, each approach advocates that information is refined in one way or the other, environmental scanning and information management being possible exceptions. All approaches have strong ties to decision-making, but differ in terms of scope. In sum, the

paper shows that there are many similarities among the different approaches described, and that the main differences lie in their foci and in their scopes.

10.5 Paper V: Organizational environment revisited: A conceptual review and integration

An innumerable number of books and articles state that “the environment” is important to organizations, as changes in the environment are believed to influence both the actions and outcomes of organizations. Still, little agreement exists in the literature on how the environment should be conceptualized and understood. Paper V, forthcoming in *International Studies of Management & Organization*, presents a review of four perspectives in organization-environment research: The adaptive, the resource-dependence, the cognitive and the population-ecology perspective.

The adaptive perspective draws mainly on research in the area of strategy and contingency theory, and views organizations as active rather than passive – they can change as the environment change through a process of adaptation. The resource dependence perspective also recognizes the adaptive capacities of organizations, but draws on a different stream of literature. According to this perspective, organizations are constrained by external dependence on resources possessed by others. The cognitive perspective, mainly drawing on research in organizational social psychology, suggests that the environment is enacted and constructed rather than discovered. According to this perspective, organizational environments exist as cause-maps. These maps may be constructions of single individuals but they may also exist as collective structures. Finally, the population-ecology perspective suggests that inertia constrains the adaptive capacities of organizations, and instead suggests that selection explains differences in effectiveness and change of forms. The “perspectives” are referred to as such since they are conceptual umbrellas rather than theories or concrete conceptualizations.

Three different research questions or issues are addressed in the article. First, the article reviews, compares and contrasts the four perspectives, thereby facilitating the identification of differences and similarities among them. To accomplish this aim, nine different dimensions are used to characterize each perspective. These dimensions range from concrete ones (such as level of analysis and salient assumptions) to meta-theoretical ones (such as the ontological and epistemological standpoints they contain). The review points to many similarities among these perspectives, but also to distinct differences. Based on this review, two more questions are addressed. First, the article seeks to understand why one of these perspectives – the adaptive – is so popular and frequently used in comparison with the other three. The article suggests that this is due to the ideas in the realist paradigm in strategy research, combined with logic of appropriateness and high general applicability and prescriptive value. Finally, the article points to the consequences of overly limited conceptualizations of the environment, followed by remedies to overcome such limitations. It is suggested that a constructivist approach – characterized by ontological realism and epistemological relativism – offers a plausible avenue for combining perspectives, thus allowing both researchers and practitioners to make more realistic assumptions about environmental developments and conceptualizations.

10.6 Paper VI: Information use in strategic decision-making

Paper VI was named “Information use in strategic decision-making” and is published in *Management Decision*. Four research questions were addressed: Why is information used in strategic decision-making? What kind of information is used? How do decision-makers obtain the information? And finally, where do they obtain it? The frame of reference used suggested that information is used for the purpose of reducing uncertainty. Further, information was classified as being either soft or hard, and it was suggested that information could be obtained on a solicited or unsolicited basis. Addressing the where-question, a division into different sources of information was made. The research strategy used was case studies. The cases studied were four strategic decisions recently made by medium-sized Swedish firms – three of them listed on the OM/Stockholm stock exchange. All in all, 19 interviews were made, and documentation in the form of annual reports, press releases, newspaper clippings, and overhead materials were used to augment the interview data.

The results show that information is used for the purpose of reducing or removing uncertainty, although different actors use different terms to describe this. The uncertainty experienced was, however, non-existent, low or moderate in all decisions. The results also showed that soft information dominated in one decision, and hard information dominated in the remaining three. All decisions were, however, characterized by a combination of the two types of information. The combination of soft and hard information was also found to vary over time: most respondents started out with soft information, and then moved to hard as the process unfolded. At the time when the actual decisions were taken, soft information again came into play. All companies tended to rely heavily on information received on a solicited basis. Two of the companies ranked their customers as the most important source of information; the remaining two considered performance reports to be the most important source. Overall, the data showed a pattern where internal sources seemed to be preferred over external ones.

In the discussion section of the paper, both theoretical and empirical suggestions on how the results could be interpreted were provided. It was, for example, suggested that a low degree of experienced uncertainty might be due to bounded rationality, to expertise within a specific content domain, or an effect of retrospective rationalizations of prior actions. The combination of soft and hard information might be contingent on the type of decision taken, division of labour, decision-making style, and if the decision is perceived to be clear or not. Managers’ assumptions of the environment may also play a role. Multiple reasons were also thought to lie behind the differences in how information was obtained. Hierarchical level might play a role, as well as the nature of the decision, i.e. if it is straightforward or unclear/complicated. The time a decision-maker has been with a company was also thought to play a role, as well as the state of communication within the management team. With regard to information sources, it was suggested that personal sources may be needed to interpret unclear issues, and that impersonal sources may be appropriate when events are discrete and analysable. The emphasis on internal sources may be an effect of a positive relationship between perceived source accessibility and frequency of usage. Finally, some implications for management and academia were outlined.

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Appendix A: Interview guide (English)

General questions

Your name and position at your firm?

For how long have you been working with your firm?

What people are involved with new product development at your firm other than you?

Please describe how product development is organized at your firm

Do you have a stage-gate or other NPD process?*

Questions on information

When your firm develops new products, what role does information about your customers play?*

What are the benefits of using customer information? Are there any drawbacks?

How important is technical information? Information about competitors? Financial information? Other types of information?

What kinds of information are needed in each phase of the NPD process to enable effective development?

Questions on information sources

When developing new products at your firm, what information sources are the most important ones? Personal or impersonal sources? External or internal sources?

What information sources are needed in each phase of the NPD process to enable effective development?

Questions on cross-functional integration

Between/among what departments and functions is integration most important in the “early phase”?

Between/among what departments and functions is integration most important in the “mid-phase”?

Between/among what departments and functions is integration most important in the “late phase”?

Is structurally and formally coordinated activities among functions and departments sufficient for integration, or are continuous relationships more important?

* Question borrowed from Zahay, Griffin & Fredericks (2004).

Appendix B: Interview guide (Swedish)

Allmänna frågor:

Ditt namn och din befattning på företaget?

Hur länge har du arbetat på företaget?

Vilka personer förutom du arbetar med utveckling av nya produkter på ditt företag?

Hur är produktutvecklingsarbetet organiserat på ditt företag?

Har ditt företag en så kallad "stage-gate" eller någon annan typ av utvecklingsprocess?

Frågor om information

När ditt företag utvecklar nya produkter, vilken roll spelar information om era kunder?

Vilka är fördelarna med att använda information om kunder? Finns det några nackdelar?

Hur viktig är teknisk information? Information om konkurrenter? Finansiell information? Annan typ av information?

Vilka typer av information behövs i respektive steg av produktutvecklingsprocessen för att utvecklingsarbetet skall bli effektivt?

Frågor om informationskällor

När ditt företag utvecklar nya produkter, vilka informationskällor är de mest viktiga?
Personliga eller icke-personliga källor? Externa eller interna källor?

Vilka informationskällor behövs i respektive steg av produktutvecklingsprocessen för att utvecklingsarbetet skall vara effektivt?

Frågor om tvärfunktionella samarbeten

Mellan vilka avdelningar och funktioner är integration mest viktigt i den "tidiga fasen"?

Mellan vilka avdelningar och funktioner är integration mest viktigt i "mellanfasen"?

Mellan vilka avdelningar och funktioner är integration mest viktigt i den "sena fasen"?

Är strukturellt och formellt koordinerade aktiviteter mellan funktioner och avdelningar tillräckligt för integration, eller är kontinuerliga relationer mer viktigt?

Paper I

Managing Information in New Product Development: A Literature Review

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MANAGING INFORMATION IN NEW PRODUCT DEVELOPMENT: A LITERATURE REVIEW

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The new product development (NPD) process is frequently described as a sequence of information processing activities, but “information in NPD” occupies a broader conceptual space than the reduction of uncertainty. This article reviews the area of “information in NPD” by examining the literature on environmental scanning, market orientation, gatekeepers, cross-functional integration, and information use. It is argued that we can understand the process of managing information in terms of three steps: Acquiring, sharing and using. A tentative framework for this area is proposed, and managerial implications resulting from this literature review and tentative frame are outlined and presented.

Keywords: New product development; information; literature review.

1. Introduction

Product development and innovation are central to business prosperity. An overview of the success/failure literature in new product development (NPD) reveals a long list of critical success factors that indicate what should be done to enhance new product success rates [Cooper (1994); Cooper and Kleinschmidt (1987, 1995); Montoya-Weiss and Calantone (1994); Rothwell (1992)]. One of these factors is the pivotal role attributed to information in NPD. While the NPD process is frequently described as a sequence of information processing activities [Griffin and Hauser (1996); Moenaert and Souder (1990)], management of information in new product development occupies a broader conceptual space than just the reduction of uncertainty. On an overall level, the importance of effectively managing information derives from the fact that organizational knowledge creation relies upon the information processing capacities of the organization [Cohen and Levinthal (1990)]. To be able to draw on prior

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knowledge in the development of future new products increases NPD success and long-term competitive advantage [Marsh and Stock (2003)].

According to Smith and Reinertsen [1998], managing NPD depends on balancing four key objectives, as shown in Fig. 1. Their figure helps us understand the importance of effective management of information in NPD.

- The first objective is market introduction date, measured as the date on which the final product is available for sale to the customer. A strong emphasis on scanning or market orientation (i.e. information acquisition) in the fuzzy front end of the NPD process can reduce the time from idea to introduction by capturing customer preferences at an early stage, thus avoiding costly re-designs or termination in later stages.

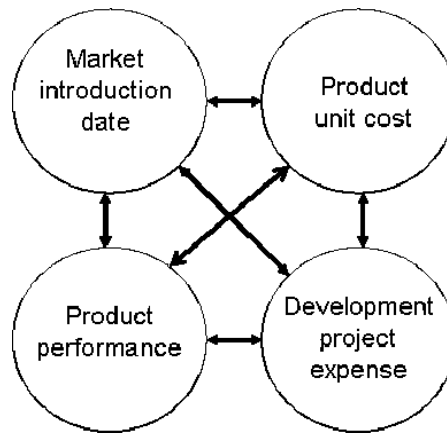


Fig. 1. Four key product development objectives. Adapted from Smith and Reinertsen [1998].

- The second objective is product unit cost. This cost can be reduced by avoiding costly re-design, and by increasing information exchange between functions and departments involved in NPD. Since NPD demands a greater organizational effort than R&D on its own, it is important that all functions collaborate effectively in order to keep costs down.
- The third objective is product performance (i.e. the revenue stream of the product over its life-cycle). Product performance can be increased by including features that customers demands. Effective scanning at the fuzzy front-end is important here, while effective market research in the actual commercialization stage is also an issue worthy of consideration.
- Finally, the fourth objective is development project expense. These are the one-time costs associated with the development project, which can be reduced by effectively managing information, for example through increasing the degree of collaboration between the different functions involved.

This paper argues that we can understand the process of managing information in NPD in terms of three steps: Acquiring, sharing and using information. Since no

review of the literature that spans the entire area exists, the aim of this article is to help close this knowledge gap. Thus, the purpose of this paper is fairly simple and straightforward: To review the literature available on the subject of “information in NPD”, thus providing an overview of the field, an analysis of the contents, as well as outlining important policy implications for practitioners involved with NPD. The paper is principally limited to supply side aspects of managing information, and thus issues such as the storage, credibility and processing of information are not explicitly included in the review. The review is further focused on the “people-side”, and does not include information technology aspects, such as the use of MIS or CRM systems.

2. Acquiring Information

In the NPD context the term “environmental scanning” is not as common as market orientation or market research. Environmental scanning, broadly defined as the activity of acquiring information [Aguilar (1967)], implies, however, that other concepts describing information acquisition can also be classified as “scanning”. The sections below review the literature on information acquisition in NPD. Access to external sources of information is important; such sources can provide new and context-rich information that challenge established assumptions [von Hippel (1988)]. Information may be acquired both formally and informally, and the latter will be discussed first.

2.1. *The informal way — trust in gatekeepers*

There are several different boundary-spanning roles described in the NPD- and innovation management literature, but in the context of informal information acquisition, the role of gatekeeper appears to be the most important. This is due to the fact that organizations and organizational units develop specific local languages, norms, values, and coding schemes to increase the efficiency of internal information processing and communication [Allen and Cohen (1969); Allen (1977)]. While this local language may increase internal efficiency, it often hinders a unit’s acquisition and interpretation of information about external events. One way of dealing with this problem is to rely on gatekeepers. The term *gatekeeper* seems to have first appeared in the late 1940s, in a study of opinion leaders in election campaigns [Lazarsfeld *et al.* (1948)]. Thomas Allen is usually acknowledged as the first to use the term in the context of NPD. There are several definitions of a gatekeeper in the literature, but one that captures the meaning of many of the others is provided by Tushman and Katz [1980, p. 1071]: “Gatekeepers are those key individuals who are both strongly connected to internal colleagues *and* strongly linked to external domains”.

What are the characteristics of the typical gatekeeper? The answer to this question varies. Allen and Cohen’s [1969] and Allen’s [1977] typical gatekeeper was a technically competent first-line supervisor. Later research by Gerpott *et al.* [1986] describes the gatekeeper more as a process promoter, often functioning as a project manager. In Macdonald and Williams’ [1994] sample, the typical gatekeeper was

an academically qualified senior manager. The gatekeepers are believed to read more of the harder literature (e.g. scientific journals), and maintain broader-ranging and longer-term relationships with significant others outside their own organization [Allen and Cohen (1969)]. Furthermore, the gatekeeper role seems to be one that a person assumes; it is not assigned to her or him. The gatekeeper often acts informally and to some extent also in his or her own interest. As Macdonald and Williams [1994, p. 125] note: “There is no society of gatekeepers, no professional body, and there are no manuals on how they should go about their business”.

One key characteristic of gatekeepers is that they are able to understand and translate different languages, conceptual frameworks and coding schemes [Allen (1977); Macdonald and Williams (1993)]. That is, they have the ability to acquire and understand external information, in addition to translate and make sense of it to their more internally oriented colleagues. These activities are known as the two-step^a process of communication; information flows from outside the organization to the gatekeeper, and then from the gatekeeper to the ultimate user. Another feature is that gatekeepers establish an information and communication network consisting of both internal and external sources, often characterized as oral [Allen (1977); Hauschildt and Schewe (2000)].

There are several benefits of having gatekeepers. On a general level, gatekeepers are necessary since widespread direct communication across boundaries is costly and inefficient [Allen (1977)]. Since gatekeepers are primarily concerned with oral sources of information they can synthesize complex ideas and communicate them rapidly, leading to improved problem solving and higher NPD performance [Schrader (1991); Harada (2003)]. Thus, gatekeepers may help to eliminate or reduce information deficits on the behalf of other more internally oriented individuals involved in NPD [Ancona and Caldwell (1992)]. Gatekeepers are also believed to facilitate cooperative relationships, for example with customers [Fritsch and Lukas (2001)].

Research by Tushman and Katz [1980] suggests that gatekeepers are not always necessary for the efficient functioning of projects and departments. The authors found that gatekeepers only perform a linking role in locally oriented projects, such as development work. In universally defined work (e.g. scientific projects), individuals outside the unit are more likely to share similar norms, values and language, thus permitting effective communication without the presence of a gatekeeper.

2.2. *The formal way — environmental scanning or market orientation*

In addition to acquiring information informally via gatekeepers, a firm may choose to engage in more formal information acquisition activities by means of a process that to a large extent can be planned, executed and controlled by the management. Environmental scanning is often described as such a process, and implies a somewhat broader search than market orientation: Information about the industry in

^aRecent research by Harada [2003] has suggested, however, that a third step may be necessary. This third step is a second person acting as a knowledge transformer; a person that transmits information collected by gatekeepers to other members in the organization.

which a firm competes and information about macro factors are potentially relevant. For example, Howell and Shea [2001] found that broad environmental scanning through a personal network was a key predictor of high performance when searching for new product innovation ideas. Neely *et al.* [2001] suggest that both government and investors play an important role in the development of new products and that these factors need to be monitored. Abell [1978], Smircich and Stubbart [1985] and Utterback [1996] further suggest that major innovations often originate outside particular industries rather than internally. This, of course, presupposes the need to monitor changes and trends outside the industry in which a firm competes, as well as an understanding of more general trends in society.

If the goal of broad environmental scanning is to find information in order to obtain a “fit” in relation to the environment, the goal of market orientation is to align the firm to a special section of its environment: The market. The market is usually believed to be the set of customers and clients who make use of subject organizations’ products or of competing (highly substitutable) products [Starbuck (1976)]. A central idea in market orientation is the marketing concept, which is a business philosophy or policy statement. It states that satisfying needs and wants of target customers more effectively and efficiently than competitors do determines an organization’s goal fulfilment [Kotler and Armstrong (1996)]. Market orientation basically means implementing the marketing concept. According to Kohli and Jaworski [1990, p. 6], market orientation is “the organizationwide generation of market intelligence pertaining to current and future customer needs, dissemination of the intelligence across departments, and organizationwide responsiveness to it”.^b There is currently a debate as to whether market orientation fosters or stifles NPD. An attempt to provide an account of the position held by each school is provided in the following paragraphs.

One school claims that market orientation leads to commonality and bland new products since customer- and competitor information constrain innovative thinking. The underlying premise is that customer opinions are restricted to the familiar — to products they can relate to. Furthermore, customers neither know what is technologically possible, nor are they adequately informed about the latest market trends. Monitoring competitors is not considered to provide any advantage — adopting competitors’ ideas and technology is more than likely to lead to the development of “me-too” products [e.g. Lawton and Parasuraman (1980); Bennet and Cooper (1981)]. Atuahene-Gima [1996] partially supports this view, and presents evidence that market orientation has a significant negative impact on product newness. In a study of 300 divisions, Moorman [1995] found that market information acquisition was not related to NPD performance. Christensen and Bower [1996] and Trott [2001] further state that market research results frequently produce negative reactions to innovative new products, and that leading firms that take heed of their customers may lose their advantage.

^bKohli and Jaworski [1990] use the term intelligence, which means value-added information. Since most authors use the term information, only that term will be used throughout the rest of the paper in order to avoid confusion and mix-up of terms.

According to the other school, most new products that fail in the market do so because of a lack of market orientation. The central idea in this school is that customer needs, both present and future, should be at the centre of R&D efforts. Kohli and Jaworski [1990] and Slater and Narver [1994] argue that businesses with a strong market orientation are best suited for NPD success. Atuahene-Gima [1995] and Kahn [2001] found a positive relationship between market orientation and NPD performance. Gatignon and Xuereb [1996] report a significant relationship between customer orientation and product innovation (in markets where demand is relatively uncertain). Lukas and Ferrell [2000] found that a greater emphasis on customer orientation increases the introduction of new-to-the-world products and reduces the number of me-too products launched. These authors, however, also found that a greater emphasis on competitor orientation increases the introduction of me-too products. Hill [1988] and Hart *et al.* [1999] argue that effective use of market information throughout the NPD process can enhance the success of new products.

The two schools of thought can easily be theoretically or conceptually separated, but the empirical studies in the area are almost always mixed, with both negative and positive correlations between different indicators of NPD/innovation performance and market orientation [e.g. Lukas and Ferrell (2000); Atuahene-Gima and Ko (2001); Atuahene-Gima (1995, 1996)]. A particular case of market orientation is market research. The principal difference between these two terms is that the former is a philosophy, while the latter operates at the level of a technique.

3. Sharing Information: The Need for Cross-Functional Integration

While the focus of environmental scanning and market orientation is on external alignment (between the firm and its environment), the focus of cross-functional integration is mainly internal: To align functionally specialized departments with each other. Such alignment is usually referred to as integration and may be defined as “the quality or state of collaboration that exists among departments that are required to achieve unity of effort by the demands of the environment” [Lawrence and Lorsch (1986), p. 1].

Integration means linking functionally specialized departments while preserving their individual orientations [Moenaert and Souder (1990)]. When integrated, they will cooperate and collaborate in those actions that are necessary for successful NPD. Successful integration requires effective management of information. The transfer of information between functionally specialized departments is therefore “the major vehicle that allows the involved individuals to become integrated” [Moenaert and Souder (1990), p. 98].

Which departments/functions should be integrated? The majority of earlier studies have focused on integration between marketing and R&D. Integration at the marketing/R&D interface is crucial since these functions share responsibility for setting NPD goals, identifying opportunities for product improvements, understanding customer requirements, etc. [Sherman *et al.* (2000)]. However, many important NPD activities (e.g. sourcing of components, prototype production, and quality control) fall outside marketing and R&D. It has therefore been suggested that an

accurate representation of cross-functional relationships in NPD should also include manufacturing [Song *et al.* (1997); Olsen *et al.* (2001)].

On a general level, integration enhances NPD performance and product success rates. Research by Souder [1988] on almost 300 NPD projects indicates, however, that disharmony rather than integration characterizes many relationships among departments and functions. As integration among functions decreases, their ability to combine skills to develop and produce successful products is reduced to the detriment of the firm [Griffin and Hauser (1996)]. For example, without a proper level of integration R&D may become enthusiastic about a new technical idea without considering its commercial significance. On the other hand, products developed with knowledge of customer needs are much more likely to succeed than products based on purely technical opportunities [Moenaert and Souder (1990)]. In addition to enhancing NPD performance, effective integration facilitates learning, encourages concurrent problem solving, and reduces product development cycle time [Sherman *et al.* (2000)]. These information-sharing activities can also lead to new and creative insights [Moenaert *et al.* (1994)].

The degree of integration needed is, however, dependent on different contingency factors. For example, the degree of integration required among functions/departments may vary over time as an NPD process unfolds. In the early stages (i.e. idea generation, product specifications, resource allocation) the level of integration needed between marketing and R&D should typically be high [Moenaert *et al.* (1994)]. In later phases, R&D may need to be more closely integrated with manufacturing. An additional factor is the type of product in question. An incremental change to a current product does not generally require high levels of integration in order to be successful.

As a construct, integration is believed to consist of two dimensions: Interaction and collaboration. Interaction represents the structural and formally coordinated activities among departments, and includes routine meetings, planned teleconferencing, memoranda, and the flow of standard documentation [Kahn (1996)]. Collaboration represents the more unstructured, affective nature of interdepartmental relationships, and stresses continuous relationships among departments as opposed to just transactions. Collaboration is defined as “an affective, volitional, mutual/shared process where two or more departments work together, have mutual understanding, have a common vision, share resources, and achieve collective goals” [Kahn (1996, p. 139)]. Both interaction and collaboration are important for NPD, but each philosophy has advantages and disadvantages. Kahn [1996] has suggested that too much interaction may overburden personnel; obliging them to attend too many meetings and exposing them to information overload. On the other hand, too much collaboration may require dramatic changes in organizational climate and culture. Due to its unstructured nature, employees may also become confused about their roles, and company productivity may suffer in the short term. However, many studies single out collaboration as the most important dimension. Fisher *et al.* [1997], Frishammar and Hörte [2005], Kahn [1996] and Maltz and Kohli [1996] all present empirical evidence, showing that collaboration is more important than interaction for enhancing NPD or innovation performance. Thus, to paraphrase

Kahn [1996], interaction may be necessary but not sufficient; while collaboration makes the difference between success and failure.

Griffin and Hauser [1996] suggest that there are six types of actions that a firm can take to improve integration: Relocation and facilities, personal movement, informal social systems, organizational structure, incentives and rewards, and formal integrative management processes. The use of specific mechanisms depends on the strategy and circumstances of the firm as well as various contingency factors [Moenaert and Souder (1990); Griffin and Hauser (1996)]. Readers interested in this area are referred to the two studies mentioned above for more detailed discussions.

4. Using Information

Given that a firm acquires information about environmental events, and that this information is shared among functions and departments, it is necessary that this information is used and evaluated by managers responsible for making key decisions [Miller and Friesen (1982)]. In other words, an organization can acquire information by means of scanning and then disseminate it internally among functions and departments but if it is not used, very little can be accomplished. In comparison with market orientation and cross-functional integration, however, relatively little attention has been paid to the area of actual "use". It has also been noted that effective use of market information is a problem for many firms [Deshpande and Zaltman (1982)].

A study by Ottum and Moore [1997] revealed a strong relationship between product success and the processing of market information, with success closely linked to actual information use. The gathering and sharing of information were only found to be important if the information was used effectively. In their study, information use correlated well with both financial success and customer success of the new products studied. A number of other studies have also found a positive relationship between the use of market- or customer information and different measures of performance, including innovation performance and NPD success [Atuahene-Gima (1995); Frishammar and Hörte (2005); Jaworski and Kohli (1993); Narver and Slater (1990); Slater and Narver (1994)].

While there is general agreement on the importance of using information in NPD, very little is known about which sources and types of information are used in which stages of the NDP process, and by whom. Interim findings on this topic are reported by Zahay *et al.* [2004]. In an exploratory study based on interviews with NPD practitioners, they identified three types of internal information (strategic; financial; project management), two types of external information (competitor; regulatory), and three types that may be internal and external (customer; needs; technical). Their findings indicate that all eight types are used at the fuzzy front end of the NPD process, while only customer- and project management information are used in the commercialization phase. Here, customer information facilitates targeting potential customers and project management information are needed to manage launching activities. Technical information together with information on needs and wants and project management information were used in the actual development stage. In the test and validation phase, several types of information

were used (project management information, regulatory-, competitive-, financial-, and information about needs and wants).

5. Discussion

In addition to some more specific comments on the work conducted in the areas of information acquisition, sharing and use in NPD, two more issues emerged which deserve attention: (1) The lack of a coherent framework for this area and (2) the carelessness with which the concept of information is treated. The three points are discussed in turn below.

5.1. *Comments about the reviewed literature*

First, the picture provided by the literature in this area is consistent in the sense that information is important for NPD performance and success. An exception exists, however, in the area of market orientation, where existing theoretical arguments as well as empirical findings point to the importance of both using and ignoring customer- and competitor information. The debate on whether NPD should be governed by market pull or technology push is likely to continue. It has been suggested that the inconclusive results could be due to scholars confusing market-oriented with customer-led. Slater and Narver [1998] argue that customer-led is a short-term philosophy in which organizations respond to customers' expressed wants, while market-oriented represents a long-term commitment to understanding both expressed and tacit customer needs. Furthermore, most studies in the area focus on market orientation as the only independent variable. Research by Atuahene-Gima and Ko [2001] suggests, however, that firms may need to balance a market orientation with an entrepreneurial orientation (i.e. innovativeness, risk-taking, and proactiveness) in order to enable effective NPD. A further reason that contributes to the inconclusiveness of the findings in this area is the plethora of definitions of innovation and product types, which results in ambiguity [see Garcia and Calantone (2002) for a deeper discussion]. Many studies also fail to consider interaction terms. It has been suggested that the type of product (e.g. radical versus incremental) may moderate the market orientation — NPD success relationship [Atuahene-Gima (1995); Johne (1994)]. It also seems to be widely believed that environmental conditions (e.g. market- and technological turbulence) may play a role [Kohli and Jaworski (1990); Slater and Narver (1990)].

Thus, acquiring information about customers and competitors via scanning activities, as well as about other environmental factors seems to be a very important activity. This is also true for the more informal means of information acquisition, i.e. gatekeepers. However, little current research exists on this topic — the interest seems to have peaked somewhere in the 1980s. MacDonald and Williams [1993] suggest that this is due to the fact that nowadays NPD is viewed more as a product of organizational effort than the outcome of R&D, or that scholars have started to consider gatekeepers as *ad hoc* and old-fashioned due to the advances in computing and telecommunications — often described as the perfect mechanism for gaining access to information, and the best means of transferring it. Still, as gatekeepers

perform a very important function in NPD, the question of whether gatekeepers can be created or at least facilitated arises.

Allen [1971] has suggested that managers can increase the number of acquaintanceships among technical personnel, for example through inter-departmental projects and transfer of staff within the firm. Facilities may also be designed to bring people into contact who would not otherwise meet. Therefore, physical location seems an important variable to consider. Furthermore, scholars have suggested that recognition, reward and promotion of boundary-spanning individuals should be a priority for managers. This may also allow the gatekeeper to develop a more diverse external communication network, which in turn may benefit the organization.

When it comes to sharing information, there is strong evidence that cross-functional integration contributes positively to NPD success. Overall, cross-functional integration seems to be an effective means for achieving internal alignment between R&D, marketing, and manufacturing functions. A high degree of integration is perhaps more important in turbulent environments, and for radical product changes, but a moderate degree is likely to be positive for all firms. Several previous studies [Fisher *et al.* (1997); Frishammar and Hörte (2005); Kahn (1996); Maltz and Kohli (1996)] provide empirical support for the hypothesis that collaboration is more important than mere interaction. Thus, interaction seems necessary to some extent, but it is collaboration that appears to make the difference.

In addition to being shared, information must also be used. Information use has previously been found to correlate positively with NPD success [see e.g. Ottum and Moore (1997)]. But research also reveals that many firms find it problematic to make effective use of market information [Deshpande and Zaltman (1982)].

5.2. A tentative framework for the area of “information in NPD”

Another feature of the literature reviewed here is the lack of a framework for interpreting the empirical findings. A majority of the studies lack a specific framework or connections with specific theoretical perspectives. This paper attempts to propose such a framework by combining what has been written about open system models and contingency theory with the literature specifically focusing on resource-based theory and dynamic capabilities. A frame can be defined as the structural core of the mental models we use to address a problem [Johnson and Russo (1997)]. The choice of frame is important, since it largely determines the recommendations to managers who face challenges in their NPD work.

On an overall theoretical level, the importance of managing and using information in NPD derives from the idea of organizations as open systems. Adopting an open systems perspective, authors in this area (implicit rather than explicit) view organizations as both influenced by environmental changes and capable of adapting to these changes. The field is also inspired by contingency theory [e.g. Lawrence and Lorsch (1986)], since management should be concerned with achieving alignment and “good fit”. “Fit” is important both internally among departments and functions (via cross-functional integration practices) as well as externally between the organization and the environment (via gatekeepers, scanning or market orientation).

Thus, in a nutshell, the open system model of organizations and general contingency theory serve as a frame.

Furthermore, resource-based theory together with the literature on dynamic capabilities can improve our understanding of the phenomenon of “information in NPD”. First, however, we need to discriminate between *information as a product* and *management of information as a process*. “Information” fits the general requirement of resource-based theory, which holds that a resource needs to be significantly heterogeneous across firms as well as imperfectly mobile to allow competitive advantage. In simple terms, resource heterogeneity means that every firm has resources that are unique in some way, while imperfect mobility refers to the fact that these resources cannot be easily bought and sold in the marketplace. Because the information used in NPD is contextual (i.e. it is informative only in a particular context), it can remain relevant over time despite attempts by other firms to acquire specific information from a successful firm. This line of thought traces back to the work of Penrose [1959]. Thus, information can be considered an asset tied semi-permanently to the firm [Wernerfeldt (1984)]. It also fulfils Wernerfeldt’s [1984] requirement that a resource should lead to superior profitability for a firm and that firm specific information is difficult to acquire, imitate, and substitute. We also find support for considering information as a resource in the writings of Barney [1991], who states that resources include all assets controlled by a firm that enable it to implement strategies to improve its efficiency and effectiveness, and information is mentioned as one such resource. This school of thought is surprisingly absent in the literature reviewed despite its potential relevancy, although Zahay *et al.* [2004] is an exception.

On the other hand, management (i.e. acquiring, sharing, using) of information can be viewed as a *routine* [Nelson and Winter (1982)] that is causally ambiguous. The causal ambiguity of this capability or routine stems from the fact that it is tacit, complex, and specific and therefore difficult to imitate from a distance. Management of information in NPD can therefore be viewed as a *dynamic capability*, defined by Teece and Pisano [1994] as the subset of the competencies/capabilities that allow a firm to create new products and processes and respond to changing circumstances.

5.3. The treatment of the concept of information

A final issue worth commenting on is how the concept of “information” is treated in the texts included in this review. Even though we constantly use the term “information” in our daily work we tend to take its meaning for granted; yet information is an elusive concept, ill defined and difficult to measure and evaluate [Kaye (1995)]. One perspective on information is that it is *value added data, a body of facts and knowledge to be applied to the solution of problems or to support decisions*, which is how the term information is usually used within the field of NPD. Thus, information in NPD has little or nothing to do with classical information theory [e.g. Shannon and Weaver (1959)]. Instead, the concept of information in NPD resembles the thoughts of Galliers [1987, p. 4] who defines information as “that collection of data, which when presented in a particular manner and at an appropriate time, improves the knowledge of the person receiving it in such a way that he/she is better able to undertake a particular activity or make a particular decision”. Huber

[1991] and Kyriakopoulos and deRuyter [2004] add that information is data given meaning by means of reducing ambiguity, equivocality, or uncertainty. However, the problem is that the texts included in this review neither treat the concept of information as problematic, nor make any attempts to define it. In other words, the bulk of research in this area tends to be vague about what information is, what kind of information is important, as well as when it is important and thus, to a large extent, fails to contribute to our understanding of the role of information in NPD.

6. Conclusions and Implications

NPD can be considered a process progressing through a series of stages such as opportunity identification, concept development, product design, process design and commercialization. Although there are different conceptualizations of this process in the literature, many authors agree that NPD is a set of activities starting with an idea and ending with commercialization, promotion, and sale of a product. How firms manage information in this process appears to be a crucial factor for NPD success and performance, as it is a key to achieving both integration among functions and departments, and organization — environment alignment.

Using the open systems model and contingency theory as an overall frame is advantageous for managers, as it places emphasis on the fact that NPD is not conducted in a social vacuum. Instead, environmental factors affect the NPD process, and the final product resulting from this process is usually launched on a market. To achieve external fit, managers involved in NPD need to promote gatekeeper behavior, since gatekeepers provide a link between the organization and its environment. Gatekeepers often acquire information that is valuable to others, and can translate between different languages, frames of references, and coding schemes. They are therefore important assets to their firms. Gatekeepers can facilitate improved problem solving and better NPD performance. This seems especially true in locally oriented work (i.e. non-scientific work). Therefore, recognition, reward and promotion of people assuming the gatekeeper role should be a priority for managers involved in NPD. Gatekeepers are especially important in securing technological information, which is very important for firms involved with NPD. Lichtenthaler [2004] suggests that the globalization of technological development, increasing competition, expanding use of external sources of technology, and the growing complexity of technological development push firms towards *systematic technology intelligence activities*. The use of gatekeepers can clearly serve as a substitute for such a formal approach.

More formal techniques for achieving external fit are also likely to be advantageous if NPD success and performance is the goal. Environmental scanning or market orientation can generate new product ideas, but also indicate what is happening in the broader environment outside the industry in which a firm competes. To place customer needs at the centre of R&D efforts seems appropriate, and should allow for increased NPD success rates. It is important to remember, though, that focusing on customers' expressed wants is not enough. A deep and sincere interest in tacit long-term needs of customers is invaluable. But despite its importance many

firms continue to neglect the activities associated with acquiring market information; activities that often discriminate between high and low performers in NPD [Cooper, Edgett and Kleinschmidt (2004)].

Furthermore, it is important to remember that if a strong emphasis on customer information leads to minor rather than major product modifications (as some authors in the area of market orientation claim), this it is not necessarily a bad thing for NPD performance. Smith and Reinertsen [1998, p. 68] argue that smaller product modifications are “the unsung heroes of product development” since they provide financial advantages, i.e. the relative investment in each product is usually lower, and revenue and profits show up faster. Furthermore, customer needs are easier to forecast over a shorter time span, and engineering advantages such as getting the product to market quickly can be realized since the development process is usually much less complex.

To achieve internal fit, information must be shared among functions and departments. There is strong evidence for the link between integration and NPD success in the literature. Collaboration has been singled out as the more important dimension. Thus, managers should try to stress the need for continuous relationships among departments and functions, make them work together, encourage a common vision, share resources, and work together to achieve mutual goals. An adequate degree of collaboration is often pictured as the difference between NPD success and failure. Integration can further facilitate learning, encourage concurrent problem solving, and reduce product development cycle time. There is also support in the literature for the idea that the acquired and shared information must be used in the NPD decision making processes, as it has a positive impact on performance. Examples include setting design specifications, or launching products on the market.

Finally, management of information in NPD should be viewed as a routine or dynamic capability, since it allows a firm to create new products and processes. The capability of managing information effectively can make a significant contribution to perceived customer benefits, and can provide access to a variety of markets. Information, by itself, should be considered a resource. Since information in NPD is often significantly heterogeneous across firms and imperfectly mobile, it is difficult to acquire, imitate, and substitute and is thus a prerequisite for sustainable competitive advantage.

7. Future Research

Despite the general agreed-upon importance of acquiring, sharing, and using information in NPD, knowledge about what kind of information is needed, by whom, and from which sources is lacking. Furthermore, and in line with the research of Zahay *et al.* [2004], different types of information are needed in different phases of the NPD process. Their study is valuable as it adds to our understanding by answering the question of *what* and *how*. Future research should strive to answer the question of *why*; what and how describe, only why explains. As a first step toward a theory of information use in NPD, future research should focus on the underlying dynamics that justify the selection of sources, types of information, participants, frequency of communication, and so forth. Further exploratory research is needed to identify key

concepts and variables, and link these with propositions and hypothesis. A valuable next step would be to examine how firms with high/low NPD performance differ in how they manage information, but subsequent future research should also turn to survey methodology in order to generate new knowledge and eliminate false hypothesis.

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Paper II

The Role of Market- and Entrepreneurial Orientation for NPD Performance in Manufacturing Firms

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The role of market- and entrepreneurial orientation for NPD performance in manufacturing firms

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Abstract

The overall purpose of this article is to examine the relationship between market- and entrepreneurial orientation, and new product development (NPD) performance in mid-sized manufacturing firms. Drawing upon a sample of 224 such firms, multiple regressions with and without interaction terms were used for hypothesis testing. The results show that market orientation and innovativeness were positively related to NPD performance, while proactiveness and risk taking show no such relationship. The results also show that neither product- nor environmental characteristics moderate these relationships. Based on these findings, implications for management as well as the scholarly literature are presented and discussed.

Keywords: Product development, entrepreneurial orientation, market orientation, capabilities, inertia.

1. Introduction

For firms active on a market characterized by competition, high performing products that achieve stipulated market share, sales growth, customer use, and profit objectives are essential. Such products are essential because they contribute to firm renewal (Harmsen et al., 2000) as well as to competitiveness and growth of the firm (Clark and Fujimoto, 1991; Cooper and Kleinschmidt, 1991; Griffin, 1997). To be able to develop high performing products, firms depend on many different capabilities. In this article we consider two such capabilities – market orientation and entrepreneurial orientation – and how these relate to new product development (NPD) performance.

Market- and entrepreneurial orientation are two separate but complementary strategic orientations or capabilities that can co-exist (Miles and Arnold, 1991) and in the literature, these two capabilities are described as firm/business unit level characteristics (Atuahene-Gima and Ko, 2001; Covin and Slevin, 1989; Lumpkin and Dess, 1996). Capabilities are “socially complex routines that determine the efficiency with which firms transform inputs into outputs” (Collis, 1994, p. 145) and both market- and entrepreneurial orientation resemble Teece and Pisano’s (1994) writings on *dynamic capabilities* since they both belong to the subset of competences/capabilities that allow a firm to create new products and processes and respond to changing circumstances. Echoing Atuahene-Gima and Ko (2001) we argue that

market- and entrepreneurial orientation creates complex, tacit, and intangible skills that allow a firm to generate new ideas for the creation of new products and services. The overall purpose of our article is to examine the relationship between market- and entrepreneurial orientation and NPD performance, with a special focus on mid-sized manufacturing firms.

Our study contributes to the literature in several ways. First, it addresses simultaneously the importance of market- and entrepreneurial orientation on NPD performance. Atuahene-Gima and Ko's (2001) study excepted, few empirical studies exist in this area of research. By simultaneously considering different strategic orientations, we also address the current debate on whether a market orientation is enough for NPD performance (see. e.g. Frishammar, 2005; Frishammar and Hörte, 2005). Many earlier studies look at market orientation as the only strategic orientation. Second, we look specifically at firms with less than a hundred employees, which has not been done before according to our knowledge. Earlier research by Tzokas et al. (2001) indicates that both market orientation and entrepreneurial orientation are important for the performance of smaller firms, but knowledge of how these capabilities affect on NPD performance is limited. Furthermore, we look at how different environmental conditions as well as product characteristics affect on the market orientation/entrepreneurial orientation – NPD performance relationship. And finally, our data was collected from firms in Sweden, where empirical research on the links between strategic orientations and NPD performance has not yet been conducted.

The paper starts by reviewing previous research on market- and entrepreneurial orientation and their links to NPD performance, with the aim of generating hypotheses. We proceed by describing the approach and methodology employed. The research findings are then presented, followed by a discussion of these findings. The paper concludes by discussing policy implications for both the scholarly literature and practitioners.

2. Frame of reference and hypotheses development

The goal of the capability of market orientation is to align the firm with a special section of its environment: the market. The market is usually believed to be the set of customers and clients who make use of subject organizations' products or of competing (highly substitutable) products (Starbuck, 1976). A central idea in market orientation is the marketing concept, which is a business philosophy or policy statement. In simple terms, it states that satisfying needs and wants of target customers more effectively and efficiently than competitors do determines an organizations goal fulfilment (see e.g. Kotler and Armstrong, 1996). Market orientation basically means implementing the marketing concept. Although research on market orientation has a long history, Kohli and Jaworski (1990) and Narver and Slater (1990) revived the interest in this line of research. In this paper, market orientation is defined in accordance with Deshpandé and Farley (1999, p. 228) as "the set of cross-functional processes and activities directed at creating and satisfying customers through continuous needs assessment". In line with Narver and Slater (1990) we view market orientation as a continuum rather than a dichotomous state.

Currently, there exist two views in the literature on how a market orientation affects NPD performance. One view or school claims that market orientation leads to commonality and bland new products since customer information constrains

innovative thinking. The underlying premise is that customer opinions are restricted to the familiar – to products they can relate to. Furthermore, customers neither know what is technologically possible, nor are they adequately informed about current trends. Thus, too much market orientation leads to the development of “me-too” products, often suffering from tough competition due to substitution possibilities, which results in squeezed profit margins. Two studies sharing the above described logic are the ones by Lawton and Parasuraman (1980) and Bennet and Cooper (1981). The former found that adopting the marketing concept had no impact whatsoever on product innovation, while the latter suggested that market orientation has negative consequences for product innovation because it leads to smaller, incremental innovations. The results of Christensen and Bower (1996) also show that firms that take heed of their customers may lose their advantage. In a similar vein, Trott (2001) suggests that market research results – one of the outcomes of a market orientation – frequently produce negative reactions to discontinuous new products that may eventually become very profitable. And finally Moorman (1995) found that such information acquisition was not related to NPD performance.

The other view or school claims that if a firm is market oriented enough, the risks of failure are reduced. The central idea is that customer needs, both present and future, should be at the centre of R&D efforts. Therefore, firms with a strong market orientation are best suited for high NPD performance (Atuahene-Gima, 1995; Hart et al., 1999; Hill, 1988; Kahn, 2001; Kohli and Jaworski, 1990; Slater and Narver, 1994) and market information should be used throughout the NPD process to enhance success rates. Scholars have also reported a positive relationship between customer orientation and product innovation (Gatignon and Xuereb, 1996) and the findings of Lukas and Ferrell (2000) indicates that a greater emphasis on customer orientation actually increases the introduction of new-to-the-world products – a finding that runs contrary to the argument that customers are a source of marginal innovation. Still another example of the importance of customers and customer information is found in von Hippel’s (1988) and Herstatt’s (2002) writings on specifically qualified customers in the search for innovations (so-called lead-users).

Trott (2001) summarizes the dilemma for us: On the one hand, market orientation may reveal limitations in new products (thus allowing for actions such as re-design), but it may also produce negative feedback on truly innovative products. That being said, it is important to remember that if a strong emphasis on market orientation leads to minor rather than major product modifications, this is not necessarily a bad thing for NPD performance. Smith and Reinertsen (1998, p. 68) argue that smaller product modifications are “the unsung heroes of product development” since they provide financial advantages, i.e. the relative investment in each product is usually lower, and revenue and profits show up faster. Furthermore, customer needs are easier to forecast over a shorter horizon, and engineering advantages such as getting the product to market quickly can be realized since the development process is usually much less complex. In addition, Pelham and Wilson’s (1999) study of market orientation in smaller firms found that a high level of market orientation was one of few important determinants of effective product development. We therefore hypothesise that:

H1: There is a positive association between market orientation and NPD performance.

Although a market orientation capability is important for NPD performance, it is probably not sufficient. As Hunt (2000) suggests, organizations cannot *know* what

alternative products consumers would like to have, so they guess in the face of uncertainty. That is, in addition to being market-oriented, organizations need to be innovative, proactive, and to take risks. They need to be entrepreneurially oriented.

Our conceptualization of entrepreneurial orientation is based on the work of Covin and Slevin (1989) and Miller (1983). Thus, we suggest that an entrepreneurial orientation consists of three dimensions: innovativeness, risk taking, and proactiveness. Like Dess and Lumpkin (2005), Lumpkin and Dess (1996), and Kreiser et al. (2002) we view these as separate dimensions since firms need not exhibit high or low levels in all three dimensions simultaneously at a given point of time. Thus, the three dimensions may come about in different combinations. Overall, entrepreneurial orientation refers to the processes, practices, and decision-making activities that lead to new entry (Lumpkin and Dess, 1996), for example through the creation of new products or services.

The first dimension or sub-capability of an entrepreneurial orientation is innovativeness. According to Lumpkin and Dess (1996, p. 142) innovativeness refers to "...a firm's tendency to engage in and support new ideas, novelty, experimentation, and creative processes that may result in new products, services, or technological processes". Hence, innovativeness resembles a culture, climate or orientation rather than an outcome. According to Lumpkin and Dess (1996), innovativeness occurs along a continuum, for example from trying a new product line or experimenting with new products, to trying to master the latest in new technologies. Nelson and Winter (1982) argued that some firms benefit more from imitation than innovation, and Dess and Lumpkin (2005) further suggest that innovativeness may lead to major pitfalls, since expenditures on R&D can be a waste of resources if these efforts do not yield results. We believe, however, that innovativeness is positively related to NPD performance for a couple of reasons.

First, innovativeness implies a willingness to depart from existing practices in a firm – a criterion necessary for the creation of something new (Özsomer et al., 1997). Second, to explore new ideas and engage in experimentation are central features of successful NPD (Robinson and Stern, 1998). In a similar vein, Cooper et al. (2004) suggest that a culture that fosters creative processes is central to NPD performance. Sethi et al. (2001, p. 74) further suggest that innovativeness allows for "meaningful uniqueness" in products, thus allowing the creation of products that are different from competing alternatives in a way that is valued by customers. Previous research by Cooper (1993) further demonstrates that the *absence of innovativeness* is an important explanation of new product failure. Our second hypothesis therefore states that:

H2a: There is a positive association between innovativeness and NPD performance.

The second component of an entrepreneurial orientation is risk taking, defined as "the degree to which managers are willing to make large and risky resource commitments – i.e. those which have a reasonable chance of costly failures" (Miller and Friesen, 1978, p. 923). As with innovativeness, risk taking occurs along a continuum ranging from relatively "safe" risks (e.g. restocking the shelves) to very high risks (e.g. launching new products on new markets) (Lumpkin and Dess, 1996).

Although too much risk may be harmful to NPD performance, risk per se is inevitable since the exact outcome of new product development cannot be known beforehand. For example, firms must frequently commit resources to development projects when opportunities are seized in the marketplace, partly without knowledge of how these development projects will turn out. Risk taking involves pitfalls and

dangers, but firms must often act without knowing how their actions will turn out (Dess and Lumpkin, 2005). Prototypes may fail in manufacturing and new designs may fail in the market-place but if no risks are taken, no new products will ever be produced and launched. We hypothesise that:

H2b: There is a positive association between risk taking and NPD performance.

The last component of an entrepreneurial orientation is proactiveness. Proactiveness relates to “forward-looking, first mover advantage-seeking efforts to shape the environment by introducing new products or processes ahead of competition” (Lyon, Lumpkin and Dess, 2000, p. 1056). According to Lumpkin and Dess (1996), proactiveness is important since it implies a forward-looking stance accompanied by innovative or new-venturing activity. According to these authors, the conceptual opposite of proactiveness is passiveness (i.e. an inability to seize opportunities).

Thus, as Lumpkin and Dess (1996) suggest, a proactive firm is a leader rather than a follower, since it has the will and foresight to seize new opportunities. Furthermore, proactive firms are often the ones to come up with new products (Miller, 1983) and often introduce new products ahead of competition (Dess and Lumpkin, 2005; Venkatraman, 1989). Despite the fact that customers of firms introducing new products can be reluctant to adapt to new ways of doing things (Dess and Lumpkin, 2005), proactiveness should impact positively on NPD performance. First, it may allow for first-mover advantage (Lieberman and Montgomery, 1988), allowing high profits from new products in the absence of competing products. Second, proactiveness implies increased speed of development, a criterion necessary for successful NPD (Smith and Reinertsen, 1998). And finally, passiveness – an inability to seize opportunities – is indeed undesirable if high NPD performance is the objective. We therefore hypothesize that:

H2c: There is a positive association between proactiveness and NPD performance.

The fact that the impacts of a market orientation on NPD success and performance does not converge in the literature is a good example of theoretical tensions, and serve as an example of what Poole and Van de Ven (1989) call a social paradox: an inconsistency in logic or assumptions, that is, good arguments for two incompatible explanations. We believe that using product newness as a moderator of the market orientation – NPD performance relationship can help solve this paradox.

Prior research by Atuahene-Gima (1995) suggests that the degree of product newness may influence at least the market orientation – NPD performance relationship. Product newness to customers is defined in accordance with Atuahene-Gima (1995, p. 278) as the extent to which new products produced by a firm are “compatible with the experiences and consumption patterns of potential customers”. According to Lawton and Parasuraman (1980), this construct reflects the extent to which behavioural change or learning efforts is required by those who adopt the new products. Atuahene-Gima (1995) argued, but failed to support in subsequent hypothesis testing, that a market orientation should have a greater influence on product performance when the degree of product newness was high. The rationale behind this argument has to do with the fact that a high degree of product newness presupposes significant behavioural changes and learning efforts for both the firm and

its customers, something a market orientation can facilitate. We believe that this argument is flawed, and hypothesise the opposite.

Thus, the overall positive association between market orientation and NPD performance should be stronger in firms with a focus on minor rather than major innovations since smaller, incremental modifications of existing products are the likely results for firms that rely heavily on market information as input for new product ideas. Consequently, the positive association between market orientation and NPD performance should be stronger in firms whose products require no major changes in consumption patterns, experiences or learning efforts (low degree of product newness to the customers) due to arguments mentioned earlier: market information from customers is likely to provide negative feedback on truly innovative products requiring major behavioural changes and learning efforts, since customers on average are constrained to what is familiar and known to them. Later research by Atuahene-Gima (1996) also found that market orientation has a significant negative impact on product newness to customers. Although we believe that a market orientation is important for all new products to some extent, we hypothesize that:

H3a: A market orientation will have a greater positive impact on NPD performance when the degree of product newness to customers is low rather than high.

If few scholars have examined how the market orientation – NPD performance relationship is moderated by the degree of product newness, research on how the entrepreneurial orientation – NPD performance relationship is moderated by product newness is virtually non-existent. We believe that an entrepreneurial orientation is also important for all kinds of products in general and at least to some extent. The hypothesized relationship should, however, be the opposite compared with the market orientation case. Thus, the positive relationship between entrepreneurial orientation and NPD performance should be stronger when product newness to the customers is high.

The rationale underlying this argument is: if firms have a strong focus on major rather than minor innovations, a market is not necessarily in existence for product launch, thus implying that a market must be created for product diffusion. For such actions to occur successfully, innovativeness, risk taking and proactiveness are important capabilities. Furthermore, since launching radically new products involves much more uncertainty and precariousness than launching minor ones, innovativeness, risk taking, and proactiveness are needed to a larger extent. And finally, if the new products produced and launched are not compatible with the experiences and consumption patterns of potential customers, innovativeness and proactiveness rather than market orientation are needed to accomplish a change in customer behaviour. Thus, we hypothesize that:

H3b: Innovativeness, risk taking and proactiveness will have a greater positive impact on NPD performance when the degree of newness to customers is high rather than low.

The environment has long been considered one of the critical contingencies in organization theory (Child, 1972; Pfeffer and Salancik, 1978; Porter, 1980). In this paper, we consider two dimensions of the external environment: technological turbulence and competitive intensity. Technological turbulence captures the rate of technological change as experienced by firms. Competitive intensity captures the

degree of competition in an industry, ranging from low - customers are “stuck” with the organization’s products - to high - customers have many options for satisfying their needs and wants (Jaworski and Kohli, 1993).

Based on field interviews with a large number of executives, Kohli and Jaworski (1990) argued that a market orientation may be less critical under certain environmental conditions. Kohli and Jaworski argued that in industries characterized by rapidly changing technology (i.e. high technological turbulence), a market orientation may be less critical since radical new products will often be developed outside that particular industry, thus diminishing the benefits of a market orientation. Furthermore, the perceptions of the executives in their sample led them to the conclusion that if competitive intensity is high, the relationship between market orientation and performance should be stronger. The rationale is that, under conditions of high competitive intensity, a business unit must be more aggressive in discovering customer wants and creating customer value to satisfy these wants.

In subsequent studies, these propositions were tested by Jaworski and Kohli (1993) and Slater and Narver (1994), whose results provided very limited support for these environmental dimensions as moderators. Instead, Slater and Narver (1994) suggest that the benefits of market orientation are long-term while environmental conditions are often transient, thus leading to the conclusion that a market orientation is beneficial in all environmental conditions. Attempts to adjust the degree of market orientation, implying a change in firms’ business philosophy or culture, is neither cost-effective nor feasible, given the complexity of changing a market orientation. Kohli and Jaworski (1990), Jaworski and Kohli (1993) and Narver and Slater (1994) used measures of business performance as dependent variables, however, and were not concerned with NPD performance. We believe, however, that these results are plausible with NPD performance as a dependent variable as well, because cost and inertia makes it unlikely that firms will change their degree of market orientation to adjust to environmental contingencies. And even if it was possible, as Hult et al. (2004) remark, it is doubtful whether most firms possess the skills needed to do so successfully.

There are reasons to believe, however, that technological turbulence and competitive intensity may moderate the entrepreneurial orientation – NPD performance relationship. According to Miles and Arnold (1991), an entrepreneurial orientation suggests that organizations seek to exploit the dynamics of their macro- and task environments. Drawing on research by Khandwalla (1977) and Smart and Vertinsky (1984), Miles and Arnold (1991, p. 49) argue that an entrepreneurial orientation provides the base for appropriate strategic responses “caused by environmental turbulence”. The findings of Covin and Slevin (1989) also lend validity to our argument. Covin and Slevin found that performance among smaller manufacturing firms – similar to the ones in our sample – was positively related to an entrepreneurial orientation posture in hostile environments. In their eyes, hostile environments are, among other things, characterized by intense competition and lack of predictability. Advantage in such environments, argued Covin and Slevin (1989, p. 77), are likely to result from “...the proactive, innovative, and risk-taking efforts of entrepreneurial firms”. Furthermore, in discussing alternative avenues to competitive advantage, Jaworski and Kohli (1993) suggest that innovation is such an avenue for organizations experiencing high technological turbulence. That is, when the degree of technological change is high, it will be more important for firms to engage in innovative activities. An environment perceived as highly competitive and turbulent presents a great challenge, and we hypothesize that high NPD performance in such

environments is likely to result from innovativeness, proactiveness, and risk taking efforts. Thus, our final hypothesis states that:

H4: The positive relationship between innovativeness, risk taking and proactiveness and NPD performance will be stronger when technological turbulence and competitive intensity is high.

The discussion above is summarized in figure 1 below, which also outlines the perceived relationships between the variables in the study.

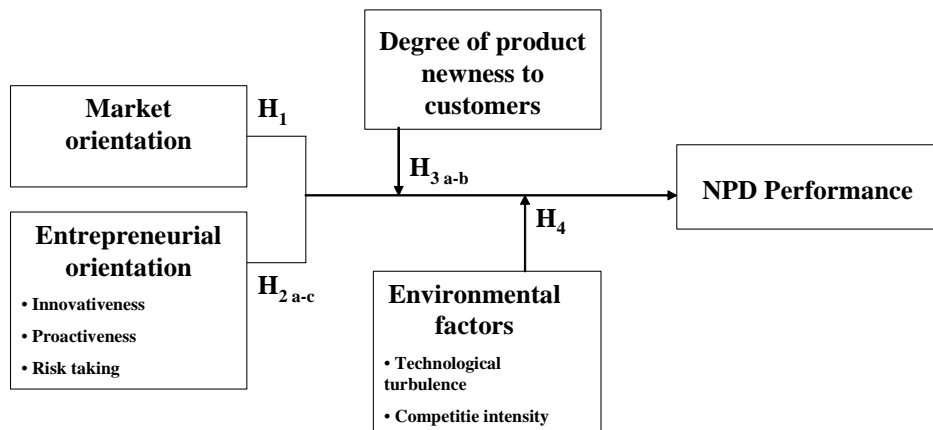


Figure 1: Conceptual model and perceived relationships among variables

3. Method and research approach

Data for this study was collected via a mail survey between November 2004 and February 2005, thus implying a self-administered, structured questionnaire. The questionnaire was tested in a pilot study of ten persons; five executives and five academicians. Our sampling frame derived from the database Affärsdata and comprised Swedish firms classified as manufacturers with 50 – 250 employees, numbering to N = 848, which is the universe of firms in that database. Due to time and budget constraints, a random sample of 400 firms was drawn from this frame. The average firm had 98 employees and annual sales of € 20.2 million. In addition to controlling for size, we assured that these firms had in-house product development. Furthermore, since firms' active in the same industry typically face similar environmental conditions (Porter, 1980), our sample spans a cross-section of industries. In total, 210 SIC codes are represented in the sample. After the wave of letters, three reminders were sent out and telephone calls were made to all firms that could be reached. After reviewing the results of these actions, 12 firms were dropped from the sampling frame. Seven firms were found to be pure sub-contractors thus lacking their own product development, three firms had terminated their operations on a voluntary basis, and two firms had gone bankrupt.

Thus, the actual frame comprised 388 firms, and we received 224 completed questionnaires – an effective response rate of 57.7%. Due to size considerations of the firms investigated, as well as to the fact that top administrators are widely believed to provide the best information about environmental and organizational characteristics, the questionnaires were mailed to the CEOs of these firms. Of those who responded, 93 % were CEOs; the remaining 7% were marketing, research & development- or financial managers.

3.1 Measures

Variables were selected on the basis of their utility in past research, although one has been slightly modified for the present research purposes. All scale items were averaged to obtain the variable scores. Five- and seven point scales were used for measurement (see appendix A). All variables met the criteria for skewness and kurtosis suggested by Hair et al. (1998) and were approximately distributed normally. In order to test for dimensionality, an exploratory factor analysis was performed. A summary of this test as well as descriptive statistics and reliabilities for all constructs are found in table 1 below.

Constructs	Initial no. of items	Items remaining	Mean	Std.	Lowest item-total correlation	Lowest item-item correlation	Cronbach's alpha	Eigenvalue
Market Orientation	10	5	3.47	0.81	0.58	0.38	0.82	3.75
Entrepreneurial Orientation								
Innovativeness	3	3	4.30	1.10	0.45	0.34	0.71	1.90
Proactiveness	3	2	4.80	1.06	0.48	0.48	0.65	1.54
Risk-taking	3	3	4.16	0.99	0.52	0.44	0.76	2.03
Degree of Product Newness to Customers	6	6	3.40	1.12	0.48	0.24	0.81	3.08
Environmental Variables								
Technological Turbulence	4	4	2.92	0.90	0.58	0.43	0.84	2.69
Competitive Intensity	6	5	3.17	0.74	0.46	0.29	0.75	2.61
NPD Performance	4	4	4.77	0.91	0.55	0.43	0.85	2.79

Table 1: Descriptive statistics and test of reliability and dimensionality

Market orientation. Several different measures for market orientation have been suggested in the literature (e.g. Deshpandé and Farley, 1999; Deshpandé et al., 1993; Kohli et al., 1993; Narver and Slater, 1990). We used the Deshpandé and Farley (1999) scale as it has the advantage of having relatively few items, thus keeping the size of the questionnaire down. Previous tests of this scale also show that it has some sort of universal characteristic (e.g. the theoretical underpinnings should be valid in different research settings). Therefore, lack of significant inter-industry and inter-nation differences added to our choice of this scale. Some severe problems were experienced with the market orientation scale, however. One item was deleted due to cross-loading problems, and the remaining items loaded on two separate factors which can be named *market research orientation* (items measuring the gathering or sharing of market information) and *customer orientation* (items measuring the extent to which customers are put in front for goal-setting and strategy making). The customer orientation scale performed below the standards for reliability, and thus another four items were dropped.

Entrepreneurial orientation. Our choice of items for measuring innovativeness, risk taking and proactiveness draws on Covin and Slevin (1989), who grounded their

construct in the work of Miller (1983). Several earlier studies (Miller, 1983; Covin and Slevin, 1989; Atuahene-Gima and Ko, 2001) have used this scale with satisfactory results. It is important to note that two other dimensions of entrepreneurial orientation are potentially relevant, but they were not considered in this study: competitive aggressiveness and autonomy (see e.g. Lumpkin and Dess, 1996). Competitive aggressiveness refers to intensity and head-to-head posturing that new entrants need to compete with existing rivals. Since the empirical foundation for our article is not start-up firms, we consider this dimension less relevant. Autonomy, defined as independent actions of *teams* or of *an individual*, was dropped for another reason: the level of analysis differs from that of the firm, thus posing possible measurement problems. One item was dropped from the proactiveness scale due to reliability considerations.

Degree of product newness. For measuring degree of product newness, we draw on Atuahene-Gima (1995). Degree of product newness, or incremental/radical innovation, is typically measured at the product level (Gatignon et al., 2002) but the original items used here were adapted from the product level to the firm level. We slightly modified the 6 items for measuring product newness to customers to fit the firm level and no items were dropped from this adjusted scale.

Environmental factors. For measuring technological turbulence and competitive intensity, we draw on Jaworski and Kohli (1993). All in all, four items were used to capture the dimension of technological turbulence, and six items were used to measure competitive intensity. One item from the technological turbulence scale was dropped a priori from our survey on the basis of the refinement procedure conducted by these previous authors. In the subsequent analysis of dimensionality, one item was dropped from the competitive intensity scale since it was the only item loading on one factor.

NPD Performance. NPD Performance was measured at the firm level. Although some authors (e.g. Atuahene-Gima, 1995) favour measuring this concept at the *project level*, we aimed for the firm level for three reasons. First, since the firms we investigate are fairly small, there is no reason to believe that substantial differences exist in NPD performance among different units of the same company. Second, since smaller firms, *ceteris paribus*, undertake fewer NPD projects than large ones, considerable variations in the nature and performances of new product projects are less likely to occur in comparison with large firms. And finally, a shortcoming of selecting the project level is also that a project selected by a respondent may not be representative of the entire set of projects undertaken by a firm (the “*le cas pur*” problem, see Galtung, 1967). Furthermore, there seems to be no comprehensive and integrated answer to the questions of *what* and *how* to measure NPD performance (Söderquist and Godener, 2004) so the choice of specific measure is awkward. Operationally, we used the four items suggested by Atuahene-Gima and Ko (2001). This scale measures to what extent new products are perceived to meet their market share, sales and customer use, sales growth, and profit objectives. A potential problem with this scale is that it is perceptual. Several earlier studies claim, however, that perceptual measures are highly correlated with objective measures of product innovation but also have the advantage of facilitating comparisons among firms in different industries (Ancona and Caldwell, 1992; Zahra, 1993; Zahra and Covin, 1993).

4. Analysis and results

Table 2 below shows the correlation matrix for all variables included in the paper. To avoid potential problems with multicollinearity as indicated by the table, different forms of multiple regression equations were used in subsequent steps of the analysis.

Variables	1	2	3	4	5	6	7	8
1. NPD Performance	1							
2. Market Orientation	.239**	1						
3. Innovativeness	.361**	.245**	1					
4. Risk Taking	.218**	.188**	.447**	1				
5. Proactiveness	.223**	.170*	.415**	.386**	1			
6. Product Newness to Customers	-.067	.080	.166*	.178**	.185**	1		
7. Technological Turbulence	.176**	.151*	.330**	.325**	.188**	.277**	1	
8. Competitive Intensity	.037	.027	.005	-.053	-.089	-.066	-.049	1

** $p < .01$

* $p < .05$

Table 2: Correlation matrix built on Pearson correlation (n = 224)

H1 and H2a-c were tested by regular multiple linear regression analyses and the results of these tests are found in model 1 in table 3 below. Starting out, H1 was supported: A positive association exists between market orientation and NPD performance ($\beta = .152$, $p < .05$). Support for H2a was also found, as there exists a positive association between innovativeness and NPD performance ($\beta = .279$, $p < .01$). H2b and H2c, supported in the bi-variate analysis conducted in table 2, show no significant relationship with NPD performance in regression model 1. Thus, no significant relationship exists between risk taking and proactiveness on the one hand, and NPD performance on the other ($\beta = .039$ and $\beta = .067$ respectively).

To test for the moderation effects stipulated in H3a-b and H4, we followed the strategy suggested by Aiken and West (1991), thus testing these hypotheses by performing a series of multiple regression analyses with interaction terms added as cross-products of a new variable and one already in the equation. This type of analysis determines whether moderating effects exist, and the hypotheses are supported if the β -coefficient for the interaction term differs significantly from zero. Cross-product interaction terms are often highly correlated with the corresponding simple independent variables already present in the equation, thus creating problems with determining the relative importance of main- and interaction effect. To address this problem, all variables were centered (i.e. the mean from each datum was subtracted) in order to reduce problems with multicollinearity. Through this procedure we were able to reduce the variance inflation factor (VIF) values way below the cut-off point of 10 suggested by Hair et al. (1998).

Table 3 also reports the results of multiple regression analyses with interaction terms¹. Models 2, 4, and 6 add to model 1 one of the moderating variables proposed in H3a-b or H4: Product newness to customers, technological turbulence, and competitive intensity. One of these terms is significant (product newness to customers

¹ Note that this table also shows that technological turbulence and competitive intensity does not moderate the market orientation – NPD performance relationship. We never stated this as an explicit hypothesis in the paper, simply because there is no need for a hypothesis if no moderation effect is expected.

in model 2; $\beta = -.153$, $p < .05$), while the other two show no effects. This indicates that neither technological turbulence nor competitive intensity has a significant influence on NPD performance. In the remaining models (3, 5, and 7) the interaction terms were entered into the models to test the remaining hypotheses. In models 3, 5, and 7, none of the interaction terms were significant. Our results thus provide no support for either product characteristics or environmental dimensions moderating the market orientation/entrepreneurial orientation – NPD performance relationships. More specifically, H3a is not supported since product newness to the customer does not moderate the market orientation – NPD performance relationship. Similar results are given by testing H3b – product newness to the customer does not moderate any of the relationships between an entrepreneurial orientation (innovativeness, proactiveness, risktaking) and NPD performance.

Model	1	2	3	4	5	6	7
Market orientation (MO)	.152**	.155**	.167**	.149**	.151**	.150**	.150**
Innovativeness (I)	.279***	.289***	.269***	.269***	.260***	.276***	.286***
Proactiveness (P)	.067	.084	.081	.067	.077	.071	.065
Risk Taking (RT)	.039	.054	.053	.030	.028	.041	.056
Degree of product newness to customers (PNC)		-.153**	-.150**				
(MO x PNC)			.004				
(I x PNC)			-.091				
(P x PNC)			.016				
(RT x PNC)			.135				
Technological turbulence (TT)				.043	.052		
(MO x TT)					.015		
(I x TT)					-.046		
(P x TT)					.010		
(RT x TT)					-.033		
Competitive intensity (CI)						.040	.048
(MO x CI)							-.027
(I x CI)							-.102
(P x CI)							-.070
(RT x CI)							.053
R2	.160	.182	.195	.162	.166	.162	.180
Adj. R2	.145	.164	.161	.143	.130	.143	.145
F	10.457***	9.733***	5.771***	8.424***	4.718***	8.424***	5.208***

* $p < .10$

** $p < .05$

*** $p < .01$

Table 3: Regression models with NPD performance as dependent variable. Standardized β -coefficients displayed.

H4 was neither supported. We expected the positive relationship between an entrepreneurial orientation and NPD performance to be stronger when technological turbulence and competitive intensity were high, but no support was found for this hypothesis.

5. Discussion

Our results show that market orientation has a favorable effect on NPD performance. Thus, in order to increase NPD performance, present and future customer needs should be viewed as important guidelines for NPD efforts. Our findings are in line with those of Kohli and Jaworski (1990) and Slater and Narver (1994) and others, and they imply that market information should be used throughout the NPD process to increase the performance of new products and decrease product failure rates also in smaller mid-sized firms. Furthermore, innovativeness – one of the components of an entrepreneurial orientation – is more strongly associated with NPD performance than with market orientation. Thus, while listening to the voice of the market may be important, firms need also to depart from existing practices, engage in experimentation, support new ideas, and facilitate creative processes. The ability to explore new ideas and engage in experimentation has previously been suggested as important factors for successful NPD (e.g. Robinson and Stern, 1998) and these findings are supported here. As Sethi et al. (2001) suggest, firm's innovativeness can contribute to product offerings that are unique in a meaningful way – to products that are different from competing alternatives in a way that is valued by customers. The result is higher NPD performance. A current example from practice is Apple's launch of the iPod mp3 players, clearly unique in design and image.

It is clear from our results that different strategic capabilities contribute to NPD performance. On the one hand, firms need to be sensitive to customer information, make incremental adjustments of products and product lines, and (at least partially) base NPD decision-making on information about customer needs and wants – activities associated with a market orientation. Simultaneously, firms need also engage in more bold moves, to some extent ignore customer information, engage in experiments, create a culture that fosters creativity (Cooper et al., 2004), and support creative processes – activities associated with innovativeness. Thus, as Tzokas et al. (2001) suggest, high performance requires contradictory and somewhat paradoxical capabilities. Our results thus suggest that both market orientation and innovativeness are important for NPD performance in mid-sized manufacturing firms.

Counter to our hypothesis, both risk taking and proactiveness show no significant relationship with NPD performance. The assumptions underpinning H2b-c are disconfirmed, and resemble what Weick (1989) call a *“that's interesting”* response. Such a response (an assumption of moderate strength disconfirmed) is an opportunity to learn something new and to discover something unexpected. Although Weick is concerned with thought trials as opposite to empirical research, his ideas have a bearing on the latter situation as well. The question thus is: how can these results be interpreted?

With regard to risk taking, a possible interpretation is that smaller mid-sized firms, such as the ones we have studied, are constrained in the extent to which they can make risky resource commitments. As smaller firms generally have a limited resource-base, large resource commitments with costly failure as a possible outcome might have a serious impact on profits or possibly jeopardize the future of the firm. Thus, smaller firms might choose NPD projects with a lower degree of risk, while simultaneously trying to control the probability of occurrence since, due to limitations in size and resource base, they are more vulnerable than large firms. The key to managing risk is to control the probability of occurrence of risks (Smith and Reinertsen, 1998). In the context of smaller firms, too much risk may come about

rather quickly. This appears a logical explanation, although a speculative one, and future in-depth research may provide further insight into this question.

The lack of association between proactiveness and NPD performance may be explained in a similar way. Due to their size and limited resource base, the majority of the firms in our sample cannot perhaps shape the environment by introducing new products ahead of competition. First mover advantage-seeking efforts are also likely to involve high degrees of risk – both technical and market risks. Thus, even if smaller firms such as the ones that we have studied have the will and foresight to seize new opportunities, they may not possess the resources and capabilities needed to exploit them.

Two additional factors deserve attention. First, our results support viewing the entrepreneurial orientation dimensions as separated as do Lumpkin and Dess (1996) rather than as a single strategic posture, as do Covin and Slevin (1989). Thus, all three entrepreneurial orientation dimensions do not contribute equally to high/low NPD performance. And second, the R² values in the regression equations – the percentage of the variance in NPD performance explained uniquely or jointly by market orientation and the three components of an entrepreneurial orientation – are lower than we initially expected them to be, although comparable to many studies previously published. A possible interpretation is that there exists a large conceptual space between the independent variables and the dependent, and many other factors except strategic orientations can potentially affect NPD performance.

The outcome of testing the hypothesis with interaction terms suggests that neither product- nor environmental characteristics moderate the market orientation/entrepreneurial orientation – NPD performance relationships. An interpretation of these results, partially drawing on Slater and Narver (1994), is that the benefits of a market orientation or innovativeness are long-term and independent of product- and environmental characteristics. A market- or entrepreneurial orientation is likely to be operationally manifest once in place and changing these capabilities may be very difficult for reasons of cost and inertia. Inertia is defined as the tendency of a unit to remain in a given state (Chandrashekar et al., 1999) or as resistance to fundamental reorientations in policy (Miller and Chen, 1994). Due to inertia, it is difficult for managers to adjust “the wrong set of organizational capabilities to the emergence of market opportunities” (Kogut and Kulatilaka, 2001, p. 744). Moreover, it might not be desirable to change a market orientation or an entrepreneurial orientation as the environment changes either. As environmental conditions are often described as transient (Slater and Narver, 1994) or difficult to predict (Pfeffer and Salancik, 1978), changing these capabilities might even be bad for performance as inertia may facilitate more effective use of resources and managerial skills (Miller and Chen, 1994).

6. Implications for management

Important to explicate is that the generalizability of the conclusions are bounded in space and time, and applies mainly to smaller mid-sized manufacturing firms in a single country. Managers of firms outside this population must draw their own implications indirectly by way of analogy. Given this restriction, our study leads to the following implications for management.

Managers interested in increasing NPD performance should push their organizations to become more market oriented. The use of market information in and

throughout the NPD process is likely to lead to higher product success rates. Market orientation, a strategic orientation or business culture, implies an organization which is customer driven and interfunctionally committed. To further build and enhance the market orientation capability of their firms, managers need to communicate their commitment to it to subordinates, improve interdepartmental dynamics through the exchange of employees across departments (and through cross department training programs), as well as changing the firms reward system. We refer readers interested in this area to the works of Deshpandé (1999), Kohli and Jaworski (1990), Narver and Slater (1990) and Slater and Narver (1994) for further and more specific guidelines.

Managers interested in increasing NPD performance should also strive to improve their firms' innovativeness. Managers thus need to break with and question ingrained opinions, encourage experimentation, support new ideas, and facilitate creative processes. This can be accomplished mainly by promoting cultural norms associated with innovativeness. For example, managers can promote freedom and discretion over work design, encourage external orientation, trust and openness, and design reward systems so as to promote innovativeness. A flat, organic work organization is also associated with innovativeness. For a more complete discussion and review, see Ahmed (1998). In sum, our results show that high NPD performance partly requires contradictory and somewhat paradoxical capabilities: both market orientation and innovativeness are important antecedents to NPD performance.

As both risk taking and proactiveness show no significant relationships to NPD performance, our results suggest that taking larger risks and acting too proactively may be inappropriate for smaller firms, at least if NPD performance is the goal. We would advice managers of smaller firms to avoid taking major risks, and try to manage risks – both technical risks and market risks – carefully, as management of risk has a great impact on performance (Simon, Houghton and Savelli, 2003). We further advice managers in smaller firms to avoid acting too proactively, given limitations in resources and capabilities due to size.

Finally, our results imply that market orientation and innovativeness have a favorable effect on NPD performance irrespective of product characteristics and environmental conditions. Thus, managers should embrace the principles associated with a market orientation and innovativeness irrespective of the environmental characteristics their firms are currently facing, and the degree of newness in the products manufactured and market, as these capabilities are important to firms in different kinds of environments and with different newness in products.

7. Limitations and further research

The findings of this paper should be interpreted cautiously. First, the independent variables reflect strategic orientations only, and many other variables can potentially affect NPD performance. Second, and due to the cross-sectional design where data on both independent and dependent variables have been gathered simultaneously at a given point of time, the question of causality is in doubt. It might be imagined that firms with high NPD performance have the extra resources needed to invest in market research and innovative ventures. Furthermore, our study is bounded in space and time, and we have only investigated smaller manufacturing firms in one country. That is, could the results obtained here hold for other populations as well? The reliance on single key informants can also affect the trustworthiness of the study as it potentially imposes position bias, but considering the average size of the firms we have

investigated it seems a reasonable approach. Moreover, data on the dependent variable is perceptual, which might be a disadvantage. And finally, we also experienced unexpected problems with the market orientation scale employed. The results might have been different, had the scale survived the tests of dimensionality and reliability somewhat better.

Our knowledge of how market orientation and the different components of an entrepreneurial orientation affect NPD performance may be enhanced by additional research. First, the fact that risk taking and proactiveness show no positive relationship to NPD performance was surprising. We proposed tentative, although speculative explanations of this, but case studies are better suited to shedding light on this issue. Sorting out correct from incorrect explanations with survey data is awkward in this case. Further, an interesting approach would be to consider other strategic orientations, for example technological orientation. A replication with a sample of larger firms would also contribute to knowledge and increase external validity, as would the use of multiple key informants in subsequent research.

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Appendix A: Operational measures

Market orientation

1. Our business objectives are driven primarily by customer satisfaction.**
2. We constantly monitor our level of commitment and orientation to serving customer needs.
3. We freely communicate information about our successful and unsuccessful customer experiences across all business functions.**
4. Our strategy for competitive advantage is based on our understanding of customers' needs.**
5. We measure customer satisfaction systematically and frequently.
6. We have routine or regular measures of customer service.
7. We are more customer focused than our competitors.*
8. I believe this business exists primarily to serve customers.**
9. We poll end-users at least once a year to assess the quality of our products and services.
10. Data on customer satisfaction are disseminated at all levels in this business unit on a regular basis.

(Response format: 1 = strongly disagree; 5 = strongly agree)

Innovativeness

1. At my firm, there is a strong emphasis on the marketing of true and tried products or services vs. At my firm, there exists a very strong emphasis on R&D, technological leadership and innovations.
2. How many new products or services has your firm marked in the past 5 years? No new products or services in the past 5 years vs. Hundreds of products or services in the past 5 years.
3. Changes in products/services have been mostly of a minor nature (e.g. putting in a towel with the soap) vs. Changes in products/services have usually been dramatic (e.g. changing from mechanical to electric calculators).

Proactiveness

1. In dealing with its competitors, my firm typically responds to actions which competitors initiate vs. Typically initiates actions which competitors then respond to.
2. In dealing with its competitors, my firm is very seldom the first business to introduce new products/services, administrative techniques, operating technologies, etc. vs. Is very often the first business to introduce new products/services, administrative techniques, operating technologies, etc.
3. In dealing with its competitors, my firm typically seeks to avoid competitive clashes, preferring a "live-and-let-live" posture vs. Typically adopts a very competitive, "undo-the-competitors" posture.**

Risk taking

1. My firm has a strong proclivity for low-risk projects (with normal and certain rates of return) vs. A strong proclivity for high-risk projects (with chances of very high returns).
2. My firm believe that owing to the nature of the environment, it is best to explore it gradually via timid, incremental behaviour vs. Owing to the nature of the environment, bold, wide-ranging acts are necessary to achieve the firm's objectives.
3. When confronted with decision-making situations involving uncertainty, my firm typically adopts a cautious, "wait -and-see" posture in order to minimize the probability of making costly decisions vs. typically adopts a bold, aggressive posture in order to maximize the probability of exploiting potential opportunities.

(Response formats for Innovativeness, Proactiveness and Risk Taking: Paired statements, 1-7)

Degree of product newness to customers

1. New products/services at our firm usually require major learning efforts or experience by our customers.
2. It usually takes a long time before our customers can understand the full advantages of our new products/services.

3. Our new product/service concepts are usually difficult for our customers to evaluate and understand.
4. Our new products/services usually require considerable advance planning by the customers before use.
5. Our new products/services usually involve high changeover costs for the customers.
6. Products/services we launch nowadays are usually more complex than products/services previously launched into the same market by our firm.

(Response format: 1 = Strongly disagree; 7 = Strongly agree)

Technological turbulence

1. The technology in our industry is changing rapidly.
2. Technological changes provide big opportunities in our industry.
3. A large number of new product ideas have been made possible through technological breakthroughs in our industry.
4. Technological developments in our industry are rather minor.

(Response format: 1 = Strongly disagree; 5 = Strongly agree)

Competitive intensity

1. Competition in our industry is cutthroat.
2. There are many “promotion wars” in our industry.
3. Anything that one competitor can offer, others can match readily.
4. Price competition is a hallmark of our industry.
5. One hears of a new competitive move almost every day.
6. Our competitors are relatively weak.*

(Response format: 1 = Strongly disagree; 5 = Strongly agree)

NPD performance

1. New products/services at my firm generally achieve its market share objectives.
2. New products/services at my firm generally achieve its sales and customer use objectives.
3. New products/services at my firm generally achieve its sales growth objectives.
4. New products/services at my firm generally achieve its profit objectives.

(Response format: 1 = Strongly disagree; 7 = Strongly agree)

* Item was deleted based on EFA results.

** Item was deleted due to reliability considerations.



Till VD

Ett företags långsiktiga framgång och överlevnad beror till stor del på dess förmåga att utveckla nya fysiska produkter och tjänster. Åsikterna om hur detta ska åstadkommas går emellertid isär. Ska företagen lyssna noga på sina kunder och utveckla produkter och tjänster utifrån deras synpunkter, eller ska de vara mer proaktiva, innovativa och beredda att ta risker i sitt arbete med utveckling av nya produkter? Det fattas kunskap om dessa frågor trots att deras praktiska relevans är mycket stor, i synnerhet för små företag.

Vid Sektionen för Ekonomi och Teknik, Högskolan i Halmstad, arbetar vi för närvarande med ett forskningsprogram som fokuserar på dessa frågor. Syftet med forskningen är att bättre kunna förstå vilka strategiska vägval som leder till framgång vid nyproduktutveckling.

Vi är tacksamma om du vill medverka i denna undersökning genom att besvara denna enkät. Tidsåtgången är beräknad till 10-15 minuter. Alla frågor kan besvaras genom att helt enkelt ringa in den siffra som bäst motsvarar din uppfattning på en skala. Alla frågor är lättfattliga och det finns inga rätta eller felaktiga svar.

Vi garanterar att den information du lämnar förblir konfidentiell. Uppgifterna kommer att genomsnittsbäknas på individer och företag, och ingen individ eller företag kommer att identifieras i något undersökningsresultat. Etiketten med ert företagsnamn som sitter på frågeformuläret är därför endast avsedd för internt bruk – så att vi vet vem som har svarat när analysen är klar, och så att vi kan skicka en återkopplingsrapport till dig. Återkopplingsrapporten du får kommer att innehålla (1) en sammanfattning på en sida av undersökningsresultaten, och (2) en OH som du kan använda för att presentera resultaten för dina kolleger på ditt företag.

Din medverkan är av stor betydelse för undersökningsresultaten och vi hoppas att du kan avsätta 10-15 minuter av din tid. När du har fyllt i frågeformuläret, var snäll och lägg det i det bifogade kuvertet och posta det senast 24e november 2004.

Tack för din medverkan!

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Enkät

1. Fullständigt namn: _____

2. Din befattning i företaget: _____

Nedanstående påståenden beskriver normer som tillämpas i företag. V.g. ange i vilken utsträckning du håller med om att påståendena beskriver de faktiska normerna i ditt företag.
Instruktion: Ringa in en siffra för varje rad

	1 = Instämmer inte alls	5 = Instämmer helt
Vårt företags mål styrs främst av vår strävan att tillfredsställa kunderna.	1-----2-----3-----4-----5	
Vi kontrollerar ständigt att vårt engagemang och vår inriktning möter kundernas behov.	1-----2-----3-----4-----5	
Vi sprider gärna information om våra framgångsrika och mindre lyckade kunderfarenheter till alla funktioner i företaget.	1-----2-----3-----4-----5	
Vår strategi för att uppnå konkurrensfördelar bygger på vår förståelse för kundernas behov.	1-----2-----3-----4-----5	
Vi mäter ofta och systematiskt kundernas tillfredsställelse.	1-----2-----3-----4-----5	
Vi utför rutinmässiga eller regelbundna bedömningar av kundservice.	1-----2-----3-----4-----5	
Vi är mer kundfokuserade än våra konkurrenter.	1-----2-----3-----4-----5	
Jag anser att vårt företag främst existerar för att betjäna kunderna.	1-----2-----3-----4-----5	
Vi intervjuar våra slutanvändare minst en gång per år för att bedöma kvaliteten på våra produkter och tjänster.	1-----2-----3-----4-----5	
Uppgifter om kundtillfredsställelse sprids regelbundet till alla nivåer inom vårt företag.	1-----2-----3-----4-----5	

Nedanstående påståenden beskriver normer som tillämpas i företag. V.g. ange i vilken utsträckning du håller med om att påståendena beskriver de faktiska normerna i ditt företag.
Instruktion: Ringa in en siffra för varje rad.

På mitt företag...

...läggs stark tonvikt på att marknadsföra väl beprövade produkter eller tjänster.

1---2---3---4---5---6---7

...läggs mycket stark tonvikt på F&U, teknologiskt ledarskap och innovationer.

Hur många nya produkter eller tjänster har ditt företag lanserat under de senaste fem åren?

Inga nya produkter eller tjänster under de senaste fem åren.

1---2---3---4---5---6---7

Hundratal produkter eller tjänster under de senaste fem åren.

Förändringarna av produkter/tjänster har mestadels varit av mindre art (t.ex. att låta en handduk följa med tvålen).

1---2---3---4---5---6---7

Förändringarna av produkter/tjänster har vanligen varit dramatiska (t.ex. byte från mekaniska till elektriska räknemaskiner).

Med avseende på våra konkurrenter så...

...svarar vårt företag vanligen på konkurrenternas handlingar.

1---2---3---4---5---6---7

...vidtar mitt företag vanligen handlingar som konkurrenterna svarar på.

...är mitt företag sällan det första som lanserar nya produkter/tjänster, administrativa metoder, driftsmetoder, etc.

1---2---3---4---5---6---7

...är mitt företag ofta det första som lanserar nya produkter/tjänster, administrativa metoder, driftsmetoder, etc.

...strävar mitt företag vanligen efter att undvika konkurrenskonflikter och föredrar en "leva-och-låta-leva"-attityd.

1---2---3---4---5---6---7

...intar mitt företag vanligen en mycket konkurrensinriktad, "ner-med-konkurrenterna"-hållning.

Mitt företag har...

...en stark böjelse för lågriskprojekt (med normal och säker avkastning).

1---2---3---4---5---6---7

...en stark böjelse för högriskprojekt (med möjligheter till mycket hög avkastning).

Mitt företag tror att...

...på grund av omvärldens beskaffenhet är det bäst att gradvis undersöka omvärlden via försiktiga, stegvisa åtgärder.

1---2---3---4---5---6---7

...på grund av omvärldens beskaffenhet är djärva, vittomfattande insatser nödvändiga för att nå företagets mål.

När mitt företag ska fatta beslut i osäkra lägen...

...intar vi vanligen en försiktig, "vänta-och-se"-attityd för att minimera risken av att fatta kostsamma beslut.

1---2---3---4---5---6---7

...intar vi vanligen en djärv, aggressiv attityd i syfte att maximera chansen att utnyttja potentiellt gynnsamma tillfällen.

Nedanstående frågor beskriver olika egenskaper i den omvärld som ditt företag verkar i. V.g. ange i vilken utsträckning du instämmer med innehållet i dessa frågor. Instruktioner: Ringa in en siffra för varje rad.

I vilken utsträckning instämmer du med vart och ett av följande påståenden?

	1 = Instämmer inte alls	5 = Instämmer helt
I vår typ av verksamhet förändras kundernas produktpreferenser ganska avsevärt över tid.	1-----2-----3-----4-----5	
Våra kunder tenderar att leta efter nya produkter/tjänster hela tiden.	1-----2-----3-----4-----5	
Vi upplever efterfrågan på våra produkter och tjänster från kunder som aldrig tidigare har köpt dem.	1-----2-----3-----4-----5	
Våra nya produkter/tjänster tenderar att ha egenskaper som skiljer sig från behoven hos våra nuvarande kunder.	1-----2-----3-----4-----5	
Vi levererar främst till många av de kunder som vi brukar betjäna.	1-----2-----3-----4-----5	
Teknologiutvecklingen inom vår bransch förändras snabbt.	1-----2-----3-----4-----5	
Teknologiska förändringar medför stora möjligheter inom vår bransch.	1-----2-----3-----4-----5	
Ett stort antal nya produktidéer har möjliggjorts genom teknologiska genombrott inom vår bransch.	1-----2-----3-----4-----5	
Den teknologiska utvecklingen inom vår bransch är ganska begränsad.	1-----2-----3-----4-----5	
Det råder mördande konkurrens inom vår bransch.	1-----2-----3-----4-----5	
Det förekommer många "marknadsföringskrig" i vår bransch.	1-----2-----3-----4-----5	
Vad helst som en konkurrent kan erbjuda, kan andra matcha utan problem.	1-----2-----3-----4-----5	
Priskonkurrens är utmärkande för vår bransch.	1-----2-----3-----4-----5	
Vi hör talas om något nytt konkurrentutspel nästan varje dag.	1-----2-----3-----4-----5	
Vi har tämligen svaga konkurrenter.	1-----2-----3-----4-----5	

Nedanstående frågor berör olika egenskaper hos nya produkter i ditt företag. V.g. ange i vilken utsträckning du instämmer med innehållet i dessa frågor. Instruktioner: Ringa in en siffra för varje rad.

I vilken utsträckning beskriver vart och ett av följande påståenden nya produkter/tjänster i ditt företag?

	1 = Instämmer inte alls	7 = Instämmer helt
Nya produkter/tjänster från vårt företag kräver vanligen omfattande kunskaper eller erfarenhet hos kunderna.	1---2---3---4---5---6---7	
Det tar vanligen lång tid innan våra kunder helt kan förstå fördelarna med våra nya produkter/tjänster.	1---2---3---4---5---6---7	
Våra nya produkt/tjänstekoncept är vanligtvis svåra att utvärdera och förstå för våra kunder.	1---2---3---4---5---6---7	
Våra nya produkter/tjänster kräver vanligen avsevärd förhandsplanering från kundernas sida innan de kan tas i bruk.	1---2---3---4---5---6---7	
Våra nya produkter/tjänster medför vanligen höga byteskostnader för kunderna.	1---2---3---4---5---6---7	
De produkter/tjänster som vi nu lanserar är vanligen mer invecklade och komplicerade än de som vi tidigare har lanserat på samma marknad.	1---2---3---4---5---6---7	

I vilken utsträckning beskriver vart och ett av följande påståenden nya produkter/tjänster i ditt företag?

De produkter/tjänster mitt företag lanserar är i allmänhet...

	1 = Instämmer inte alls	7 = Instämmer helt
...förbättringar av befintliga produkter eller tjänster, t.ex. förbättrad kvalitet.	1---2---3---4---5---6---7	
...produktlinjeutökning, t.ex. införande av en ny produkt/tjänstetyp i en befintlig produkt/tjänstelinje.	1---2---3---4---5---6---7	
...nya produkt- eller tjänstetyper i vårt företag.	1---2---3---4---5---6---7	
...verkliga, världsunika innovationer.	1---2---3---4---5---6---7	

Nedanstående frågor beskriver olika framgångskriterier för produkter och tjänster. V.g. ange i vilken utsträckning du instämmer med innehållet i dessa frågor. Instruktioner: Ringa in en siffra för varje rad.

Till vilken grad stämmer följande påståenden om ditt företags produkter/tjänster?

	1 = Instämmer inte alls	9 = Instämmer helt
Våra nya produkter/tjänster uppfyller de prestandakrav som uppställts för dem.	1-----2-----3-----4-----5-----6-----7-----8-----9	
På det hela taget är våra nya produkter/tjänster framgångsrika.	1-----2-----3-----4-----5-----6-----7-----8-----9	

V.g. ge synpunkter på följande påståenden angående nya produkter/tjänster hos ditt företag:

	1 = Instämmer inte alls	7 = Instämmer helt
Nya produkter/tjänster på vårt företag uppfyller i allmänhet uppställda mål för marknadsandelar.	1----2----3----4----5----6----7	
Nya produkter/tjänster på vårt företag uppfyller i allmänhet uppställda mål för försäljning och kundanvändning.	1----2----3----4----5----6----7	
Nya produkter/tjänster på vårt företag uppfyller i allmänhet uppställda mål för försäljningsökning.	1----2----3----4----5----6----7	
Nya produkter/tjänster på vårt företag uppfyller i allmänhet uppställda vinstmål.	1----2----3----4----5----6----7	

Paper III

**Managing External Information in Manufacturing Firms: The
Impact on Innovation Performance**

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Johan Frishammar

Sven Åke Hörte

Managing External Information in Manufacturing Firms: The Impact on Innovation Performance*

Johan Frishammar and Sven Åke Hörte

Drawing upon a sample of 206 medium-sized manufacturing firms, this article investigates the extent to which management of external information is associated with innovation performance. The overall purpose of the article is to examine whether or not those organizations that are better at managing external information are also those that are the better innovators. The research strategy used was a survey, and data were collected by means of mail questionnaires (with a 62.4% response rate). A multiple regression analysis was used for hypothesis testing. The results show that scanning the technological sector of the environment was positively associated with innovation performance, while scanning customers, suppliers, and competitors proved to be negatively correlated with innovation performance. Cross-functional integration in the form of collaboration also proved significantly correlated with innovation performance, while interaction showed no such relationship. Further, decision-making based on information from the industry environment correlated significantly with innovation performance. Research and managerial implications of these findings are presented and are discussed.

Introduction

The environment creates both opportunities and problems for organizations. Organizations depend on the environment for scarce resources (Pfeffer and Salancik, 1978) and often must cope with and adapt to changes in the environment. The environment affects organizational processes and decision-making perhaps more than any other factor (Daft, Sormunen, and Parks, 1988; Duncan, 1972). A process open to environmental influence, and central to business prosperity, is product innovation. An overview of the success/failure literature on new product development (NPD) (e.g., Cooper, 1994; Cooper and Kleinschmidt, 1987, 1995; Montoya-Weiss and

Calantone, 1994; Rothwell, 1992) points to environmental information as one critical factor for successful NPD. On an overall level, the importance of managing external environmental information derives from the fact that organizational knowledge creation depends crucially upon the information processing capacities of the organization (Cohen and Levinthal, 1990; March and Simon, 1958).

This article examines the link between innovation performance and management (i.e., gathering, sharing, and using) of information, with a special focus on external information. This question is of great importance, since many firms with in-house product development active on a competitive market are crucially dependent on innovation. At the same time, information-processing activities such as scanning or market research are costly, and their outcomes are often uncertain. Specifically, this article aims to contribute to the literature in this area in the following ways. First, unlike the studies on market orientation and NPD (e.g., Atuahene-Gima, 1995, 1996; Narver, Slater, and

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MacLachlan, 2004; Slater and Narver, 1994) this article considers other environmental factors than just customers and competitors. Second, the article is underpinned by empirical data collected from mid-sized firms in Scandinavia, while many earlier studies have been conducted on large firms either in the United States or central/western Europe. Third, this article focuses simultaneously on collection, sharing, and use of information. Many studies on integration (e.g., Kahn, 1996; Moenaert et al., 1994; Souder, 1988) are limited for example to sharing information. The overall purpose of the article is to examine whether or not those organizations that are better at managing external information are also those that are the better innovators.

From a theoretical point of view, there are several reasons why the gathering, sharing, and use of external information should be positively associated with innovation. First, in line with the arguments of Miller and Friesen (1982), this article assumes that innovation is not a natural state of affairs. Innovation must be encouraged by challenges and threats and therefore requires effective information processing to make managers aware of the need for change. Attempts to gather information from the environment may make managers aware of the disadvantages of their own product lines but also can indicate changing customer demands and buying patterns (Miller and Friesen, 1982).

The second argument suggests that, as organizations mature, they become more remote from external developments. According to Koberg, Uhlenbruck, and Sarason (1996) a great deal of innovation is initiated externally, which suggests that the boundaries of an organization must be permeable, at least from the outside in, and that information gathering from various sources is vital to the success of a firm that

depends on its own product development. For an example, see Neely et al. (2001) or von Hippel (1988), who suggest that innovative firms maintain close contact with customers and suppliers in order to obtain ideas. Therefore, after an original idea has been commercialized, firms that wish to remain innovative will need to continually acquire and analyze information from the environment (Gupta, Raj, and Wilemon, 1985; Quinn and Cameron, 1983).

The starting point of the third argument lies in the difference between the two terms *invention* and *innovation*. As stated by Garcia and Calantone (2002, p. 112), an innovation is “an iterative process initiated by the perception of a new market and/or new service opportunity for a technology-based invention which leads to development, production, and marketing tasks striving for the commercial success of the invention.” According to the current literature, it is important to elucidate that an invention does not become an innovation until it has been processed through production and marketing and is diffused into the marketplace. Thus, a discovery that goes no further than the laboratory remains an invention.

In order to transform an invention into an innovation—and to diffuse it successfully—information from various sectors of the external environment is necessary. A firm must analyze current situations and trends of a potential market for a new product (a new invention). Without knowledge of the potential market, a firm may waste resources in developing a product for an unfavorable market (Mishra, Kim, and Lee, 1996; Ottum and Moore, 1997). For example, a firm may produce a product for which there is insufficient demand. The literature reviewed so far suggests that external information is important for innovation in firms. That is, successful innovation is largely dependent on how external information is managed. The information–innovation theme is further developed in the next section of the article, comprising the frame of reference.

BIOGRAPHICAL SKETCHES

Johan Frishammar (Ph.Lic.) is a teacher and researcher at the Center for Product Development Research (CPDR) of the School of Business & Engineering at Halmstad University in Sweden. His research interests include how organizations discover, relate to, and make sense of their environment, especially in the context of new product development.

Sven Åke Hörte (Ph.D.) is professor of industrial organization at Luleå University of Technology and is professor of sociology at Halmstad University in Sweden. He is also the head of the CPDR at Halmstad University. His research focuses on the management of innovation, product development, simulation techniques, and company competitiveness.

Frame of Reference and Hypotheses

To monitor the external environment of organizations involves collecting information. This activity is known as *environmental scanning* and is defined as “the activity of acquiring information” (Aguilar, 1967, p. 1). There are different methods of scanning available to an organization. A firm may use formal techniques such as market research, a competitor analysis system

(Porter, 1980), or a formalized intelligence-gathering system (Ashton and Stacey, 1995). A common characteristic of these is that activities can be planned, controlled, and executed by the management of a firm. Another option is to rely on more informal means such as gatekeepers. The latter have received a fair share of attention in NPD since people assuming the gatekeeper role can open “the gate” raised by differences in language, norms, values, and coding schemes inside and outside an organization (Allen, 1977; Allen and Cohen, 1969; Brown and Utterback, 1985; Tushman and Scanlan, 1981). That is, gatekeepers have the ability to gather and to understand external information but also the ability to translate and to make sense of it to their more internally oriented colleagues. Therefore, a gatekeeper is thought to provide a link between an organization/organizational unit and its environment. Irrespective of what method or combination of methods on which a firm relies, these information acquisition activities are the means by which managers perceive external events and trends (Hambrick, 1982). Such information acquisition and processing activities are believed to generate openness to external knowledge (Birkinshaw and Fey, 2000) but also to have a large impact on the process of innovation (Lozada and Calantone, 1996). In summary, environmental scanning spawns innovative ventures (Howell and Shea, 2001).

Environmental scanning provides information from different sectors of the environment. In order to discriminate between different environmental sectors, a hierarchical conception of firms’ external environment was employed for the present study. The article thus suggests a division¹ into (1) competitive or industry environment and (2) general environment. The *industry environment* comprises a firm or business unit and its competitors in the same industry. It is thought to consist of a particular set of competitive forces that establish both opportunities and threats and that may change due to the actions of competitors. As such, it represents a specific school of thought in environmental analysis with regard to what is fundamental and important. Porter (1980) uses the term *competitive forces* to refer to buyers, suppliers, substitute products (or services), and potential industry entrants, as well as strategic groups of directly com-

peting firms. Strategic moves by any of these can alter prevailing relationships and thereby can change the pattern of forces in a firm’s environment. It has been suggested that environmental change from this perspective occurs as a result of certain evolutionary processes that originate from both interaction among competitors and events in the general environment (e.g., product innovation, government policy). In either case, the effect is to erode the prevailing equilibrium of the underlying structural features of an industry. This sets the stage for the emergence of a new pattern of the competitive forces (Lenz and Engledow, 1986). Change is, however, not random. Rather, multiple scenarios exist for the development of organizational environments, and in order to track these changes it is proposed that organizations should gather information about their environments through the implementation of a formalized competitor analysis system (Porter, 1980).

Monitoring factors in the industry environment seem important for a firm’s innovation. For example, the gatekeepers in Macdonald and William’s (1994) study considered suppliers the most important source of information, followed by customers and competitors ranking third and fifth. Research in the area of market orientation has singled out two sources in the industry environment as very important for firms’ innovation: customers and competitors. Both Kohli and Jaworski (1990) and Slater and Narver (1994) argue that businesses with a strong market orientation are best suited for NPD success. Atuahene-Gima (1995) and Kahn (2001) found a positive relationship between market orientation and product development performance. Gatignon and Xuereb (1997) report a significant relationship between customer orientation and product innovation (in markets where demand is relatively uncertain). Lukas and Ferrell (2000) found that a greater emphasis on customer orientation increases the introduction of new-to-the-world products and reduces the number of me-too products launched by firms. There is, however, an opposite view whose claim is that information about certain industry-related factors (i.e., customers and competitors) leads to lower rather than higher innovation (e.g., Christensen and Bower, 1996). All organizations active in an industry characterized by competition face some kind of industry environment, however. It therefore seems necessary to actively engage in information gathering, since scanning these factors generally is considered important for firms’ innovation. Therefore, the first hypothesis states that

¹ A third level, referred to as *task environment*, can be identified (Dill, 1958). The task environment can be described as firm specific and is not considered in the present study.

H1: There is a positive association between scanning of the industry sector of the environment and innovation performance in organizations.

Everything of importance to an organization does not take place in the industry, however. An organization also must be alert to changes in the general environment (Fahey and Narayanan, 1986). Factors in the general environment influence all the industries within it and include social factors (e.g., demographics, life styles, social values of society), economic factors (e.g., economic development, interest rates), political factors (e.g., political processes, regulatory institutions), and technological factors (e.g., technological processes or advances, new products, processes, materials). For example, innovative firms have reported that investors and governments play a crucial role in the innovation process—the former by providing funding and the latter by influencing the firms' choices with regard to standards (Neely et al., 2001).

Moreover, Abell (1978) argues convincingly that the nature of technological innovation and diffusion is such that most major innovations will originate outside a particular industry and not within it. Established competitors in an industry are usually challenged not by their known competitors within the industry but by organizations that base their approach on a technology developed outside that industry. To cope with this, Abell (1978) suggests that managers should increase their information-gathering activities in an attempt to improve decision-making.

Utterback (1996) also emphasizes that changes that revolutionize an organization's business have a tendency to come from unexpected directions and tend to be viewed as disruptive. These include functional competition from new technologies often introduced by new firms or existing businesses entering a new market. The author suggests that organizations must adapt to environmental changes that are often beyond their control or influence and that require changes in products, policies, and structure. This presupposes a need to anticipate important environmental changes as well as an emphasis on the way in which organizations gather and analyze information about the environment (Utterback, 1996).

Yet another example is provided by Smircich and Stubbart (1985), who claim that outsiders often generate really novel products that invade an industry. The authors exemplify this with the Miller Brewing unit of Philip Morris and their introduction of light

beer—a significant product innovation that tested the salient assumption that a light beer could not be sold. This example and others point to the importance of factors outside a specific focal industry for firms' innovation. So far the discussion in this section has centered on major or radical innovations. Does that imply that factors in the general environment are not important for other types of innovation? While this is not necessarily the case, the present authors nevertheless have failed to locate anything in the literature to lend support to such an opinion. This is a question that needs closer attention. Thus, firms also should pay attention to the importance of factors outside the industry, and therefore it is hypothesized that

H2: There is a positive association between scanning of the general sector of the environment and innovation performance in organizations.

Gathering information from the environment is, however, not sufficient. Sharing information across functional areas is also vital for innovation. Because innovation is an iterative process of information-processing activities (e.g., Clark and Fujimoto, 1991), it requires input from members of various functions playing different roles. In accordance with the existing literature, the term *integration* will be used when referring to this dimension. Lawrence and Lorch (1986, p. 1) define integration as “the quality or state of collaboration that exists among departments that are required to achieve unity of effort by the demands of the environment.” In practice, integration means linking functionally specialized departments while preserving their individual orientations (Moenaert and Souder, 1990). For example, information transfer at the marketing–research and development (R&D) interface is crucial since these functions share responsibility for setting NPD goals, for identifying opportunities for product improvements, and for understanding customer requirements (Sherman, Souder, and Jenssen, 2000). However, many important activities in NPD (e.g., sourcing of components, prototype production, quality control) fall outside of marketing and R&D. It therefore has been suggested that an accurate representation of cross-functional relationships in NPD also must include manufacturing (Olsen et al., 2001; Song, Montoya-Weiss, and Schmidt, 1997).

To achieve integration between departments is problematic for many firms (Griffin and Hauser, 1996; Gupta and Wilemon, 1988; Moenaert et al.,

1994; Sherman, Souder, and Jenssen, 2000). Research by Souder (1988) on almost 300 NPD projects indicates that disharmony rather than integration characterizes many relationships between departments and functions. In essence, Souder's (1988) findings indicate that high integration projects succeed, and low integration projects fail. Similar ideas have been expressed by Ottum and Moore (1997), who observe that information collected by one department is rarely shared with others. Thus, it is suggested that information sharing between functions and departments is an important activity that needs to be performed in addition to acquiring information via different scanning methods.

It has been suggested that integration is a two-dimensional construct representing both interaction and collaboration. *Interaction* represents the structural and formally coordinated activities between departments and includes routine meetings, planned teleconferencing, memoranda, and flow of standard documentation (Kahn, 1996). *Collaboration* represents the more unstructured, affective nature of interdepartmental relationships and stresses continuous relationships between departments as opposite to just transactions. Collaboration is defined as "an affective, volitional, mutual/shared process where two or more departments work together, have mutual understanding, have a common vision, share resources, and achieve collective goals" (Kahn, 1996, p. 139). Interaction and collaboration are both important elements of interdepartmental relationships. While interaction clearly addresses the issue of sharing and transferring information, collaboration is also a good approximation of such activities, since a high degree of collaboration presupposes an adequate flow of information between functions and departments.

In sum, different departments and functions need information from one another to accomplish their specific tasks. As integration between functions decreases, their ability to combine skills to develop and to produce successful products decreases, and the firm suffers (Griffin and Hauser, 1996). The transfer of information between functionally specialized departments is therefore "the major vehicle that allows the involved individuals to become integrated" (Moenaert and Souder, 1990, p. 98). Or, to paraphrase Rothwell (1992), organizations that are successful with regard to innovation emphasize information sharing across functions, thus ensuring that customer needs remain the focus of R&D activities. The third hypothesis therefore suggests that

H3: There is a positive association between integration and innovation performance in organizations.

Given that an organization gathers information about the environment through environmental scanning activities, and given that this information is communicated to and is shared between functions and departments, it is still necessary for this information to be used and evaluated by executives responsible for making key decisions (Miller and Friesen, 1982). As earlier research has shown, the fact that information is available is no guarantee that it is used (Cyert and March, 1963). Without delving too deeply into the field of organizational decision-making [for a short review, see, e.g., Saunders and Jones (1990)], one can agree with Choo (1996) that the end goal of environmental scanning should be to ensure better-informed decisions. In other words, an organization can generate information by means of scanning and then can disseminate it internally between functions and departments, but if it is not used, very little is accomplished. It is recommended therefore that collected and disseminated information should be considered when making decisions pertaining to innovative activities. Thus, it is hypothesized that decision-making based on environmental information is an important activity that needs to be performed in addition to information acquisition and sharing. Therefore, this article's fourth and final hypothesis suggests that

H4: There is a positive association between decision-making based on environmental information and innovation performance in organizations.

Method

Data for the study were collected via a mail survey between October 2002 and January 2003. The target population, conceived of as a census/population rather than as a sample, comprised Swedish firms classified as manufacturers with 175–2,500 employees. The average firm had 493 employees and annual sales of €111.4 million. The purpose of controlling for size was to obtain firms large enough to have specialized functions (e.g., marketing, R&D) while still being sufficiently small so that a single respondent could be expected to have a satisfactory overview of operations. It also was checked whether the firms had in-house product development, a criterion necessary for hypothesis testing. The population represents a

cross-section of industries and in some cases also separate divisions of larger corporations.

Initially, the population consisted of 344 firms. After a first mailing wave, three reminders were sent out, and telephone calls were made to almost all firms that did not respond. After review, 14 firms were dropped² from the population frame, thus leaving 330 firms. In total, 208 responses were received, and six of those reported missing values. Two of the six were dropped since the respondents failed to answer certain sections of the questionnaire—a commonly used approach when relatively few cases report this kind of problem (Hair et al., 1998). In the remaining four, where single items were left blank, a replacement procedure employing mean substitution was adopted. Thus, the actual number of responses was 206, or a response rate of 62.4%. Since it seems to be widely believed that top administrators provide the best information about environmental and organizational characteristics, the questionnaires were mailed to the chief executive officers of these firms. Despite the potential of errors due to position bias, the findings of Huber and Power (1985) lend support to the method of using single key informants. Their study found that when several respondents had different opinions about an issue, the average of their responses was less likely to be accurate than when using one key informant. Of those who responded to the survey, 84% were chief executive officers (CEOs); the remaining 16% were typically marketing or R&D managers.

Measures

When selecting variables for the study, a conceptual model known in the literature as the intelligence cycle provided guidelines (see, e.g., Ashton and Stacey, 1995 or Montgomery and Weinberg, 1979). The model describes information collection, dissemination, and use but also provides an outline of the relationships among these variables. In summary, the model stipulates that information must be both shared and used in addition to being collected. However, to use innovation performance as a dependent variable is not stipulated by this model, nor is the conceptualization of the environment presented here. The variables considered in the present study are innovation performance, scanning of the industry and the general

environment sectors, integration, and decision-making. The variables were initially constructed as cumulative indexes with equal weight for all items included. Five-point Likert scales were used for all measurements, with the sole exception of innovation performance, which was measured on a seven-point scale. In order to test for dimensionality and reliability, an exploratory factor analysis was performed (principal components, with varimax rotation). A summary of this test, as well as descriptive statistics for each construct, is found in Table 1.

Innovation performance was measured using the three items suggested by Miller and Friesen (1982). High innovation performance means the existence of a strong emphasis on R&D, the introduction of many new products/services over time, and changes in products/services having been significant. Conversely, low innovation performance means the opposite. One item was changed; the respondents were asked about products or services instead of lines of products or services since the firms investigated were generally much smaller than those studied by Miller and Friesen (1982). Furthermore, Miller and Friesen did not give a clear definition of *product innovation* in their article. A definition combining those of Gopalakrishnan and Damanpour (1997) and Garcia and Calantone (2002) therefore was used in the mail survey (see Appendix A). From the point of view of construct validity, this method is questionable since it actually measures self-reports and therefore could be viewed as being subjective. Several earlier studies claim, however, that perceptual measures are highly correlated with objective measures of product innovation but also have the advantage of facilitating comparisons among firms in different industries (Ancona and Caldwell, 1992; Zahra, 1993; Zahra and Covin, 1993). With regard to the specific Miller and Friesen (1982) measure, Jennings and Young's (1990) findings imply that this subjective measure of innovation can be used interchangeably with objective ones. Furthermore, this measure also has been validated by Kahn and Manopichetwattana (1989), who found a strong correlation between this perceptual measure and more objective measures of innovation.

Measuring scanning activity is difficult since executives scan in fragmented, informal, and ad hoc ways (Aguilar, 1967; Hambrick, 1982). When measuring the scanning of the industry environment and the scanning of the general environment, a method suggested by Hambrick (1981, 1982) that has found widespread acceptance was adopted. While adopting the

²Twelve firms lacked their own product development (they were subcontractors), one was bought up, and one was found to market only services and no products.

Table 1. Descriptive Statistics and Test of Reliability and Dimensionality

Variables	Initial no. of items	Items remaining	Mean	Std.	Lowest Item-Total correlation	Lowest Item-Item correlation	Cronbach's Alpha	Eigenvalue
Innovation Performance	3	3	3.98	1.24	0.60	0.51	0.79	2.10
Scanning of Industry Environment								
Substitutes	2	2	2.79	0.83	0.53	0.53	0.70	1.28
Customers, Suppliers, and Competitors	6	3	3.99	0.62	0.44	0.32	0.66	2.94
Scanning of General Environment								
Political/Economical Factors	4	3	2.99	0.82	0.49	0.41	0.75	3.16
Demographical Factors	2	2	2.21	0.82	0.54	0.54	0.70	1.33
Technological Factors	2	2	3.44	0.72	0.46	0.46	0.62	1.06
Integration								
Personal Interaction	4	4	4.14	0.62	0.49	0.29	0.75	1.17
Impersonal Interaction	5	5	3.36	0.80	0.62	0.42	0.84	2.07
Collaboration	6	6	4.07	0.61	0.63	0.46	0.88	6.22
Decision-Making								
Decision-Making Industry	3	3	3.98	0.90	0.62	0.58	0.83	1.66
Decision-Making General	3	3	2.84	0.96	0.72	0.67	0.83	3.10

basic idea of the method, the items used in the original version had to be amended due to differences in environmental conceptualization. The method is built around two different submethods—referred to as the *frequency method* and the *interest method*. The frequency method, as used here, involved asking respondents how frequently they learned of events or trends in two sectors of the environment. The interest method involved asking executives to rate the extent to which they made a point of staying abreast of the two sectors of the environment. A total of 16 items were used—eight for scanning the industry environment and eight for scanning the general environment. Both scanning variables turned out to be more complex than initially assumed. Scanning of the industry environment split into (1) information about substitute products; and (2) information about customers, suppliers, and competitors. Scanning of the general environment, in turn, split into three different constructs: information about (1) political/economical factors; (2) demographical factors; and (3) technological factors.

Integration was measured using the guidelines provided by Kahn (1996). Nine items were used to measure interaction, of which four were slightly modified to reflect activities better, thus hopefully making more sense to the respondents. Another six items were used to measure the collaboration dimension, and thus a total of 15 items was used. The subdimension of interaction split into two separate dimensions: (1) personal interaction; and (2) impersonal interaction.

Personal interaction represented activities such as telephone calls and participation in meetings, while impersonal interaction contained factors such as exchange of reports and written messages.

When measuring decision-making, or the extent to which the external information collected actually enters into the decision-making process in the area of innovative activities, initial inspiration was provided by Ottum and Moore (1997). While the basic idea of their method has been adapted, all items were made from scratch, since no previously used instrument that fitted the research purpose of the present study could be located. As expected, the decision-making variable consisted of two dimensions: (1) decision-making based on information about industry factors; and (2) decision-making based on information about general environment factors.

Analysis and Research Findings

Since three of the constructs (both scanning variables and the integration variable) proved more complex than initially assumed, making sense of the correlations also became a somewhat more complex process. Table 2 shows the correlation matrix for all variables included in the article. To avoid potential problems with multicollinearity as indicated in Table 2, the hypotheses in the present study were tested by analyzing the outcome of a linear multiple regression equation.

Table 2. Correlation Matrix Built on Pearson Correlation (*N* = 206)

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Innovation Performance											
Scanning of Industry Environment	1										
2. Substitutes	.250**	1									
3. Customers, Suppliers, and Competitors	.128	.304**	1								
Scanning of General Environment											
4. Political/Economical Factors	.074	.234**	.213**	1							
5. Demographical Factors	.121	.304**	.216*	.380**	1						
6. Technological Factors	.487**	.358**	.359**	.259**	.276**	1					
Integration											
7. Personal Interaction	.241**	.160*	.209**	.092	0.36	.266**	1				
8. Impersonal Interaction	.158**	.208**	.392**	.169*	0.98	.232**	.560**	1			
9. Collaboration	.298**	.147*	.297**	.133	.190**	.306**	.491**	.452**	1		
Decision-Making											
10. Decision-Making Industry	.408**	.170*	.285**	.127	.085	.312**	.330**	.250**	.275**	1	
11. Decision-Making General	.223**	.228**	.096	.341**	.426**	.200**	.092	.217**	.188**	.296**	1

*Correlation significant at the 0.05 level (two-tailed).
**Correlation significant at the 0.01 level (two-tailed).

The results of this regression analysis are shown in Table 3.

Starting out, no support was found for H1. No significant correlation existed between scanning of substitutes on the one hand and innovation performance on the other ($\beta = .104$). Further, scanning of customers, suppliers, and competitors proved to be significantly negatively correlated with innovation

Table 3. Standardized Coefficient Estimates. Dependent Variable: Innovation Performance

Independent Variables	Std. Coefficient Beta
Scanning of Industry Environment	
Substitutes	.104
Customers, Suppliers, and Competitors	-.128*
Scanning of General Environment	
Political/Economical Factors	-.084
Demographical Factors	-.039
Technological Factors	.386***
Integration	
Personal Interaction	.016
Impersonal Interaction	-.043
Collaboration	.145**
Decision-Making	
Decision-Making Industry	.260***
Decision-Making General	.084
<i>R</i> ²	.349
Adjusted <i>R</i> ²	.316
<i>F</i> -Statistic	10.472***
<i>N</i>	206

**p* < .10.
***p* < .05.
****p* < .001.

performance ($\beta = -.128$). The results obtained when testing H2 were similar: scanning of political/economic factors as well as demographical factors showed no significant correlations with innovation performance ($\beta = -.084$ and $\beta = -.039$, respectively). Scanning of technological factors proved, however, to be strongly correlated with innovation performance ($\beta = .386$). H3 stated that there should be a positive association between integration on the one hand and innovation performance on the other; only partial support was found for this hypothesis. Personal interaction showed a positive yet insignificant correlation with innovation performance ($\beta = .016$), and the effect of impersonal interaction was negative yet insignificant ($\beta = -.043$). Collaboration proved, however, to be significantly positively correlated with innovation performance ($\beta = .145$). Finally, only one of the decision-making constructs correlated significantly with innovation performance. Making decisions based on information about industry factors (e.g., about competitors, suppliers) is significantly positively correlated with innovation performance ($\beta = .260$). Decision-making based on information about more general factors (e.g., economic development, technological factors) proved not to be significantly correlated with innovation performance ($\beta = .084$).

Discussion

At a first glance, the results of testing H1 seem counterintuitive. The importance of scanning customers,

suppliers, and competitors is firmly rooted in the field of industrial organization, as well as in the NPD literature and also (to a large extent) in the marketing literature. A first plausible explanation for these findings is found, however, in the research area of market orientation. Some authors in this area claim that market orientation leads to commonality and bland new products since customer and competitor information constrains innovative thinking (Bennett and Cooper, 1981; Christensen and Bower, 1996; Lawton and Parasuraman, 1980; Trott, 2001). The underlying premise is that information about customer opinions are restricted to what is familiar to the customers—to products they can relate to. Furthermore, customers neither know what is technologically possible nor have full information about the latest market trends. Monitoring competitors is not thought to give any advantage either—adopting competitors' ideas and technology is likely to lead to the development of "me-too" products. Atuahene-Gima (1996) partially supports this view and presents evidence that market orientation has a significant negative impact on product newness. In a study of 300 divisions, Moorman (1995) found that market information acquisition was not related to NPD performance. There is, of course, a counterargument: information about customer needs and competitors are central to innovation success (c.f. Gatignon and Xuereb, 1997; Kahn, 2001; Kohli and Jaworski, 1990; Lukas and Ferrell, 2000; Slater and Narver, 1994).

A second plausible explanation for the lack of significant correlations between most scanning constructs and innovation performance is that carrying out an activity such as environmental scanning is no guarantee that the substance of that activity has been fully appreciated. As Brown and Ennew (1995) suggest, the form of best practice may be followed, while the content is largely ignored. Observing actions and motives in detail with survey data is difficult and awkward, however, and sorting out correct explanations from incorrect ones becomes troublesome. It seems safe to state that more research in this area is needed, especially in the form of in-depth case studies or studies of ethnographic design.

Further, political–economical factors as well as demographical factors appeared much less important than expected. Perhaps this kind of information does not add much to firms' innovation performance. One can imagine that this kind of information is more broad and general, and since resources and time for

scanning activities are scarce, firms might choose to devote their attention to factors that affect their operations more directly (e.g., monitoring technological changes). Perhaps political–economical factors are more important in a context where the institutional environment is much more turbulent (as in many developing countries), and perhaps demographic information is more important when the activities take place on an volatile market characterized by constantly changing customer preferences, for example in fast moving consumer goods. This is a plausible explanation, although truly speculative, and evidence to back it up is not available.

Furthermore, an obvious interpretation of testing H2 is that staying ahead of technological development is crucial for firms relying on their own product development. The importance of monitoring technological factors has been established in previous studies (e.g., Ashton and Stacey, 1995; Clemons, 1997). Several motives contribute to explaining the importance of scanning the technological sector of the environment. First, the globalization of technological development forces firms to pay special attention to this area. Second, the general trend toward using external sources of technology makes systematic scanning of the technological environment necessary. Third, the growing complexity of the technological development also points to the importance of scanning this sector. And finally, keener competition often increases the pressure on R&D to improve its effectiveness. For a deeper and more complete discussion, see, for example, Lichtenthaler (2004).

The results on integration support earlier research findings (e.g., regarding the importance of collaboration). Fisher, Maltz, and Jaworski (1997); Kahn (1996, 2001); and Maltz and Kohli (1996) all present empirical support for collaboration being more important than interaction for enhancing NPD performance. The results further parallel the findings on interaction: Kahn (1996) found no significant effects of interaction on NPD performance (even if Kahn's post hoc analysis showed that a few elements of the interaction scale correlated positively). Thus, the present study's results suggest that neither of the two interaction constructs contribute to increasing innovation performance. This result points to the importance of personal communication between functions and departments for increasing innovation performance. Collaboration—an unstructured, volitional, and affective process—seems to make a difference, while interaction—a more structured one—does not.

Finally, using information about factors in the industry environment seems important for innovation performance. Ottum and Moore (1997) remind us that if information is not used, gathering and sharing do not matter. It seems fair to say that if information is not used in addition to being acquired and shared, innovation performance resulting from such information is not possible.

Conclusions and Implications

Overall, this study indicates that a positive relationship exists between scanning of technological factors and innovation performance. The findings further suggest that collaboration enhances innovation performance, as does using information about industry related factors when making decisions pertaining to innovative activities. Overall, the results indicate that managing (i.e., gathering, sharing, and using) external information is one important factor to consider when planning for innovation (although all types of information are not equal in terms of importance). Since environments change over time (Child, 1972; Pfeffer and Salancik, 1978; Porter, 1980), the present study's results support the idea that monitoring these changes will pay off in terms of increased innovation performance. Technological factors seem to be of special importance here, and managers of firms with in-house product development are strongly advised to pay special attention to this area.

Furthermore, some earlier research suggests that scanning customers and competitors leads to lower rather than higher NPD performance—findings confirmed in this article. These results should not be interpreted, however, as customers or competitors being unimportant. Managers are likely to benefit greatly from closely monitoring these important others. Managers therefore may be advised to track and monitor changes in customer needs and wants as well as the actions of competitors, while keeping in mind that although information about these issues might be of great value to other parts of their operations, they should not be considered primary sources of innovation.

With regard to integration, the message sends a clear signal to managers involved with NPD: facilitate and encourage collaborative work between functions and departments in the innovation process. As Griffin and Hauser (1996) show, the evidence is strong across different methodologies that cooperation enhances

success. The present study's results suggest that managers need specifically to encourage personal communication and information exchange in the form of collaboration. Lack of communication is one of the most significant barriers to integration (e.g., Gupta, Raj, and Wilemon, 1985), and the results of the present study point to one obvious strategy for addressing that problem: invest resources in and encourage personal communication between functions and departments during the NPD process. It is suggested, therefore, that managers need to carefully evaluate and consider the different integrating mechanisms available (e.g., goal setting, task forces, integrating roles) for the criteria of personal communication. As earlier research in this area has shown, the choice of specific mechanisms to use depends on the specific strategy and circumstances of the firm and other contingency factors (Galbraith, 1973; Griffin and Hauser, 1996; Moenaert and Souder, 1990). Managers and other readers interested in this area are referred to these three pieces of literature for a more detailed discussion of what mechanisms might be appropriate and under what conditions.

Further, the results also may be interpreted as pointing to the importance of gatekeepers. Since gatekeepers are strongly linked to internal colleagues (Tushman and Katz, 1980), are described as key communicators (Davis and Wilkof, 1988), and often prefer oral sources of information (Allen, 1977; Hauschildt and Schewe, 2000; Tushman, 1979), they are likely to contribute to increasing the level of collaboration in a unit or organization. Thus, gatekeepers may help to close or to reduce information deficits on the part of other individuals (Ancona and Caldwell, 1992) as well as to facilitate cooperative relationships (Fritsch and Lukas, 2001). Therefore, recognition, reward, and promotion of these individuals should be a priority for management. A further benefit of gatekeepers, which traces to the findings of Allen (1977), is that they are particularly useful in securing technological information. This kind of information seems especially important for increasing innovation performance according to the results of this research.

Finally, it is important to elucidate that information needs to be used when making decisions. If information is not used, collection and dissemination are expensive and useless activities. To use environmental information seems especially important in so called "nonprogrammed" decision-making. According to Miller, Hickson, and Wilson (1996), such decisions are unfamiliar, to some extent are novel,

and have not been encountered in quite the same way before. They therefore present a special challenge to managers, since there are no well-trodden paths to follow. Nonprogrammed decisions appear regularly in NPD, since the heart of that activity implies creating something new. Although intuitive decision-making has been found to correlate positively with performance in unstable environments (Khatri and Ng, 2000), managers are advised to consider available information about industry-related factors carefully, in particular when involved in nonprogrammed decision-making situations.

Limitations and Future Research

The findings in this study should be interpreted with caution for a couple of reasons. First, the variables considered in the study concern information aspects only; many other variables have an impact on innovation performance in firms. Spillovers (Blind and Grupp, 1999; Hörte, 2004) and joint R&D (Brenner, 2001) are two (of many) variables potentially relevant. That is, all hypotheses tested here are implicitly governed by *ceteris paribus* assumptions. Second, since the data is cross-sectional, it is difficult to ascertain whether being skillful at managing information invariably leads to increased innovation performance. One could visualize a reverse direction of causality—that is, that more innovative firms have excess resources to spend on managing information. Future studies with a longitudinal design may shed light on this question. Third, one key feature of innovation—the fact that it is a process—is taken as given in this study. Failure to discuss this fact more deeply does not reflect a judgment that this is irrelevant or uninteresting. Rather, it was necessary for hypothesis testing.

Finally, understanding how firms' management of external information affects innovation performance may be enhanced by additional research. One approach would be to examine differences in how "more" and "less" innovative firms manage external information in NPD processes. As stated by Hart, Tzokas, and Saren (1999), there is little empirical research that has examined what information is required, when it is required, and how it can be used during the various phases of the NPD process. Preferably, such a study should be conducted by employing a case-study approach. Case-study research could also aid in understanding how and why customer and competitor information affect innovation perform-

ance the way it does. Furthermore, to collect data over time with a longitudinal design also would be valuable.

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Appendix. Operational Measures

1. Innovation Performance

By a new product/service innovation we mean one that is new to the firm, new to the market, or new to the industry and that is introduced for the benefit of customers or clients outside of your firm.

Please consider the following paired statement with regard to product/service innovation, and circle the number that is most accurate for your firm:

There is a strong emphasis on the marketing of true and tried products or services.	1 to 7	There exists a very strong emphasis on R&D, technological leadership, and innovations.
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How many new products or services has your firm marketed in the past 5 years? Please exclude mere minor variations.

No new products or services in the past 5 years.	1 to 7	Hundreds of products or services in the past 5 years.
--	--------	---

Consider also the following statement, and circle the option that best suits your firm.

Changes in products/services have been mostly of a minor nature (e.g., putting in towel with the soap).	1 to 7	Changes in products/services have usually been dramatic (e.g., changing from mechanical to electric calculators).
---	--------	---

2. Scanning of Industry Environment

Listed below are 4 types of external events/trends or factors potentially affecting your organization. Please rate the approximate frequency with which each type of information comes to your firm's attention.

Information about . . .

- 1 Customers of your organization
- 2 Suppliers to your organization
- 3 Competitors
- 4 Substitute products

(Response format: 1 = once a year or less; 5 = once a day or more)

Listed below are the same 4 types of external events/trends or factors that were described above. Please rate the extent to which your firm makes a point of staying abreast of these various trends/factors.

Information about . . .

- 1 Customers of your organization
- 2 Suppliers to your organization
- 3 Competitors
- 4 Substitute products

(Response format: 1 = We generally do not try to stay abreast of this type of information; 5 = We try to know all there is to know about this type of information).

3. Scanning of General Environment

Listed below are 4 types of external events/trends or factors potentially affecting your organization. Please rate the approximate frequency with which each type of information comes to your firm's attention.

Information about . . .

- 1 Demographics (life styles, social values of society)
- 2 Economic factors [interest rate, gross domestic product (GDP), etc.]
- 3 Political factors (new laws, regulations, and policies)
- 4 Technological factors (new products, processes, materials)

(Response format: 1 = once a year or less; 5 = once a day or more)

Listed below are the same 4 types of external events/trends or factors that were described above. Please rate the extent to which your firm makes a point of staying abreast of these various trends/factors.

Information about . . .

- 1 Demographics (life styles, social values of society)
- 2 Economic factors (interest rate, GDP, etc.)
- 3 Political factors (new laws, regulations, and policies)
- 4 Technological factors (new products, processes, materials)

(Response format: 1 = We generally do not try to stay abreast of this type of information; 5 = We try to know all there is to know about this type of information)

4. Integration

When developing new products or services, to what degree do the departments and/or functions of marketing, production, and R&D within your firm interact with each other with regard to the below activities?

- | | |
|---|---|
| 1 Participation in meetings | 9 Exchange of FAX materials |
| 2 Participation in committees/task forces | 10 Achieve goals collectively |
| 3 Phone conversations | 11 Work for a mutual understanding |
| 4 Exchange of mail | 12 Informally work together |
| 5 Exchange of electronic mail | 13 Share ideas, information, and/or resources |
| 6 Exchange of forms | 14 Share the same vision for the company |
| 7 Exchange of reports | 15 Work together as a team |
| 8 Exchange of memorandums | |

(Response format: 1 = never; 2 = seldom; 3 = occasionally; 4 = often; 5 = quite frequently)

5. Decision-Making

Information collected from the industry environment (e.g., information about customers, suppliers, competitors, substitute products) is extremely important when:

- (a) We set the actual design specifications for new products/services at our firm.
- (b) We make decisions on developing new products/services at our firm.
- (c) New products/services are introduced into the market by our firm.

Information collected from the general environment (e.g., information about demographics; life styles; economic, political, and technological factors) is extremely important when:

- (a) We set the actual design specifications for new products/services at our firm.
- (b) We make decisions on developing new products/services at our firm.
- (c) New products/services are introduced into the market by our firm.

(Response format: 1 to 5)



Till VD,

På sektionen för Ekonomi & Teknik vid Högskolan i Halmstad pågår för närvarande ett forskningsprojekt med fokus på omvärldsanalys, och hur sådana analyser påverkar ett företags förmåga att skapa nya innovationer. Syftet med denna forskning är att skapa ny kunskap och bättre förståelse om sambandet mellan användningen av omvärldsinformation och innovationsutveckling, dvs. skapandet och framtagandet av nya varor och tjänster.

Vi skulle uppskatta ditt samarbete, och hoppas att du har tid och möjlighet att fylla i den bifogade enkäten som är en del i detta forskningsprojekt. Enkäten tar cirka 10 minuter att besvara. De flesta frågor besvaras enkelt genom att du ringar in det alternativ som passar bäst för ditt företag, baserat på din erfarenhet. Vi tror att du kan besvara alla frågor, och det finns inga felaktiga eller rätta svar. Dina svar kommer naturligtvis att behandlas strikt konfidentiellt. Ingen individ och inget företag kommer att skylta med namn i den färdiga rapporten, och det kommer inte att vara möjligt att härleda vissa svar till vissa företag eller personer. Etiketten med ditt företags namn som finns på enkäten är endast för internt bruk. Detta för att vi vid vår analys skall veta vilka företag som svarat på enkäten, och för att vi skall kunna skicka en sammanfattande rapport till dig.

Någon månad efter att du besvarat frågeformuläret så skickar vi en sammanfattande rapport till dig, som visar på resultatet från studien. Den sammanfattande rapporten som vi skickar till dig kommer att innehålla (1) en sammanfattning av studiens resultat på ett A4, samt (2) en overhead som du kan använda för att presentera studiens resultat till medarbetare på ditt företag.

Din medverkan är mycket viktig för oss, och för studiens resultat. Vi hoppas därför att du kan avvara 10 minuter av din tid. När du fyllt i frågeformuläret, var snäll och lägg det i det bifogade svarskuvertet och posta det senast den 8e november.

Stort tack för ditt samarbete!

Sven Åke Hörte

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Frågeformulär

1. Ditt namn: _____

2. Din befattning inom företaget: _____

3. Hur många år har du arbetat på företaget?

Mindre än 1 år ☐

1-5 år ☐

Mer än 5 år ☐

Syftet med följande del av frågeformuläret är att få en uppfattning om hur starkt ditt företag betonar utveckling av nya varor och tjänster, hur många nya varor och tjänster som har utvecklats under de senaste 5 åren, samt hur pass omfattande graden av förändring i dessa varor eller tjänster varit. Med en ny vara/tjänst avser vi en som är ny för marknaden, ny för företaget, eller ny för branschen och som introduceras till gagn för kunder eller klienter utanför ditt företag.

4a. Beakta nedanstående påstående med avseende på utveckling av nya varor/tjänster, och ringa in det nummer som stämmer bäst för ditt företag:

Det råder en stark betoning på
gamla och beprövade varor
och tjänster.

1—2—3—4—5—6—7

Det råder en stark betoning
på forskning och utveckling,
teknologiskt ledarskap, och
innovationer.

4b. Hur många nya varor och tjänster har ditt företag lanserat under de senaste 5 åren? (Var snäll och bortse från mindre förändringar).

Inga nya varor / tjänster under
de senaste 5 åren.

1—2—3—4—5—6—7

Hundratals nya
varor/tjänster under de
senaste 5 åren.

4c. Beakta även följande påstående, och ringa in det alternativ som passar bäst på ditt företag.

Förändringar i varor/tjänster
har huvudsakligen varit
mindre betydande (ex. byta
färg på en miniräknare).

1—2—3—4—5—6—7

Förändringar i varor/tjänster
har huvudsakligen varit
dramatiska (ex. byte från
mekaniska till elektroniska
miniräknare).

Syftet med följande del av frågeformuläret är att få en uppfattning om hur ofta ditt företag får information om externa händelser/faktorer, samt hur viktig sådan information är för ditt företag.

5a. Nedan listas 8 typer av externa händelser/trender eller faktorer som potentiellt kan påverka ditt företag. Med vilken **frekvens** kommer varje typ av sådan information till ditt företags kännedom? (1 = En gång om året eller mindre; 5 = En gång om dagen eller mer).

Information om...

1 Kunder till ditt företag	1—2—3—4—5
2 Leverantörer till ditt företag	1—2—3—4—5
3 Konkurrenter	1—2—3—4—5
4 Substitut-produkter	1—2—3—4—5
5 Demografiska faktorer (livsstil, sociala värderingar, etc.)	1—2—3—4—5
6 Ekonomiska faktorer (räntenivå, BNP, etc.)	1—2—3—4—5
7 Politiska faktorer (nya lagar, regleringar, och policys)	1—2—3—4—5
8 Teknologiska faktorer (nya produkter, processer, material)	1—2—3—4—5

5b. Nedan listas samma 8 typer av externa händelser/trender eller faktorer som beskrevs i föregående fråga. Till vilken grad försöker ditt företag att **följa utvecklingen** av dessa faktorer? (1 = I allmänhet försöker vi inte följa utvecklingen inom denna typ av information; 5 = Vi försöker ta reda på allt som finns att veta om denna typ av information).

Information om...

1 Kunder till ditt företag	1—2—3—4—5
2 Leverantörer till ditt företag	1—2—3—4—5
3 Konkurrenter	1—2—3—4—5
4 Substitut-produkter	1—2—3—4—5
5 Demografiska faktorer (livsstil, sociala värderingar, etc.)	1—2—3—4—5
6 Ekonomiska faktorer (räntenivå, BNP, etc.)	1—2—3—4—5
7 Politiska faktorer (nya lagar, regleringar, och policys)	1—2—3—4—5
8 Teknologiska faktorer (nya produkter, processer, material)	1—2—3—4—5

Syftet med följande del av frågeformuläret är att få en uppfattning om graden av interaktion och samarbete mellan avdelningarna/funktionerna för Marknadsföring, Produktion och Forskning & Utveckling inom ditt företag.

6. Vid utveckling av nya varor eller tjänster, till vilken grad interagerar avdelningarna/funktionerna för marknadsföring, produktion, och F&U inom ditt företag med varandra med avseende på följande aktiviteter? (1 = Aldrig; 2 = Sällan; 3 = Då och då; 4 = Ofta; 5 = Mycket ofta).

- | | |
|--|-----------|
| ➤ Deltagande i möten | 1—2—3—4—5 |
| ➤ Deltagande i kommittéer och grupper | 1—2—3—4—5 |
| ➤ Telefonsamtal | 1—2—3—4—5 |
| ➤ Utbyte av post | 1—2—3—4—5 |
| ➤ Utbyte av e-post | 1—2—3—4—5 |
| ➤ Utbyte av formulär/blanketter | 1—2—3—4—5 |
| ➤ Utbyte av rapporter | 1—2—3—4—5 |
| ➤ Utbyte av PM & meddelanden | 1—2—3—4—5 |
| ➤ Utbyte av Fax-material | 1—2—3—4—5 |
| ➤ Uppnå mål gemensamt | 1—2—3—4—5 |
| ➤ Jobba för en gemensam förståelse | 1—2—3—4—5 |
| ➤ Informellt jobba tillsammans | 1—2—3—4—5 |
| ➤ Dela information, idéer och/eller resurser | 1—2—3—4—5 |
| ➤ Dela samma vision för företaget | 1—2—3—4—5 |
| ➤ Jobba tillsammans som ett team | 1—2—3—4—5 |

Frågorna i denna sista del av frågeformuläret syftar till att kartlägga graden till vilken information om externa händelser/faktorer används när ditt företag fattar beslut om att designa, utveckla och lansera nya varor/tjänster. Ringa in det nummer som passar bäst för ditt företag. (1 = samtycker inte alls; 5 = samtycker helt och hållet).

7a. Information insamlad från företagets **branschomgivning** (info. om kunder, leverantörer, konkurrenter, substitutprodukter) är extremt viktig när:

- (a) Vi sätter **designspecifikationer** för nya varor/tjänster på vårt företag. 1—2—3—4—5
- (b) Vi fattar beslut om **utveckling** av nya varor/tjänster på vårt företag. 1—2—3—4—5
- (c) Nya varor/tjänster **introduceras på marknaden** av vårt företag. 1—2—3—4—5

7b. Information insamlad från företagets **makroomgivning** (info. om demografiska faktorer, ekonomiska, politiska, och teknologiska faktorer) är extremt viktig när:

- (a) Vi sätter **designspecifikationer** för nya varor/tjänster på vårt företag. 1—2—3—4—5
- (b) Vi fattar beslut om **utveckling** av nya varor/tjänster på vårt företag. 1—2—3—4—5
- (c) Nya varor/tjänster **introduceras på marknaden** av vårt företag. 1—2—3—4—5

Paper IV

Characteristics in Information Processing Approaches

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Characteristics in information processing approaches

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Abstract

This paper describes and compares different information processing approaches (terms). The purpose is to identify similarities and differences in the terms, relate them to and compare them with each other, but also to identify their underlying concepts and the course of events they represent. The terms or approaches addressed are Environmental scanning, Business, Competitive, Competitor, Market and Political intelligence, Marketing research and Information management. It was concluded that all approaches have a strong future orientation and strong ties to decision-making, and advocate that information is ennobled in one way or the other. The main differences lie in their focus, and in their scope. © 2002 Elsevier Science Ltd. All rights reserved.

Keywords: Information processing; Intelligence; Scanning; Comparative study

1. Introduction

A central theme in books and articles within different areas of the field of business administration is that the world (i.e. the external environment of firms) is changing at a faster and faster pace. The reasons given for this is globalization (Oxelheim, 1998), investments in IT-technology (Maier & Kelly, 1997) and the rapid pace of technological change in combination with escalating costs of research and development (Ashton & Stacey, 1995). Therefore, companies are believed to need information about environmental events. Information is important since it is believed to be a cornerstone for long-term company survival. Information can reduce uncertainty (Ginzberg, 1980), risks in decision-making (Gilad, 1996), is an important input in the process of strategy formulation (Lozada & Calantone, 1997), serve as a base for competence development (Hamrefors, 1996) and so on. But the process of gathering information is not trouble free. A theme stressed in the literature is the paradoxical situation that, although there is an abundance of

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information available, it is often difficult to obtain useful, relevant information when it is needed (Edmunds & Morris, 2000).

Useful, relevant and [when it is] needed are the keywords here. By consulting the literature, a tentative conclusion may be that companies do not necessarily need more information; what they need is useful and relevant information in time. This fact has been noticed by researchers within different academic disciplines, not to mention the variety of consulting firms within this area. But the area is blurred, we feel. The reason for this is that there are a lot of different terms (that we will later label approaches) used to describe how useful and relevant information might be collected, interpreted, analyzed, distributed and so forth. Some of the more popular terms used are Business intelligence, Information management, Marketing research, and Environmental scanning. These terms or approaches have a lot in common, but also there are significant differences.

1.1. Purpose

Thus, the purpose of this paper is to identify similarities and differences in these terms, relate them to and compare them with each other, but also to identify their underlying concepts and the course of events they represent.

The intent with this paper is not to present a complete list of references on the subject, but rather to study some of the literature at hand as a first step towards a mapping of the characteristics stressed in the different terms/approaches.

2. Terms, concepts and course of events

As mentioned in Section 1, it is important to look behind terms to discover their meaning. Carl Hempel (1969) made this point clear; it is very important to make a distinction between terms and concepts. By looking behind the terms we mean trying to locate the domain(s) (course of events) they are supposed to reflect, but also to try to identify the concept(s) underlying the terms.

A term (word or sign) is believed to represent a certain object or a course of events (i.e. domain). The object or course of events is contained in a certain concept; the term means this

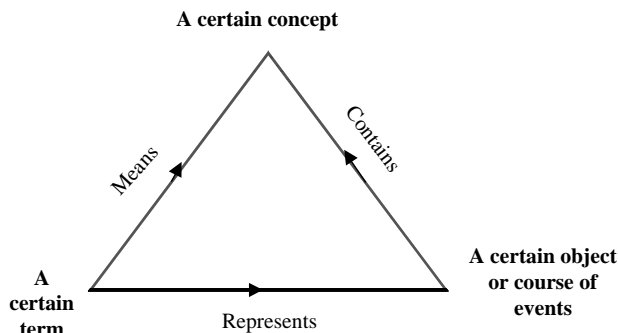


Fig. 1. The difference between terms, concepts and course of events. Source: Zetterberg, 1968.

concept (Zetterberg, 1968). In this paper, Marketing research is an example of a term. The term is represented by the Marketing research process, which is a course of events or a domain. Marketing research may be defined as “the function that links the consumer, customer, and public to the marketer through information”, which is the concept that the term Marketing research means. The purpose with this distinction is basically to facilitate communication and exchange of meaning. This idea is shown visually in Fig. 1 below.

3. Information processing approaches

In this section, the terms or approaches¹ Environmental scanning, Business, Competitive, Competitor, Market, and Political intelligence, Marketing research, and Information management will be described. The approaches are not compared in this section, only described. The information system approach is described together with the term Information management. Our intent was originally also to include Management information systems (MIS) as an approach here. This proved very difficult since there seems to be no consensus with regard to how the term is used. Lee and Gosain (1999, p. 234) claim that the MIS discipline is “a fragmented adhocracy characterized by research that is rather personal, weakly coordinated in the field as a whole, with weak entry barriers from one fragment to the other and common sense language dominating”. Based on our limited knowledge of the field, we agree with these authors and therefore choose to exclude the term/approach MIS in this paper.

3.1. *Environmental scanning*

According to Augilar (1967, p. 1), Environmental scanning is defined as “the activity of acquiring information”. Hamrefors (1999, p. 3) has a somewhat complementary view and claims, “by scanning I mean the behavior of attending to the events and phenomena in the environment”. Under the term scanning Augilar (1967) includes not only purposeful search but also undirected viewing. Augilar maintains that the importance of scanning derives from the importance of the decisions involved. He further argues that information is useful for making decisions about strategy and long-range plans. The dependence of decision-making on scanning becomes apparent as soon as one examines the various steps of the decision-making process, according to the author. The most important type of information received through Environmental scanning is external strategic information, and information is classified as such when it refers to information about events or relationships in the firms outside environment that unveil opportunities to exploit the firms strengths, accentuate the firms weaknesses, or highlight potential threats facing the firm (Augilar, 1967).

Before proceeding, what is actually being scanned? How can “environment” be defined? According to May, Stewart, and Sweo (2000) most research definitions of organizational or business environment has been based on the work of Duncan (1972). Duncan defines the environment as all of the relevant factors outside an organization’s boundary that are

¹In this paper, the words “term” and “approach” are used synonymously.

incorporated into its decision-making. Further, the environment could be anything material or social in the surroundings, close or distant to an individual (Hamrefors, 1999). Considering these relevant factors, the environment can be divided into two distinct strata named task and general environment (Bourgeois, 1980). The task environment involves sectors in which there is direct interaction with other organizations, suppliers, customers, and competitors being good examples. The general environment includes sectors with indirect interaction with the organization such as government, economic conditions, and socio-cultural factors (Hamrefors, 1999).

Environmental scanning is, according to Hamrefors (1999), a quite new phenomenon on the organizational scene. Only in the latest 15 years has this topic started to be of importance on the agenda of many organizations, even if it is by no means a new phenomenon. When consulting the literature, we can see that from the 1960s onwards a lot has been written using the term Environmental scanning in such prominent magazines as *ASQ*, *Management Science*, *Academy of Management Journal*, and the *Strategic Management Journal*. Issues that were addressed among others were environmental uncertainty (Duncan, 1972; Milliken, 1987) environmental characteristics (Emery & Trist, 1965; Bourgeois, 1980), scanning behavior of executives (Hambrick, 1982; Daft, Sormunen, & Parks, 1988; Sawyerr, Ebrahimi, & Bahman, 2000) and scanning behavior in relation to competence development (Hamrefors, 1996).

3.2. Business, competitive, competitor, market and political intelligence

The question of Environmental scanning has been raised in several contexts. One is the need to identify changes in the organizational environment that the management thinks is important for the organization. This kind of Environmental scanning is often labeled Business intelligence (BI), a wording that reflects that it is often inspired by Military intelligence (Hamrefors, 1999). Business intelligence could be broadly defined as systematized Information management (planning, collection, analysis and dissemination) aimed at generating insight into the future developments that are assumed to have an impact on the organization as decision support in organizations (Svensson-Kling, 1999).

Usually, the term intelligence is used for indicating that it is an organized activity and an interpretation of the environmental events, rather than sheer information about them. To put it another way, intelligence is actionable, processed, and organized information (Barndt, 1994). Another characteristic of intelligence is that it is future oriented. By using organized intelligence activities one tries to forecast how relevant parts of the environment will develop in the future (Svensson-Kling, 1999). In the literature the term intelligence is often used to capture the process and organization of transforming information into something that makes sense (Weick, 1995) and that could be used in decision-making.

Almost all major corporations have Business intelligence units today (Pagels-Fick, 1999). The purpose of BI is proactively to support information to decision-makers for their actions. Often a distinction is made between tactical and strategic intelligence, which originates from the military intelligence tradition that the authors of BI often come from. Furthermore, the proactivity of BI often distinguishes between the ability of finding critical information, without the decision-makers having to ask for it, and the proactivity to anticipate future questions from the management (Hamrefors, 1999, p. 6). Methodologically, the BI operations are based on the intelligence cycle.

This cycle has been described by many authors (Ashton & Stacey, 1995; Collins, 1997; Lagerstam, 1988 among others), all having their own version of the same basic cycle. The cycle used here is adopted from Ashton and Stacey (1995) (Fig. 2).

The first step includes planning the intelligence activities. Effective intelligence is based on clear identification of user or customer needs to be served by the intelligence activity and careful forethought about information gathering and analysis. The second step is to collect source materials. Sources of information can be internal or external, formal or informal, personal or electronic. The secret, according to Ashton and Stacey (1995), lies primarily in narrowing down what information is relevant, identifying where to find it, and knowing how to analyze it in order to support decision-making.

The third step involves analysis of the materials and sources to interpret their meaning in the light of intelligence objectives or user needs. This includes, for example, interpreting the meaning of information, to develop results, and to assess implications. The fourth step is to deliver the information products. This can be done through formal presentation, through e-mail, or by other means. Once developed and disseminated, intelligence results are applied or used in some way to affect organizational decisions or actions (step 5). Typically, the findings are either used as the basis for specific action or simply stored for possible later use in actions. Finally, in step 6, the intelligence process and results should be evaluated with regard to whether they serve user needs and ultimately have beneficial impacts on the organization. The purpose of the evaluation is to improve future operations by making them more responsive to company needs, to further clarify those needs and to adjust practices accordingly (Ashton & Stacey, 1995). By looking at the model,

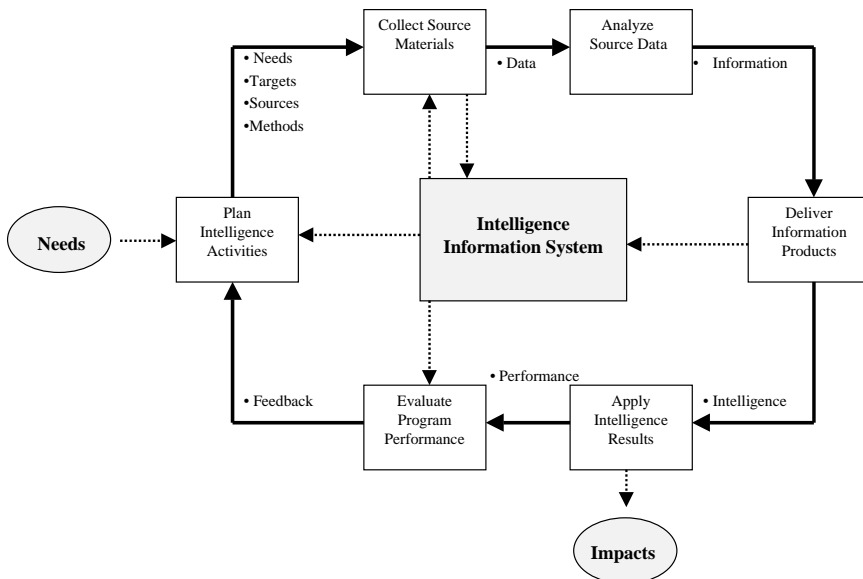


Fig. 2. The S&T intelligence process. Source: Adapted from Ashton and Stacey, 1995.

it is easy to get the impression that the activities are sequential, starting with the planning of intelligence activities. It should be emphasized though that the intelligence cycle describes a continuous activity; a never-ending process oscillating between search and decision (Hamrefors, 1999).

3.3. Marketing research

Effective decision-making depends on the quality of the information input, and Marketing research plays an essential role in providing accurate and useful information (Churchill, 1999; Kumar, Aaker, & Day, 1999). Marketing research is the firm's formal communication link with the environment. It is the means by which the firm generates, transmits, and interprets information from the environment about or relating to the success of the firms marketing plans (Churchill, 1999).

Marketing research is broadly concerned with the application of theories, problem-solving methods and techniques to the identification and solution of problems in marketing. Marketing research may be defined as "the function which links the consumer, customer, and public to the marketer through information—information used to identify and define marketing opportunities and problems; generate, refine, and evaluate marketing actions; monitor marketing performance; and improve our understanding of marketing as a process" (Malhotra, Peterson, & Kleiser, 1999, p. 6). Marketing research links the organization with its market environment. It involves the specification, gathering, analysis, and interpretation of information to help management understand that particular market environment, to identify its problems and opportunities, and to develop and evaluate courses of marketing action (Kumar et al., 1999).

As with the Business intelligence cycle, the Marketing research process (see Fig. 3) has been described by several authors, for example, Churchill (1999), Kumar et al. (1999). Except some minor differences, the process seems to be quite similar, independent of the author. Step 1 in the research process, agree on research process, comprises a shared understanding between the manager and the researcher of problems or opportunities to be studied, decision alternatives to be evaluated and users of the research results. Then, the research objectives are established (step 2). The research objective is a statement, in as precise terminology as possible, of what information is needed. A research objective has three components. The first is the research question. It specifies the information the decision-maker needs. The second and third elements help the researcher make the research question as specific and precise as possible. After establishing objectives, it is necessary to have an estimate of the value of the information—that is, the value of obtaining answers to the research questions. Such an estimate will help determine how much if anything should be spent on research (Kumar et al., 1999).

The research is then designed, the data collected, the data analyzed, and the results are reported together with recommendations (steps 3–6).

Over the last ten years, research within the area of Marketing research has been concerned with advertising and media research, brand evaluation and choice, brand management, buyer and consumer behavior, channels of distribution, new product research, pricing research, and other marketing-related activities (Malhotra et al., 1999).

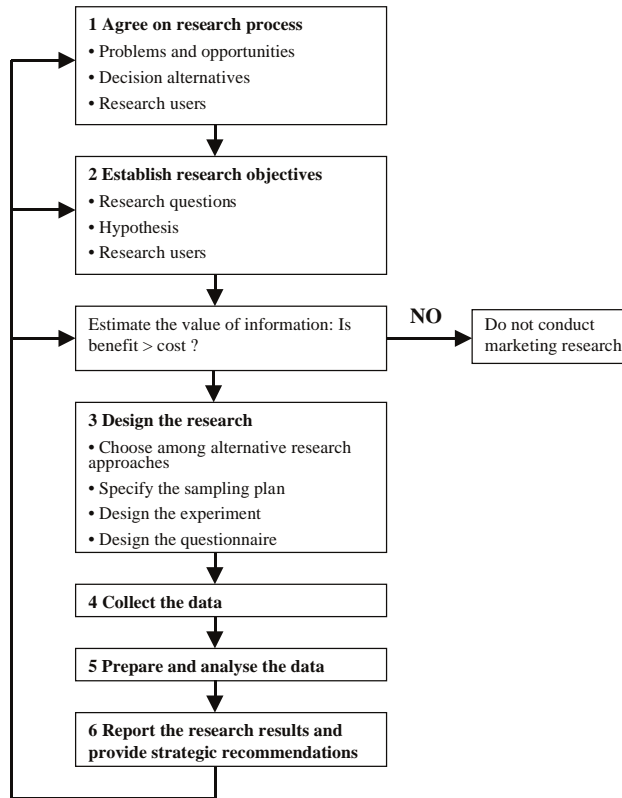


Fig. 3. The Marketing research process. Source: Adapted from Kumar et al., 1999.

3.4. Information management and information systems

Information management has emerged as the most common brief name for the management of the use of information technology in an organization. In this context, information technology refers to the hardware and software of computing and telecom, and associated resources. A central theme in Information management, independent of perspective, is information processing. Information processing might be viewed as doing something to information to make it into something else, e.g. subjective knowledge, differently arranged information or summary information (O'Brien, 1995).

In general terms, Information management can be viewed as a response to, and a search for new and improved means of controlling the information explosion and the resultant increasing complexity of decision-making by improving the flow, the control, the analysis and the synthesis of information for decision-makers. The following definition of Information management may be used: "The aim of Information management is to promote organizational effectiveness by

enhancing the capabilities of the organization to cope with the demands of its internal and external environment in dynamic as well as stable conditions. Information management includes organizational wide information policy planning, the development and maintenance of integrated systems and services, the optimization of information flows and the harnessing of leading edge technologies to the functional requirements of end-users, whatever their status in the parent organization. Information management has two dimensions, the management of the information process and the management of data resources” (Rowley, 1998, p. 361).

Rowley (1998) has also suggested a framework for Information management, with the intention of presenting a structure of the knowledge, research and practice within the area of IM. This framework can be found below (Fig. 4).

The framework shows the different levels at which Information management can be studied. Outside the circles we find the *information environment*—the environment that surrounds information contexts; it consists of political, legal, regulatory, societal, economic and technological forces. In the same way business or marketing systems exist in a wider environment, so the contexts in which Information management occurs can be placed in a wider context. The outer circle—information context—is the context in which information systems are encountered. The context influences system design, and encompasses the user. Organizations and businesses are an important category of context, but other contexts are also possible, including education, home and community. Information contexts are the contexts in which information processing and management take place.

As can be read in the definition of IM above, part of Information management is information systems, a point also made by Cronin and Davenport (1991). These systems are used in many organizations for daily operations (Heikkilä, 1996). An information system may be defined as an organized combination of people, hardware, software, communication networks, and data

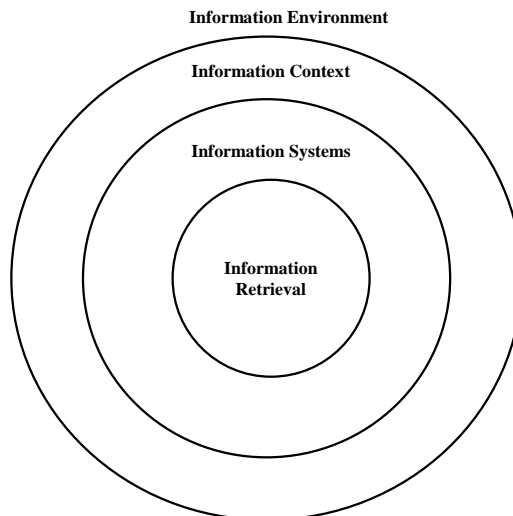


Fig. 4. A framework for information management environments. Source: Rowley, 1998.

resources that collects, transforms, and disseminates information in an organization (O'Brien, 1995). Information systems (the middle circle) are the systems designed to enter information, store it and facilitate effective retrieval. Facilities to support efficient and accurate data entry must be coupled with adequate physical storage capacity and appropriate logical database structures. Systems include hardware and software, and data, and in some models, users. Information systems should be the invisible tools that support the information processing of individuals or organizations. The impact of such systems on information processing and developments in information processing in recent years have been so significant that it is appropriate to consider this level in the framework explicitly. An alternative perspective might actually be that the entire framework is concerned with information systems, since either an organization or an individual can be regarded as an information system (Rowley, 1998).

The key issues in IS from IS-managers perspectives are (1) improving the links between information systems strategy and business strategy, (2) developing and implementing information infrastructure, (3) implementation of knowledge management systems, and (4) reducing IT-projects completion time and budget deviations (Gottschalk, 2000). Recent academic research has centered on IS development, studies of decision support systems, IS evaluation, IS implementation, and studies of expert systems/artificial intelligence (Claver, Gonzales, & Llopis, 2000).

Finally, the inner circle—the information retrieval circle—is concerned with the individual interfacing with a system or range of systems or sources with a view to meet specific conscious or unconscious information requirements. It concerns the actions, methods, and procedures for recovering information from stored data. Information retrieval commences with an individual's explicit or implicit need for information. Typically, the individual will then select one or more sources which on the basis of previous experience might expect to offer access to the required information. Once an appropriate source has been selected the user interacts with that source (Rowley, 1998).

4. Comparison of the different approaches

After describing the different terms/approaches used to describe how information might be collected, interpreted, analyzed, distributed and so forth, it is now time to compare these approaches with the characteristics mentioned in each approach. As will be soon evident, there are a lot of similarities between these approaches even if the terms used seem to differ a lot at first glance. The comparison of the different approaches and their characteristics are summarized in Fig. 5.

First, we will claim that all the approaches are future oriented in the sense that they aim at generating insight into future developments. Augilar (1967) claimed that the most important type of information received through Environmental scanning is information that let the firm exploit its strengths, accentuate weaknesses, or highlight potential threats. This information can be used for making decisions about strategy and long-range plans, something that appears in a close or remote future. Svensson-Kling (1999) claims that one characteristic of Business intelligence is that it is future oriented. By using organized intelligence activities a company tries to forecast how relevant parts of the environment will develop in the future. This should not be surprising, since BI is viewed as a part of the broader area named Environmental scanning. Further, the purpose of the evaluation step in the intelligence cycle is to improve future operations by making them more

Approaches	Characteristics						
	Future Orientation	Focus	Methodology	Ennobled (Value-added)	Ties to decision-making	Scope	
	Environmental Scanning	Yes	Acquire general info. of events or phenomena in the environment	Scanning process	Yes and No	Strong	Broad, contains BI
	Business Intelligence	Yes	Interpretation of information of changes in environment	Intelligence cycle	Yes	Strong	Part of Env. Scanning, contains all other intelligence terms
	Competitive Intelligence	Yes	Interpretation of information about competitive position	Intelligence Cycle	Yes	Strong	Part of BI
	Competitor Intelligence	Yes	Interpretation of information about competitors	Intelligence Cycle	Yes	Strong	Part of BI
	Market Intelligence	Yes	Interpretation of information with focus on customers	Intelligence Cycle	Yes	Strong	Part of BI
	Political Intelligence	Yes	Interpretation of information about political factors	Intelligence Cycle	Yes	Strong	Part of BI
	Marketing Research	Yes	Information from environment about firms marketing plans	Marketing Research Process	Yes	Strong	Narrow, but touches on other approaches
	Information Management	Yes (to some extent)	Prime focus on management of IT but also info policy planning, info systems, info flows	N/A	Yes and No	Strong	Broad, contains information systems

Fig. 5. Comparison of the different information processing approaches.

responsive. Since Market, Competitor, Technological, and Political intelligence are viewed as sub-groups to the approach Business intelligence, they too are future oriented, trying to generate insights from various areas. And so is the approach Marketing research. Marketing research may help a decision-maker to understand a particular marketing environment (Kumar et al., 1999) in order to evaluate courses of action for the future that might concern new product research or consumer behavior, for example. The approach Information management is also future oriented, at least to some extent, although this is not explicitly stated in the preceding description. Although a lot of emphasis is put on IT-technology and infrastructure, the aim is to support decision-making (Rowley, 1998), aiming at better future decisions.

Information management has its prime focus on the management of the use of information technology in organizations. Here, information technology refers to hardware and software of computing and telecom, and associated resources (O'Brien, 1995). Information management also focuses on information policy planning, information systems and optimization of information flows (Rowley, 1998). Here, the issue is not what kind of information that is at stake; the issue is, for example, how information is distributed to end-users—by which means.

Some of the approaches but not all are based around a certain *methodology*, i.e. how the activities are carried out. Environmental scanning is, according to Augilar (1967), based around the scanning process; see Augilar (1967, p. 33). This process is comprehensive and extensive, looks like an enormous blueprint, and is not contained in this report. Business intelligence, and its

subgroups Competitive, Competitor, Market, and Political intelligence all seem to be based around the intelligence cycle, described by Ashton and Stacey (1995), Collins (1997) and Lagerstam (1988) among others. The cycle may vary from author to author, but the basic idea remains the same. The intelligence cycle is described in page 5 in the report. Marketing research is based on the Marketing research process, described in page 7. It is worth to note that the Marketing research process can be cyclical; provided results and recommendations may trigger new problems or opportunities, thus starting the process all over again. But the process may also be carried out just on a one-time basis. In contrast, the intelligence cycle describes a continuous activity; a never-ending process oscillating between search and decision (Hamrefors, 1999). Information management is not, based on our limited research, based on a certain common methodology. This might be due to the fact that the IM approach is focused more on infrastructure, and that the IM approach is more diverse than for example Marketing research.

Moreover, most of the approaches appear not to be able to avoid the consideration of the processing of information in one way or the other, i.e. making information *ennobled*. In the Environmental scanning approach, the issue of information processing is not addressed explicitly. However, Augilar (1967) talks about purposeful search for information, which can be interpreted as separating important information from less important. In the different intelligence approaches (Business, Competitive, Competitor, Market and Political intelligence), ennobling of information is central. Intelligence usually indicates an interpretation of environmental events, rather than sheer information. Intelligence is actionable, processed and organized information (Barndt, 1994). When information is transferred into something that makes sense it is often called intelligence (Weick, 1995). Marketing research, too, is concerned with ennobling of information. It involves, among other things, interpretation of information (Kumar et al., 1999), and so is Information management, to some extent. Information processing is considered a central theme, and is viewed as doing something to information to make it into something else (O'Brien, 1995).

Further, all approaches have strong ties to decision-making. The dependence of decision-making becomes apparent as soon as one examines the various steps of the decision-making process, according to Augilar (1967). The tie to decision-making is also apparent in Duncan's (1972, see p. 3) definition of environment. Business intelligence, as well as the other intelligence approaches, is tied to decision-making too. The aim of BI is to generate insight into future developments as decision support in organizations (Svensson-Kling, 1999) or as Hamrefors (1999) puts it, the purpose of BI is to proactively support information to decision-makers for their actions. Ashton and Stacey (1995) has similar thoughts and thinks that once developed and disseminated, intelligence results are applied or used in some way to affect organizational decisions or actions. This is not surprising since adequate information is a prerequisite for rational decision-making. The Marketing research approach is also strongly tied to decision-making. Churchill (1999) claims, for example, that effective decision-making depends on the quality of the information input, and that Marketing research plays an essential role in providing accurate and useful information. Finally, Information management is concerned with decision-making too. Rowley (1998) claims, for example, that IM is a means for controlling the information explosion and the resultant increasing complexity of decision-making by improving the flow, the control, the analysis and the synthesis of information for decision-makers.

Finally, each approach has a distinct scope, marking the boundaries or frame of the approach. Environmental scanning has a broad scope, and contains the approach of Business intelligence

within its scope. The approach of Business intelligence, in turn, contains all the other intelligence terms or approaches within its scope. The scope of Information management can also be said to be broad, and contains within its boundaries the term information systems. With regard to some issues, for example the purpose of making information ennobled and future orientation, these two approaches touches on each other in terms of scope. Marketing research might also be related to these two in terms of scope, since there might be similarities with, for example, Marketing intelligence (Walle, 1999) and Information management in terms on ties to decision-making.

5. Discussion and comments

As we have shown, there are many similarities between the different information processing approaches described and compared in this report. As can be seen from Fig. 5, the main difference is in their focus and scope. The approach that deviates most from the others is Information management with a strong emphasis on information technology and systems. It has to be emphasized though that if other characteristics had been chosen for comparison, the result may have been completely different.

It is also important to remember that different terms or approaches are defined and described differently by different authors. In this report, we have sometimes implicitly assumed that all authors within an approach using the same term also share the same ideas with regard to the underlying concept and course of events. This is not necessarily true, even if there seems to be some kind of consensus with regards to what the terms used means and represents. With regard to

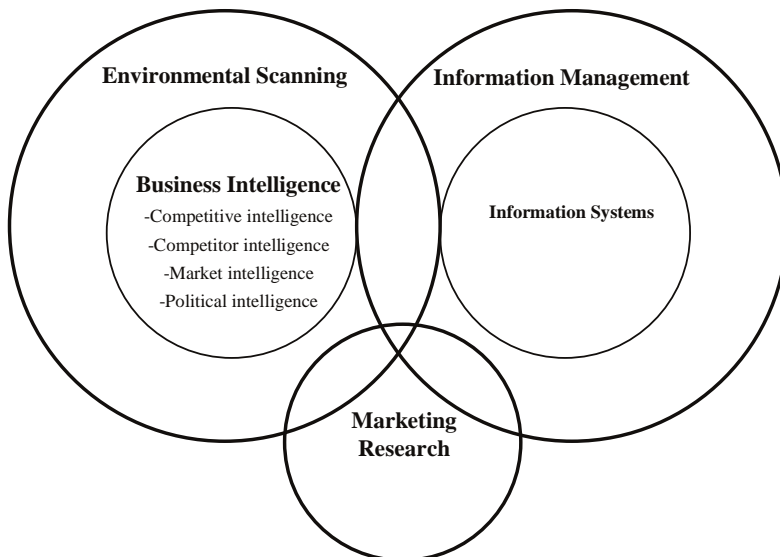


Fig. 6. The different information processing approaches and their relationships.

the term MIS we did not find that consensus, and therefore we excluded that term. Much more can be said and criticized with regard to the contents in this paper; it is far from complete. But hopefully it contributed with at least something more than easing up the knots in our minds a bit. Finally, a figure trying to position the different terms in relation to the others in terms of scope is provided, just to visually show how we perceive the approaches (Fig. 6).

The point is to visually show that these approaches are not considered completely separated from each other in terms of their focus; rather, there are significant overlaps between the different approaches described.

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Paper V

Organizational Environment Revisited: A Conceptual Review and Integration

Forthcoming in *International Studies of Management & Organization*.

Johan Frishammar

Organizational Environment Revisited: A Conceptual Review and Integration

Abstract: *An innumerable number of books and articles state that “the environment” is important to organizations and merits attention as it is thought to influence organizations’ actions as well as outcomes. Still, little agreement exists on what the environment is and how to apprehend it. This article presents a review of four different perspectives in organization–environment research: the adaptive, the resource-dependence, the cognitive and the population-ecology perspective. All perspectives present assumptions about environmental structure, sources of environmental change, level of analysis, etc. but they also imply different meta-theoretical assumptions that constitute distinct frames of references. The article suggests that the ideas in the realist paradigm in strategy research, the logic of appropriateness and high general applicability and prescriptive value contribute to explaining the dominant position of the adaptive perspective. The article further argues that viewing “environment” from one angle only is too limited a conceptualization, and suggests constructivism to be a feasible avenue for combining and integrating characteristics from different perspectives in order to overcome limitations with a single-frame approach.*

Introduction

Management and organization research during the first half of the 20th century tended to ignore the environment. Or, at least, to hold the environment constant while searching for universalistic principles of structure, planning and control (Miles, Snow and Pfeffer 1974). Perhaps the best-known example of this approach is the work by Taylor (1947) and Fayol¹ (1949) that seeks to identify universally applicable principles, that is, the one best way.

In the literature, although perhaps not in practice, the importance of the environment to organizations was acknowledged by the introduction of open-system concepts and models in organization theory. The open-systems concept stresses the reciprocal ties that link an organization with elements that surround it (Bertalanffy 1956). Early contributors adopting this line of thought were Burns and Stalker (1961), Emery and Trist (1965), Lawrence and Lorsch (1967),

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and Aguilar (1967). What is meant by the term “environment”, then, is the environment of *organizations*².

On a more concrete level, there are several different concepts used to describe specific sectors of organizational environments, for example the task environment (Dill 1958), domain (Levine and White 1961), territory (Child 1972), sub-environment (Lawrence and Lorsch 1967) or industry (e.g., Porter 1980). On a higher abstraction level we can find different perspectives in organization-environment thinking. While concrete conceptualizations such as industry or sub-environment are likely to be known by most readers, different perspectives on what environment “is” might not be.

Analyzing environmental perspectives is appealing for a couple of reasons. First, they seem to determine how researchers as well as practitioners conceive of the concept of environment, what they mean when using the term as well as what concept the term is thought to refer to. Notably, the term “environment” is used relatively constantly over time and among authors but the conceptions differ. Second, the choice of perspective often appears to be a choice based on religious faith, as if certain actors believe in and subscribe to a certain perspective while simultaneously being unable to justify their choice. Questions such as whether a certain perspective is better than alternative ones for a phenomenon under study, its degree of explanatory power (Bunge 1967) and the assumptions on which it is built are seldom discussed. Finally, while most introductions-to-OB/OT or strategy textbooks briefly address the issue of organizational environment (usually on a concrete level), systematic and exhaustive reviews of environmental perspectives are few – another motive justifying the present study.

Research Purpose

Three different research questions or issues are addressed in this article. *First*, the article reviews, compares and contrasts four frequently utilized perspectives in organization-environment research, thereby facilitating the identification of differences and similarities among these perspectives. *Second*, and based on this review, the article seeks to understand why one of these perspectives – the adaptive – is so popular and frequently used in comparison with the other three. And *third*, the consequences of limited conceptualizations of the environment are highlighted, together with remedies to overcome such limitations.

Perspectives and Dimensions

In this review, the term “perspective” is used since, in each case, we will be dealing not with a single, unified model or theory of environment but rather with a number of varying approaches amounting to four different schools of thought. Each perspective will serve as a conceptual umbrella under which related views and authors have been gathered.

One could consider the selection of perspectives in terms of samples and universes. Despite the obvious fact that in this case we are dealing with a non-probability sample, the criteria for choosing these perspectives were that they deal explicitly with the environment and how organizations relate to it, and they include assumptions about the environment such as structural properties and

level of analysis. Also, all four are frequently utilized, implicitly or explicitly, in research directed at organization-environment relations.

The perspectives described and compared are *the adaptive, the resource-dependence, the cognitive and the population-ecology ones*. While the last three are common names used in the literature, the term “adaptive perspective” was borrowed from Hannan and Freeman (1977) because this term captures its salient assumptions. Other perspectives were considered but transaction-cost analysis (e.g., Williamson 1975) was dropped because it is not primarily concerned with the environment while institutional theory (e.g., DiMaggio and Powell, 1983) left out due to internal inconsistencies in environmental conceptualization among different sub-schools.

Nine different “dimensions” were chosen for contrasting these four perspectives as they seem meaningful, relevant and can serve as guidelines for obtaining an overview of the basic characteristics of each perspective. The first dimension is that of *salient assumptions* which were derived inductively from the texts relevant for each perspective. This dimension raise the question of unit, namely, “salient assumptions about what?” The term has a bearing on the interface between organization(s) and their environment(s) and is used accordingly. This first dimension is broader and more general than the following ones and it is used with the aim of capturing the essence of each perspective.

The second dimension is *assumptions about the environment* since we can assume the environment to be either analyzable or unanalyzable (Daft and Weick 1984). In addition, under this dimension, the view of organizational boundaries within each perspective need also be discussed – that is, how these are conceived of and drawn. Third, follows *the focus of enquiry*. Different theories or perspectives may be classified according to: (1) those attempting to conceptualize environments and how these change; (2) those dealing with how environments affect organizations, and (3) those concerned with how organizations go about understanding or analyzing their environments (Fahey and Narayanan 1986).

The fourth dimension is that of *assumptions about environmental structure*. Different perspectives may be classified according to their description of the structural properties of the environment (Lenz and Engledow 1986). Fifth; different perspectives are concerned with different *levels of analysis*, which may be carried out at the level of the organization set, that is, the environment is viewed from the standpoint of a specific (focal) organization. A second level is that of organizational populations but analysis can also be made at the inter-organizational community or organization-field level (Scott 1998). Sixth, all perspectives present assumptions about *the origins of environmental change*. All authors agree that environments change but the changes depend on which perspective is advocated since the sources of change may differ. An eight dimension is *how to gain knowledge of the environment?* Opinions on how these activities should be carried out also differ and seem to be contingent on the perspective in question. The last two above dimensions were borrowed from Lenz and Engledow (1986).

Ninth, the *meta-theoretical assumptions* in each perspective are highlighted; the ontological, epistemological and human-nature standpoints are addressed on the bases of the writings of Burrell and Morgan (1979)³. In terms of *ontology*, nominalism and realism make up two end points. The nominalist position

implies that the world is made up of nothing more than names, concepts and labels used to structure reality so that there is no “real” structure to the world. The realist position assumes that the world is made up of hard, tangible structures that exist as empirical entities so that the world exists independently of an individual’s perception of it.

When it comes to *epistemology*, positivism and anti-positivism make up two points on a continuum. Positivism seeks to explain and predict what happens in the social world by searching for regularities and causal relationships, laws or underlying structures. The anti-positivistic stance implies that the social world is relativistic so that objective knowledge cannot be generated, and we have to understand from the inside rather than from the outside. That is, one can only understand by “occupying the frame of reference of the participant in action” (Burrell and Morgan 1979, p. 5).

With regard to the *human-nature dimension*, one can identify a determinist view where actors and their activities are viewed as completely determined by the situation or environment in which they are located, while the voluntarist view treats actors as completely autonomous and free-willed. We now turn to the adaptive, resource-dependence, cognitive and population ecology perspectives per se.

The adaptive perspective

The adaptive perspective is the most widespread, popular and frequently utilized perspective reviewed here. A quotation representative of this perspective was provided by Miles and Snow (1984, p. 10):

“Successful organizations achieve strategic fit with their market environment and support their strategies with appropriately designed structures and management processes”.

By looking at the adaptive perspective through the eyes of those advocating other perspectives, we will put it into perspective. The first line of the quotation illustrates the essence of this perspective. Namely, that environments are important to organizations and in order to be successful, organizations can and must adapt to the demands of the environment. An emphasis on adaptation means viewing organizations as changing in response to changes in environments (Carroll and Hannan 1995). The adaptive perspective is seen most clearly in the management literature. At the risk of subjectivity, over-simplified inference and potential fallacies, this perspective is what business students are taught in business programs at business schools.

The adaptive perspective suggests that organizations are affected by their environments according to the ways in which managers or leaders formulate strategies, make decisions and implement them. Therefore, successful managers are able either to buffer their organizations from environmental disturbances or to arrange smooth adjustments that require minimal disruption. Hence, subunits of the organization, usually managers or dominant coalitions, scan the relevant environment for opportunities and threats, formulate strategic responses, and adjust organizational structure, strategy and processes accordingly (Hannan and Freeman 1977). Consequently, the *salient assumptions* in this perspective are that organizations are viewed as active and that they can adapt to changes in the

environment by making decisions to alter strategy, structure and processes, and then implement these decisions.

One of the best-known books illustrating the adaptive perspective is Michael Porter's (1980) *Competitive Strategy*, though many other strategy authors have helped promote it, e.g. Utterback and Abernathy (1975), Hofer and Schendel (1978), Miles and Snow (1978) and Ansoff (1988). Moreover, it is not exclusively related to the industry level. At the level of firms, the perspective is evident in the area of marketing whose essence is that firms can achieve their goals and attain efficiency by adapting to the needs and demands of target markets (e.g., Kotler and Armstrong 1996). The adaptive perspective is also relevant above the industry level, for example in coping with technological or social changes in the macro environment (Fahey and Narayanan 1986). Much of what we recognize as contingency theory also falls within the adaptive perspective (i.e., Burns & Stalker 1961; Lawrence and Lorsch 1967; Galbraith 1973). Contingency theory is guided by the hypothesis that organizations whose internal features best match the demands of their environments will achieve the best adaptation (Scott 1998).

To undertake a complete review of those who advocate the adaptive perspective would be very space consuming since the main differences among authors lie in their assumptions about environmental structure while they seem to share the same salient assumptions, focus of inquiry, assumptions about the environment and level of analysis.

According to Porter (1998), the essence of formulating and implementing competitive strategy lies in relating a firm to its environment. Conceptually, the idea is that companies need to formulate strategies to obtain a defensible position in the industry, thereby being able to cope with and adapt to industry forces and yield a superior return on investments. The best strategy for a given firm is ultimately a unique construction reflecting its particular circumstances although Porter identifies three generic strategies of cost leadership, differentiation and focus.

Under the adaptive perspective, the *assumption about the environment* is that it is analyzable. Organizations do not invent or create their environments because the environment represents an underlying order rather than a superimposed one. Therefore, by means of environmental-scanning techniques or market research, organizations can explore and discover its properties with the aim of achieving adaptation. The environment is not just analyzable but can be known a priori and serve as an input in a strategy-formulation process. The fact that organizations have boundaries is typically implied but not clarified. General descriptions of "the organization" and "the environment" are found in Porter (1980), Fahey and Narayanan (1986) and Hofer and Schendel (1978). With the adaptive perspective, the *focus of enquiry is on how the environment affects organizations*.

For Porter (1980), the key aspect of the firm's environment is the industry or industries in which it competes, which is decomposed into buyers, suppliers, substitutes, potential entrants, and competitors (see Figure 1). The industry environment comprises a firm or a business unit and its competitors operating in the same industry. It consists of a particular set of competitive forces that generate both opportunities and threats and that may change due to the actions of competitors. Note that Porter's model does *not* contain a focal firm, even if the analysis is typically carried out from a focal firm's point of view. The figure

shows five basic competitive forces which are believed to determine the state of competition faced by a firm in an industry and which need to be monitored and understood for successful adaptation to occur.

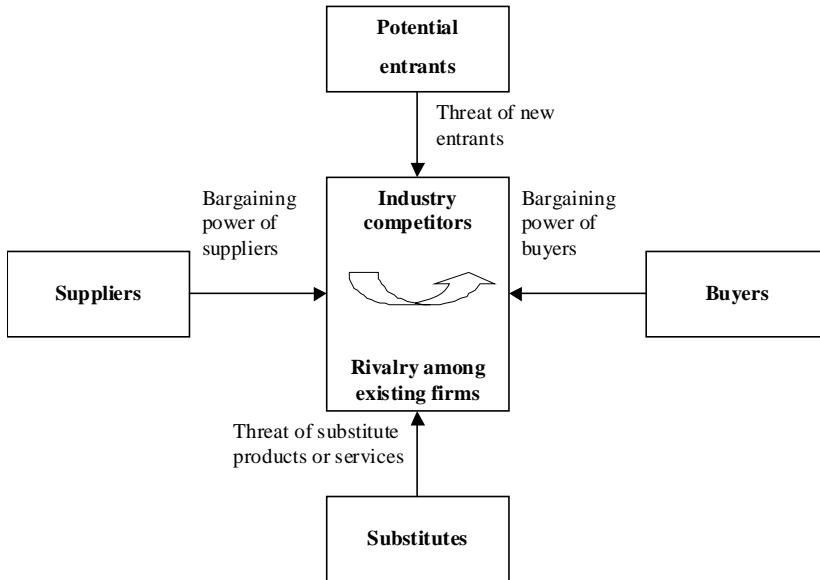


Figure 1. Forces driving industry competition. (Porter 1980, p. 26)

If we take Porter's view, the *assumptions about environmental structure* is that the relevant environment consists of a set of competitive forces in the industry or industries in which a firm competes. Porter does, however, provide a couple of passing references to factors in the macro environment – a theme more explicitly developed by Fahey and Narayanan (1986). Therefore, under this perspective, the environment is not just the industry but may consist also of social, political, economic and technological segments above the level of industry. The *level of analysis* usually employed in this perspective, by Porter as well as by other authors, is that of the organization set, which means that analysis is conducted from the viewpoint of a specific focal organization.

Moves by competitors can alter prevailing relationships and thereby change the pattern of forces in a firm's environment. Therefore, from this perspective, *environmental change* occurs as a result of certain evolutionary processes that originate from both interactions among competitors and events in the general environment (e.g., product innovation and new government policies) [Lenz and Engledow 1986]. In either case, the effect is to erode a prevailing equilibrium among the underlying structural features of an industry. This sets the stage for the emergence of a new pattern of competitive forces but change is not random. To adapt to these changes and to *gain knowledge of the environment*, it is suggested that organizations should gather information about their environments through the implementation of a formalized competitor analysis system (Porter 1980) although it is also possible to utilize more flexible and less

formalized approaches for environmental scanning (Aguilar 1967; Hambrick 1981, 1982).

Ontologically, the adaptive perspective take a position close to realism, that is, the social world external to individuals or organizations constitute a real world made up of hard, tangible structures that exist as empirical entities so that an industry, for example, exists independently of an individual or organization's perception of it. *Epistemologically*, the adaptive perspective is close to positivism in the sense that it seeks explanation and prediction since objective knowledge is possible. Objective knowledge of, say, competitors may be gathered a priori and then serve as input when formulating strategies. In terms of *human-nature thinking*, the adaptive perspective advocates a voluntarist view where individuals and/or organizations are viewed as autonomous and free-willed. Typically, a great deal of discretion is thought to reside in the hands of managers or other members of an organization's dominant coalition.

The resource-dependence perspective

For certain purposes, the resource-dependence perspective may be viewed as a special case of the adaptive perspective. This perspective shares the emphasis on adaptation but it also shows similarities with the adaptive perspective in terms of assumptions about the environment and level of analysis. The structural properties of the environment are, however, not far removed from the cognitive perspective. Furthermore, the resource-dependence perspective has a prime focus on the importance of resources – a feature shared with the population-ecology perspective. We will therefore review it in some detail since it merits attention in its own right.

The resource-dependence perspective was born in the early 1960s when Levine and White (1961) argued that the behavior of organizations in the social-service sector could be explained by examining inter-organizational exchanges. Government regulation and support were critical to such organizations which also operated in situations of resource scarcity and depended upon other agencies and organizations for much of what they required. Pfeffer and Salancik (1978, p. 2) pointed out that:

“The key to organizational survival is the ability to acquire and maintain resources. This problem would be simplified if organizations were in complete control of all the components necessary for their operation. However, no organization is completely self-contained. Organizations are embedded in an environment comprised of other organizations. They depend on those other organizations for the many resources they themselves require”.

The idea of resources being important to organizations is not a new one. Penrose (1959) gave them a central role in firm's strategy formulation, as did Emery and Trist (1965) who suggested that different ideal types of environments differ in how resources are distributed. Working in the same tradition as Penrose, that is, by focusing on strategy formulation based on firms' resources, we also find the work of Barney (1991, 1995), Black and Boal (1994), Conner (1991), Conner and Prahalad (1996), Grant (1991), Peteraf (1993) and Wernerfeldt (1984). Although noting the importance of resources to

organizations and how resources can serve as a base for strategy formulation, authors adhering to a resource-based view of the firm do not usually highlight the question of how these resources are acquired, nor the interdependence that organizations face with regard to other elements in the environment when in need of them.

Pfeffer and Salancik (1978) stressed the thesis that to survive, an organization requires resources but failed to provide a clear definition of what resources really are (these authors refer to electricity, workers, information, monetary resources, etc., but it seems as if resources can be almost everything). When acquiring these resources, the organization must interact with others (usually other organizations) who control these resources. This fact makes an organization dependent on its environment. When transacting with others for necessary resources, these others attain power over the focal organization. Therefore, due to resource dependence, organizations are more or less externally controlled. Pfeffer and Salancik (1978) utilized Thompson's (1967) definition of dependence by claiming that an organization is dependent on some element in its environment: (1) in proportion to its need for resources or performances which that element can provide, and (2) in inverse proportion to the ability of other elements to provide the same resources or performance.

The degree of control others have on a focal organization is explained by how dependent that organization is on others for pursuing its goals. Few but large exchanges usually imply that the degree of external control is greater. An organization can, however, reduce its dependence by avoiding single large exchanges. It is therefore suggested that organizations develop in a way that allows them to depend on a variety of exchanges, thereby being less dependent on a single or a few exchanges.

However, the problem is not merely that organizations depend on others in the environment but also that the environment is not dependable. Environments may change, new organizations enter and exit and the supply of resources may become more or less scarce but a focal organization can also change its activities in response to environmental factors through adaptation. Hence, the *focus of enquiry* is how the environment affects organizations. Furthermore, the *salient assumptions* underlying the resource-dependence perspective are that organizations are constrained by dependence on resources that others possess, which allows others to exercise control over a specific focal organization. An organization can, however, alter these dependences through a process of adaptation.

The assumption is that *the environment is analyzable*. Even if it is simply the case that many of the things that affect organizational results are not controlled by organizational participants, the managers of organizations can discover and analyze an organization's dependences (for example through information systems), and then take appropriate action to reduce these dependences. The organization may maintain discretion by à-priori identifying alternative sources of supply, by using alternative resources, through diversification, and by other means.

The organization is also considered to have boundaries. Pfeffer and Salancik (1978) argued that the organization ends and the environment begins at the point where the organization's control over activities diminishes and the control exercised by other organizations or individuals takes over since it is behaviors that are organized, not people. Thus, by focusing on activities instead of actors,

it is possible for a person to be both part of an organization and part of its environment as a result of different behaviors occurring at different times. The organization's boundary can then be defined by focusing on activities rather than actors. Hence, where the influence of the focal organization is greatest, those activities are included within its boundaries.

With regard to the *assumptions about environmental structure*, Pfeffer and Salancik (1978) suggested a division into three levels of environment. At one level, the environment is believed to consist of the entire system of interconnected individuals and organizations that are related to each other and to a focal organization through transactions. The second level, more narrowly defined than the first, is the set of individuals and organizations with whom the organization directly interacts. This second level of environment is not, however, the one that determines organizational action since it is too large to be observed and registered. Therefore, the third level of the organization's environment is the one that is perceived and represented – *its enacted environment*. The enacted environment is that part of the environment that the organization has perceived, attended to, interpreted, and given meaning to (Pfeffer and Salancik 1978, p. 72-74).

Further, it is argued that these three levels of environment are related since: (1) the larger environment can impact on the set of transactions between a focal organization and other individuals/organizations and (2) transactions occurring at the second level are, in turn, conceived to be the raw material out of which the enacted environment is formed. The enacted environment does influence organizational actions while events at the other two levels may only affect its outcomes (Pfeffer and Salancik 1978). From this perspective the *level of analysis* is that of the organization set; the environment is viewed from the standpoint of a specific focal organization (Scott 1998).

Given the focus on resources, the *origins of environmental change* basically refer to changes in resource distribution. Since new organizations can enter and exit the environment, the supply of certain resources may become more or less scarce. When these changes occur, the definition of a critical resource may also change. Organizations may, for example, become more vulnerable if changes in the environment mean that certain resources are no longer assured (Pfeffer and Salancik 1978).

If organizations adapt to their environments and if the environment, in turn, constrains and influences behavior, then the question of how organizations learn, that is, how they *gain knowledge of the environment* is an important one. Pfeffer and Salancik (1978) are of the opinion that, as a result of past experience, organizations learn what portions of the environment merit their attention. Since an enacted environment determines organizational action, the organization responds to what it perceives and believes about the world. The enactment process, in turn, is largely dependent on information so these researchers suggest that attention has to be devoted to information-gathering activities since effective action is more likely if the context is accurately perceived. Examples of such activities might be the establishment of scanning units or information systems.

In terms of *ontology*, the resource-dependence perspective may fall somewhere in between realism and nominalism. At one level, the perspective recognizes a “real world” but, on another, it opens up for nominalist ideas due to its recognition of an enacted environment. *Epistemologically*, the perspective

again seems to fall somewhere in between, but perhaps closer to positivism than anti-positivism due to the recognition that objective knowledge is possible. In terms of *human-nature thinking*, the resource-dependence perspective takes a position closer to determinism than voluntarism due to its emphasis on external control.

The thesis that environments consist of underlying structures that are revealed to inquisitive discoverers, as in the adaptive and to some extent the resource-dependence perspectives, runs contrary to the view that organizations create or invent the environment to which they respond – a perspective we turn to next.

The cognitive perspective

Those advocating a cognitive perspective on the environment have a radically different view on the meaning of this concept. In their opinion, perceptions and actions have a strong influence on organizational responses to the environment (Child, 1972). As Starbuck (1976, p. 1080) argued:

“The same environment one organization perceives as unpredictable, complex, and evanescent, another organization might see as static and easily understood . . . to learn an environment’s causal structure solely through observation of naturally occurring phenomena is virtually impossible, because autocorrelations among successive observations can be produced either by a variable’s dependence on its own past values or by interdependence among groups of variables. The abstract feasibility of sorting out correct from incorrect explanations only becomes practically relevant after the perceiver has accumulated literally tens of thousands of successive observations, and by that time, the causal structure may well have shifted to a new form. Consequently, a perceiver’s ability to organize and interpret his observations depends very strongly on theories and beliefs he holds a priori, and he tends to learn what he already believed”.

This quotation implies a couple of things. First, organizations’ perceptions and interpretation of the environment are important. Second, to understand the environment in an objective sense is virtually impossible due to: its complexity, and the limited information-processing capabilities of organizations. Therefore, this perspective leads to the assumption that *the environment is unanalyzable* (Daft and Weick 1984) so that organizations do not primarily focus on reducing uncertainty through scanning and information-processing activities but instead aim at reducing “equivocality”. Equivocality means unclear, messy and ambiguous - a situation where multiple meanings exist. Under such circumstances, new information may even increase uncertainty as it can be interpreted in many different ways. To cope with situations of high equivocality, such as an unanalyzable environment, managers create or enact an answer rather than learning it from new data and information (Daft and Lengel 1986, p. 554).

What people refer to as their environment is generated by human actions and accompanying intellectual effort to make sense out of these actions (Smircich and Stubbart 1985). How enactment is done is what an organization knows, and the final product of enactment will be a cause-map. Therefore, from this

perspective, the *salient assumptions* are that the environment is not discovered but instead created out of equivocal information and that it becomes known through a process of enactment. Furthermore, the *focus of inquiry* is placed on how organizations and individuals go about understanding their environment.

The concept of a cause-map or causal map implies that “the environment” is embodied in a cognitive structure, a statement that captures this perspective on the *assumptions about environmental structure*. A cause-map thus characterizes retained content and consists of inter-connected variables (Weick 1979, p. 132). There are several related terms that describe this phenomenon, for example, interpretive schemes (Bartunek 1984), mental maps (Hedberg and Jönsson 1978), cognitive maps (Axelrod 1976). To review and compare them is beyond the scope of this work, and we shall focus on only one of them, that is, cause-maps. To understand the concept of environment as a cause-map, we need to examine four related concepts: ecological change, enactment, selection and retention.

Ecological change

The attention of people is triggered by the mechanism of ecological change, which means that something unexpected occurred – some kind of change that involve people and activities and that call for attention. Ecological change is “the raw materials for sense-making” (Weick 1979, p. 130) and highlight the fact that people tend to take for granted things that run smoothly. Attention becomes active only under occasion of change, and then follows enactment.

Enactment

When change that call for attention occur, an actor may take some action to isolate those changes for closer attention, an action called “bracketing”, which is one form of enactment. The other form of enactment occurs when the actor does something that produces an ecological change (Weick 1979). To enact an environment can imply the creation of the appearance of an environment or simulation of an environment. Organizational members act as if they have environments, create the appearance of environments or simulate environments for the sake of getting on with their business.

These organizing acts are acts of invention rather than acts of discovery and they involve a superimposed order rather than an underlying one (Weick 2001, p. 183-185). The term “enactment” is used to preserve the point that, when people act, they bring events and structures into existence and set them in motion. People who act in organizations often produce structures, constraints and opportunities that were non-existent before they took action. Enactment is a process as well as a product, an enacted environment (Weick 1988, p. 306).

Selection

Enactment, however, only provides equivocal raw materials that may either be seized or dismissed by the selection process, which involves the imposition of structures for the purpose of reducing equivocality. These structures are referred to as cause-maps containing interconnected variables. These cause-maps are built up of past experience and, when they are superimposed on

current events, they may provide a reasonable interpretation of what has occurred or they may lead to even greater confusion. Those maps that are helpful tend to be selected, and those that are not to be eliminated (Weick 1979).

Since the final product of enactment will be a cause-map, and since the enacted environment is stored therein, the *origins of environmental change* refer to changes of or modifications in these cause-maps. Cause-maps may be the construction of one single individual although they may also be found at the group or organizational level. Therefore, one may also view cause-maps as collective structures (Weick 2001, p. 313-315) and, from this perspective, the *level of analysis* may be that of the organization set but also that of the individual/organizational member.

Retention

Retention follows selection, and it affects both selection and enactment, and these effects may be either direct or inverse depending on whether the person decides to trust his/her past experience or disregard it. Retention involves the storage of the products of successful sense-making; products that Weick refers to as enacted environments. An “enacted environment” is a sensible version of what the equivocality was about although other versions could equally have been constructed. The term “enacted environment” is used to emphasise that meaningful environments are outputs of organizing process, not inputs to it (Weick 1979).

Since, from this cognitive perspective, environments are outputs of organizing and not inputs to it (i.e., they are invented or created rather than discovered), the thesis of organizations or environments having boundaries does not apply. That is, distinct organizations cannot be differentiated from their distinct environments. Thus, talk about organizations facing a certain environment is a case of misplaced correctness. The inclusion of the article “the” before “external environment” implies a unique, objective environment that is independent of actors and actions and that appears similar to all observers. The external environment also implies another environment – an internal one – that can be observed and separated from the external. While the categories of external/internal may exist logically, they do not exist empirically. That is, the logical distinction does not correspond to an empirical distinction (Weick 2001, p. 183-185). Given this perspective, knowledge of environment is gained through learning – as expressed in Figure 2.

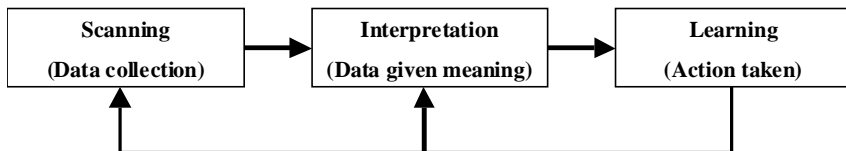


Figure 2. Relationships among organizational scanning, interpretation and learning. (Daft and Weick 1984, p. 293)

Learning

In Figure 2, “Scanning” refers to data collection, which may be accomplished through a variety of means. “Interpretation” means giving meaning to data, that is, to develop some kind of shared understanding in the form of cause-maps among organizational members (Daft and Weick 1984). Interpretation is important since people make sense of their situation by engaging in an interpretive process that forms the basis for their behavior (Smircich and Stubbart 1985). The last stage of “learning” is distinguished from interpretation by the concept of action because learning involves a response or action based on the interpretation. Learning is therefore viewed as a process of putting cognitive structures into action but it may also provide new data for interpretation or lead to a new need for scanning (Daft and Weick 1984).

Ontologically, the position encompassed by the cognitive perspective is close to nominalism: there is no “real” structure to the environment. Rather, concepts and labels are viewed as tools for describing and making sense of the external world. *Epistemologically*, the cognitive perspective is clearly anti-positivistic in the sense that the social world is relativistic. This perspective aims to understand “environment” at the level of subjective experience, within the frame of reference of the participant as opposed to that of the observer of action. In terms of *human nature-thinking*, the cognitive perspective advocates a voluntarist view whereby individuals and/or organizations are viewed as autonomous and free-willed since they are the creators of their environments.

While the cognitive perspective takes the organization set or the individual/organizational member as its level of analysis, our final perspective is concerned with aggregates, that is, populations of organizations.

The population-ecology perspective

Population-ecology approaches to organizational analysis focus aggregates of organizations – addressing issues such as market entry and exit and firm growth (Swaminathan 1996) and thus contrasting with and complementing more micro-analytical approaches such as the cognitive perspective. The population ecology perspective differs from the other three considered here not only in terms of the emphasis it puts on selection but also in the level of analysis. As Hannan and Freeman (1977, p. 940) expressed it:

“From a population ecology perspective, it is the environment which optimizes. Whether or not individual organizations are consciously adapting, the environment selects out optimal combinations of organizations. So if there is a rationality involved, it is the “rationality” of natural selection”.

“Selection” occurs as a consequence of environmental pressures: if an organization fits the environmental requirements, it is selected (Aldrich 1979). Therefore, selection refers to a change in the composition of a set of organizations. One organizational form comes to dominate because more of such organizations arise and fewer fail than is the case with alternative forms (Carroll and Hannan 1995). Hannan and Freeman (1977) argued for selection as a more adequate explanation of organizational change than adaptation due to

the severe limitations of organizations' ability to adapt, that is, there are a number of processes that create structural inertia. The main idea is that, once organizations become established, they are relatively inert and stable structures that are programmed by conditions at the time of their founding (Sandell 2001).

Inertial pressures are thought to arise both from internal structural arrangements and environmental constraints. Internal constraints that lead to structural inertia are investments in plants, equipment and specialized personnel – assets viewed as sunk costs when attempting to change. Organizational decision-makers face severe constraints on the internal information they receive as well as internal political constraints (e.g., departments battle over fixed resources), besides being constrained by their own history (i.e. path-dependence). The external pressures leading to inertia are, for example, legal and fiscal barriers to market entry and exit and the problem of obtaining legitimacy for one's operations. Furthermore, the internal constraints on the availability of information are paralleled by external ones. All these factors are believed to delimit the ability of firms to adapt, thus underlining the importance of selection (Hannan and Freeman 1977). In sum, organizations are characterized as being structurally inert – if they adapt at all, they do so slowly (Peli et al. 1994).

Thus, the *salient assumptions* in the population-ecology perspective are that organizations' ability to adapt is severely constrained since organizations are viewed as structurally inert and slow to change. Instead, environmental conditions select certain types of organizations for survival while other forms diminish or disappear. Selection is, however, not just a matter of life or death because positively selected organizations are more fit vis-à-vis a particular environment than those that fail although selection pressures are also evident in situations where relative effectiveness, rather than survival, is the issue. Therefore, one can consider more effective organizations as more fit than less effective organizations (Aldrich 1979).

Selection due to inertia raises two important questions: What is being selected and by whom? It is assumed that essential differences among types of organizations may be captured by the concept of "organizational form" (Aldrich 1999, p. 36-39) which summarizes the core properties that make a set of organizations ecologically similar. A set of organizations possesses the same "form" in this sense if environmental changes affect them similarly (Carroll and Hannan 1995). Therefore, the concept of organizational form provides some kind of uniform character. The organizational form is, however, only relevant within a system which is usually defined by geography or by market or product considerations. Then, given a system definition, a population of organizations consists of all the organizations within a system boundary that have a common form (Hannan and Freeman 1977).

Who then selects? The selecting agent is believed to be the environment although not all selection results from the working of an invisible hand. Selection criteria may, for example, be the result of political decisions influenced by other organizations (Aldrich 1999). Ecologists thus downplay the role of adaptation but they also seem to agree that organizations do formulate strategies and do try to adapt to environmental contingencies. Therefore, at least some of the structural variability observed may be the result of adaptive behavior but this is viewed as a minor part although some researchers have recently relaxed the assumption that adaptation is a rare phenomenon, thereby

focusing on the relative roles of adaptation and selection in evolutionary change (Amburgey and Hayagreeva 1996).

Clearly, the *focus of inquiry* is placed on how the environment affects organizations, mainly through the mechanism of selection. The *assumption about the environment* is that it is unanalyzable or at least close to unanalyzable. Carroll and Hannan (1995) argued that organizations cannot accurately and consistently understand variations in unpredictable turbulent environments over time. Firstly, organizations are frequently unable to accurately predict future states of the environment. Secondly, they cannot be confident that designated modifications will have the intended effects, that is, the cure may turn out to be worse than the disease. Therefore, the analysis of and adaptation to the environment are viewed as essentially random with respect to the future.

The issue of whether organizations have boundaries is discussed but not clarified. As Aldrich (1999) noted, population ecologists tend to treat the coherence of organizations as bounded entities as relatively non-problematic. This ambiguity manifests itself in the discussion of the origins of inertia which is thought to arise both “inside” the organization and in its “environment”. Therefore, the issue of where to draw the boundary between an organization and its environment appears unspecified.

With regard to the *assumptions about environmental structure*, population ecologists point to the importance of resources and other organizations. Carroll and Hannan (1995) argued that the environment of each population consists mainly of other organizations. These include, for example, the government that claims jurisdiction over activities, other firms that supply technology and materials, organizations that produce similar products or services, and those that purchase or use the products or services offered. Since these others control resources needed for operation, the environment sets the conditions under which organizations operate and survive. Hence, environments affect organizations through the process of making available or withholding resources, and organization forms can be ranked in terms of their efficacy in obtaining resources (Aldrich 1979). Populations are dependent upon distinct combinations of resources supporting them, and these combinations are referred to as “niches” (Aldrich 1999).

The niche concept provides a way of describing the effects of environmental variations and competition on the growth rates of populations of organizations (Hannan and Freeman 1989). The fundamental niche of a population is thought to consist of the set of all environmental conditions in which the population can grow or at least maintain its numbers. Moreover, competing populations usually restrict the range of conditions within which a population can be sustained since they compete for the same resources. The term “realized niche” refers to the restricted environmental space in which a population can be sustained despite the presence of competing populations of organizations. This realized niche is a subset of the fundamental niche and is usually much smaller. Therefore, resource levels determine the carrying capacity or equilibrium size for the organizational population (Aldrich 1999).

The *level of analysis* usually employed is populations of organizations. Ecological research has been primarily concerned with aggregates of organizations and has thus downplayed the role of individual actors and their interpretations (Aldrich 1999) although ecological analysis can also be

conducted at the individual or community level (Hannan and Freeman 1977, p. 933) but this rarely seems to be the case. It should also be noted, however, that populations of organizations are not immutable objects in nature but abstractions useful for theoretical purposes and they are specific time-and-space instances of organizational forms (Carroll and Hannan 1995).

When it comes to the *origins of environmental change* under the population-ecology perspective, changes in an organization's environment usually involve changes in the composition of activities of other organizations and organizational populations as well as variations in the abundance of resources on which different organizations and organizational populations depend (Carroll and Hannan 1995). Addressing the question of *how to gain knowledge of the environment*, no guidelines relating to this question could be located within the population-ecology perspective.

Ontologically, the population-ecology perspective takes a position close to realism since concepts such as niches, populations and systems clearly exist without the perception of single actors, and the world is made up of hard, tangible structures that exist as empirical entities. *Epistemologically*, this perspective is close to positivism in the sense that it seeks to explain and predict the development, birth and death of populations of organizations, and objective knowledge of such things seems possible to obtain. In terms of *human-nature thinking*, the population-ecology perspective is clearly deterministic in that it views organizations as determined by the situation or environment in which they are located. Biological theories and a Darwinian line of thought inspire a great deal of this perspective.

The perspectives compared and contrasted

Without doubt, there are similarities among the perspectives but obviously there are also significant differences.

Differences

One main difference among the perspectives clearly lies in their *salient assumptions*. Concerned with areas as diverse as adaptation, external control, environmental creation and natural selection, this salient-assumptions dimension positions the perspectives as different and distinct when compared with one another. In both the adaptive and the resource-dependence perspectives, the environment is assumed to be *analyzable* while the cognitive and the population-ecology perspective assume it to be *unanalyzable*. Organizational boundaries are implicitly assumed in both the adaptive and the population-ecology perspectives while being defined in terms of influence over activities in the resource-dependence perspective. Under the cognitive perspective, the concept of boundaries does not apply since environments are outputs of organizing and not inputs to it. In terms of *focus of enquiry*, the cognitive perspective is concerned with how organizations or individuals relate to, create and make sense of their environments while, in the remaining three perspectives, the emphasis is placed more on how the environment affects organizations (even though the ideas of how the environment actually does affect firms clearly diverge). *Environmental structure* is another dimension

pointing to differences among these perspectives. Table 1 offers details on this last dimension as well as on the others.

	Adaptive perspective	Resource-dependence perspective	Cognitive perspective	Population-ecology perspective
Salient assumptions	Organizations are active rather than passive, and they can change in response to changing environments through a process of adaptation	Organizations are constrained by external dependence on resources controlled by others	Organizations create an environment of equivocal information through a process of enactment	Inertia constrains the adaptation of organizations while selection explains change of forms/changes in effectiveness
Assumptions about the environment	Analyzable, but boundaries are not clarified although implicitly assumed	Analyzable, with boundaries defined in terms of influence over activities	Unanalyzable, with no boundaries	Close to unanalyzable, with boundaries not clarified but implicitly assumed
Focus of inquiry	How the environment affects organizations	How the environment affects organizations	How organizations or individuals go about understanding their environment	How the environment affects organizations
Assumptions about environmental structure	The environment is made up of competitive forces/factors in an industry as well as of macro factors above the industry level	The environment consists of three levels: the entire system, others with whom an organization directly interacts and the enacted environment	The environment is embodied in a cognitive structure, a cause-map	The environment consists of other organizations and resources; combinations of resources are referred to as niches
Level of analysis	Organization set - environment viewed from the standpoint of a specific focal organization	Organization set - environment viewed from the standpoint of a specific focal organization	Organization set or individual/organizational member	Usually populations of organizations
Origins of environmental change	Actions of competitors and changes in macro-factors	Changes in resource distribution; mainly in the supply of resources	Changes of or modifications in cause-maps	Changes in activities of other organizations or populations and variations in abundance of resources
How to gain knowledge of the environment	Formalized competitor analysis system or broader, more flexible environmental scanning	Better information acquisition allows for better enactment	Scanning and interpretation of data serve as a base for learning	No guidelines found within this perspective
Ontology	Close to realism	Realism/Nominalism	Nominalism	Close to realism
Epistemology	Close to positivism	Positivism/anti-positivism	Anti-positivism	Close to positivism
Human-Nature	Voluntarism	Closer to determinism than voluntarism	Voluntarism	Determinism

Table 1: A summary of the different perspectives

Similarities

Similarities are found in terms of *level of analysis*. The adaptive, the resource-based and the cognitive perspectives tend to view the environment from the standpoint of one focal organization, that is, they all take the organization set as their level of analysis. The population-ecology perspective deviates from the other three and is usually concerned with populations of organizations even if other levels are at least plausible.

The origin of environmental change is also one of those dimensions that unite more than divide. The adaptive, the resource-based and the population-ecology perspectives all seem to point to the importance of other social actors (e.g., organizations and individuals) as important causes of environmental change. The latter two also point to the importance of changes in resource

distribution. The cognitive perspective, however, points to changes within the frames of references of the creators of the environment as well as to changes of or modifications in cause-maps.

To gain knowledge of the environment, all perspectives but the population-ecology one point to the importance of information. Gathered and used in one way or the other, information about the environment is thought to allow for a better and more complete picture of a firm's outer context – whether that context is thought to be “real” or “enacted”. In the population-ecology perspective, no guidelines for this dimension have been identified, perhaps due to the emphasis on selection – that is, individual organizations are seen as relatively powerless. Also, this perspective is focused on explaining population-level change rather than organizational action, as Hamrefors (1999 p. 46) illustrated: “If one were to subscribe to this view, environmental scanning would be a futile, superstitious kind of activity.” Finally, different *meta-theoretical positions* are associated with different perspectives as is summarized in table 1. These dimensions will be further highlighted in coming sections. After describing the four perspectives, as well as identifying their similarities and differences, the next section discusses why the adaptive perspective is so popular and frequently utilized in comparison with the other three.

The dominant position of the adaptive perspective

In the mainstream organization theory/organizational behavior and management literatures, successful organizations tend to be viewed as active and thus able to change as the environment changes. It is usually assumed that the environment of organizations can be analyzed and understood even though effort is seldom directed at trying to separate distinct organizations from their environments. Furthermore, the environment is often thought to consist of industry forces/factors, as well as factors above industry level. It also seems to be widely believed and accepted that knowledge of such factors can be gained through environmental scanning activities or market research even if other terms might be used to describe the collection, sharing and use of information from the environment (Frishammar 2002). In other words, a position close to that of the adaptive perspective is usually taken. This may be because, as Tsoukas (1998) argue, mainstream organization theory has been extremely slow in incorporating novel lines of thought such as the cognitive perspective.

Another reason may be the prominent position of the realist paradigm in the field of strategy and environmental analysis, which suggests that things exist independently of their being theorized or experienced (Godfrey and Hill 2000). A further reason may be today's over-rational view of managers and management whereby managers are often used as a unit of analysis in, and a target audience for, research on organizational environments. Managers are generally expected to formulate and implement strategies, to achieve goals and objectives and to lead their companies to market performance as well as financial success. These expectations are likely to emerge from several directions: stockholders, financial institutions and employees not to mention the academic institutions where many managers receive their training.

Consistent with the realist paradigm and the over-rational view of managers and management as well as with the adaptive perspective is the common use of frameworks such as Porters five-forces, political, economic, social and

technological (PEST) analysis and the opportunities and threats (OT) component of SWOT. Hence, the fact that organizations are externally as opposed to internally controlled (Pfeffer and Salancik 1978) or selected by the environment for survival (Hannan and Freeman 1977) might be difficult to comprehend. Besides, to advocate publicly the idea that the environment actually resides *inside the head* of organizational participants (e.g., Weick 1979) may, in the eyes of other people, single out a manager as being odd or eccentric. So, the choice of a position close to that of the adaptive perspective might follow what March and Olsen (1989) referred to as the “logic of appropriateness” – that is, the logic of action that aims not at the choice of an optimal alternative but at an action that will be recognized and accepted by an audience residing within the same institutional setup. Instead of staying “in touch with reality” such actions allows a person to stay “in touch with their identity” (March and Olsen 1989, p. 161) by making an appropriate choice in line with the current frame of reference of oneself and significant others.

Other reasons contributing to the popularity of the adaptive perspective is the fact that it has *strong general applicability and prescriptive value* (both terms have been borrowed from Lord and Maher (1990) who used them when comparing information processing models). *Prescriptive value* addresses the question of whether a perspective can serve as a base for analysis while *general applicability* answers the question of whether a perspective generates applications that people can easily apply. The adaptive perspective must be considered to score high on both these dimensions.

First, this perspective can clearly serve as a base for analysis because the environment is considered external to an organization, the two can be separated, the environment is assumed to be analyzable, objective knowledge of the environment can be reached and a voluntaristic view is advocated. Second, the adaptive perspective also generates applications that people can easily apply. Porter’s (1980) five forces framework is one example of such an application – irrespective of how accurate or inaccurate the results of such an analysis may be. In contrast, the resource-dependence perspective may appear too specific (with a focus on resources only) while the population-ecology perspective neither provides guidelines for analysis nor assumes the environment to be analyzable. And even if an analysis could be made, adaptive actions do not contribute much due to selection pressures and structural inertia. The cognitive perspective is neither likely to be sufficient for the average manager/actors trying to understand or analyze her/his environment, as it might appear too fuzzy and unclear in shape.

Limitations in using a single-frame approach: Toward an integration of perspectives

Still, in order to allow for a more complete and accurate picture, a broader perspective on environment than that provided by the adaptive perspective seems necessary for both managers and academia. A sole reliance upon the adaptive perspective on an abstract level might lead to the application of too narrow models and solutions on a practical level. Such a strategy may for example lead to “shopping lists” of discrete issues and factors captured under generic headings that are supposed to be monitored (see the paper by Burt and colleagues in this issue).

It is important to recognize that we tend to look at the concept of environment in terms of socially defined categories, with the adaptive perspective being the dominant one. Being captured in and aware of only one category or perspective means looking at the world from one angle only. Once we recognize this, it should be possible to break away from such a position and develop a more complicated and realistic understanding of the environment. That is, a broader view involving a combination of perspectives is likely to be beneficial when trying to make sense of environmental changes.

One way to accomplish this objective is to argue for a constructivist approach to understanding the environment. *Constructivism* occupies a methodological space characterized by ontological realism (as in the adaptive and population-ecology perspectives) and epistemological relativism or anti-positivism (as in the cognitive perspective) [Mir and Watson 2000]. This constructivist approach works at the level of assumptions rather than at the level of techniques. In this tradition, the manager is seen as an active participant in the construction of his/her own environment but the existence of the phenomena themselves (e.g., cars, facilities and co-workers) is taken for granted. The constructivist approach is helpful here simply because its epistemological assumptions are better fitted with reality; “environments” of organizations must be understood at least partially as socially constructed phenomena.

Thus, problems occur when popular models and frameworks built on premises of universality associated with the adaptive perspective extend into the epistemological realm. This is problematic since such frameworks provide their users with insensitive representations and inaccurate pictures of the landscape, or perhaps even make them see things that are not there. It is problematic since such frameworks are believed to mirror reality. In short, the applications generated by the adaptive perspective are neither the only ones nor the best ones to gain knowledge of the environment. A related example illustrating the problems arising from a sole reliance on too narrow frameworks or models was the use (and misuse) of formal planning and portfolio analysis approaches to strategy, described by Hunt (2000) as one of the biggest collective errors ever made by businesses.

If the notion of epistemological relativism is accepted along with the notion of ontological realism, some interesting implications appear. We can then view managers and other organizational participants as actors instead of reactors in the construction process of their environment. Such a strategy points to the limitations in the idea that environments constitute something to be adapted to, to control or to get controlled by. Thus, instead of focusing solely on adapting to e.g. industry demands or social trends, one can realize that one's actions actually contribute to creating trends. As Smircich and Stubbart (1985) suggested, we can rethink constraints, threats and opportunities. If we accept the premise that social reality is formed, invented and constructed rather than discovered, managers and other organizational participants can be advised to look to themselves first, to their actions and inactions, and not to an “objective environment” for explanations of their situations. In a similar vein, context is emphasized more strongly, thereby realizing that “the environment” is not just organization-specific but that multiple realities of it may exist within a single organization.

As Smircich and Stubbart (1985) also suggested, environmental analysis can then be seen as an imaginative, creative exercise and less as sending people “out” to collect facts or information. Many managers and administrators as well as researchers are likely to benefit from such an approach. By combining perspectives and/or looking at the concept of environment from different perspectives it should be possible to make more realistic and useful assumptions about environmental developments, irrespective of whether we assume environments to be real or invented.

Notes

1. Both Fayol and Taylor ignored the environment in their texts in that they failed to discuss how the environment could affect organizations. It is quite possible, however, that these works actually reflected changes in the environment at that time (for example, a high rate of labor turnover in the case of Taylor).

2. The term “environment” may be used for other purposes as well. One example is the increasing concern in society for the emerging quality of the natural or physical environment. Even if it is obviously the case that loss of biodiversity and change of bioregions and natural environments clearly impacts on human habitation and organizational activities, these issues fall outside the scope of the present research purposes. For a review of different paradigms in human nature thinking, as well as an attempt to relate them to the concept of organizational environment, see Egri and Pinfield (1996).

3. According to Burrell and Morgan (1979), ontology concerns the very essence of the phenomena under investigation, that is, whether reality is “objective” or a product of individual cognition. Epistemology is defined as assumptions of the grounds of knowledge – how we can understand the world and communicate this knowledge to others. The human-nature dimension concerns assumptions of whether humans have a free will or not, with a special focus on the relation between human and environment.

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Paper VI

Information Use in Strategic Decision-making

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Information use in strategic decision making

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Keywords

Information, Intelligence, Strategy, Decision making

Abstract

This paper addresses the issue of information use in strategic decision making. The study employs a case study as a research strategy together with personal interviews and documentation as means of data collection. The starting-point is four specific strategic decisions recently made by medium-sized companies in Sweden. The study provides the reader with an insight into management information behaviour when taking strategic decisions, by addressing questions such as: Why is information used? What kind of information does management use? How do they obtain it? And finally, where do they obtain it? In addition, a short review of the literature pertaining to the above stated questions is provided.

Introduction

What is the foundation underlying organizational decision making? This question is crucial since decisions, especially those of a strategic nature, tend to have widespread effects on organizational members, processes, and structure. This paper is concerned with one foundation of strategic decision making: the acquisition and use of information. In other words, our aim is to take a closer look at the information-gathering behaviour that underpins strategic decisions. More specifically, we aim to empirically address the why?, what?, how? and where? of this process. Thus, we conceive a firm's external environment to be a source of information (Aldrich and Mindlin, 1978) but also its internal environment, sometimes referred to as environment. To scan the environment in order to make better-informed decisions (Choo, 1996) is an important task on the corporate agenda. Environmental scanning, whether or not it is referred to as such (Frishammar, 2002), may be defined as "the activity of acquiring information" (Aguilar, 1967, p. 1) and is the method by which managers perceive events and trends (Hambrick, 1982). Acquiring information is imperative in ascertaining environmental change and has implications for strategic decision making (Lozada and Calantone, 1997). In this study, strategic decisions are concerned with long-term direction and are normally about trying to achieve some advantage for an organization (Johnson and Scholes, 1999). A decision is, in accordance with Mintzberg *et al.* (1976), defined as a set of actions and dynamic factors beginning with the identification of a stimulus for action and ending with a specific commitment to action. Strategic simply means important, in terms

of the actions taken, the resources committed, or the precedents set (Mintzberg *et al.*, 1976). Further, these decisions concern choices about issues that materially affect the survival prospects, well being and nature of the organization (Schoemaker, 1993). In this paper, where strategic decisions are studied retrospectively, we assume a rational/traditional perspective on strategic decision making (Hendry, 2000) in contrast with the interpretative view (see Laroche (1995)). More specifically, we aim to empirically address the following questions:

- Why is information used in strategic decision making?
- What kind of information is used in strategic decision making?
- How do decision makers obtain the information used?
- Where do decision makers obtain the information used?

Testing these questions empirically is justifiable, since comparable studies are often out-dated, made in other space-time chunks. Combining the questions into a single study was also considered to provide insight and add to the existing body of knowledge. In order to clarify, the aim here is not to study entire decision-making processes, but to study information[1] acquisition and use. Such activities must precede strategy formulation and decision making (Fahey and Narayanan, 1986). The next section of the paper, comprising the frame of reference, is intended to expand and further elaborate on these questions.

Frame of reference

Why is information used in strategic decision making? In organization science, it seems to be widely accepted that the purpose of



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information use is to reduce or remove uncertainty. Uncertainty could be defined as the difference between the information processed and the information required to complete a task (Tushman and Nadler, 1978; Kaye, 1995) or as an inability to predict accurately what the outcomes of a decision might be (Duncan, 1972). In a classic study, Milliken (1987) made a distinction between state, effect and response uncertainty. In the case of state uncertainty, administrators lack information about the nature of the environment. With effect uncertainty, the shortage of information is in knowledge of how environmental events or changes will affect the particular organization. Finally, in the case of response uncertainty, there is a perceived lack of information about what the organization's response options are and/or the value or utility of each course of action (Milliken, 1987).

What kind of information is used in strategic decision making? Information may be classified as soft or hard. Soft information consists of images, visions, ideas and cognitive structures. Further, soft information can also consist of multiple conceptual schemes in the form of frames of reference or worldviews (Häckner, 1988). Gossip and hearsay are also examples of soft information (Mintzberg, 1975). Soft information is tied to an individual person, and may be characterized as broad, general and subjective. In contrast, hard information is or can easily be quantified and processed with the help of analytical methods. Such information is generally expressed numerically and is operationalized and defined as numerical information generated, used, or reported in companies' financial accounting and control systems, calculation systems, cost accounting systems, production control systems and statistics from various sources (Häckner, 1988). The findings of Häckner (1988) indicate that different kinds of decision-making situations may call for different kinds of information, but usually one type of information is almost always combined at least to a limited degree with the other type.

How do decision makers obtain information? Starting with that of Aguilar (1967), previous research has shown that information may be obtained on a solicited or unsolicited basis. Solicited information includes, first, all information explicitly sought by managers (explicitly solicited), but also second, information given to managers because of organizational requirements (organizationally solicited). Unsolicited information includes all information that cannot be classified under the above

categories. This information may be classified as either directed (intentional and purposeful on the part of the source) or undirected communications (Aguilar, 1967).

Where do decision makers obtain information? Earlier findings indicate that executives and/or decision makers use different information modes to learn about the environment (Aguilar, 1967; Daft *et al.*, 1988). The distinction made is between external and internal sources of information. An external source originates outside the boundaries of an organization, while an internal source originates within an organization. These sources may, in turn, be further divided into personal and impersonal sources. Personal sources refer to direct human contact, while impersonal sources are written/non-verbal in nature (Daft *et al.*, 1988). Aguilar (1967) found that, for important external information, managers tend to rely almost as much on inside sources as on outside sources. In later studies, too, the results with regard to this question have been mixed (see Elenkov (1997) and Ghoshal (1988)). Personal sources, however, far exceeded impersonal sources in importance in the study of Aguilar (1967). This result is supported by Keegan (1974) and Thomas (1980), who found personal sources consistent with the informal, irregular scanning that typifies many organizations.

Method and approach

The research strategy used was case studies. The cases studied are strategic decisions made in four companies. We could not study all decisions – that would be too costly – although we could not manage with one either – due to what Galtung (1967) calls the *le cas pur* problem: the problem of finding the ideal case. Therefore we took some, i.e. four. All companies whose decisions are studied are located in Sweden and are briefly described below; the last three are listed on the OM/Stockholm stock exchange:

- 1 *Alpha*, a subcontractor to the heavy vehicle industry performing such activities as tool manufacturing, pressing, cutting, and surface treatment. The company had around 300 employees and the decision taken concerned buying another company with 50 employees. The reasons behind the purchase were to achieve economies of scale in production, computer systems and R&D. Moreover, the decision was perceived as a diversification response since the acquired company was active in another market niche, specialized in long series

employing automated production techniques. Finally, to expand in terms of volume was seen as necessary for long-term survival in the industry.

- 2 *Beta*, a company specializing in information logistics, graphic solutions and office supplies. The company had approximately 1,900 employees and the decision taken concerned buying a division with approximately 40 employees from a major corporation. Motives for buying were to strengthen the relationship with the selling company (an important customer) as well as to obtain a second production site situated in a different geographic area. Moreover, Beta had a deliberate wish for expansion within the area of information logistics.
- 3 *Delta*, a company focused on development, manufacturing and R&D in environmentally friendly products. The company had approximately 350 employees and the decision studied concerned selling off one of its divisions, which employed 50 persons. Motives behind the sale were that the division was not focused on environmentally friendly products, and did not share customers or technology with other divisions in Delta. Furthermore, the division faced fierce competition and was in need of increased economies of scale in purchasing and marketing, which constituted a large part of total costs. In addition, the sale generated funds for planned acquisitions. Finally, the division turned profits into losses for the period 2001, a further motive mentioned by management.
- 4 *Gamma*, a research-intensive firm active in the biotech sector. The company had approximately 300 employees and the decision studied concerned selling one of the two divisions constituting operations, employing 150 persons. Motives for the sale were a perceived lack of strategic fit between the two divisions, which meant that no synergies could be obtained. The division sold was also considered inferior in comparison with its competitors in terms of size, market share, and technology. Cultural differences between the two divisions as well as the need to strengthen the company's financial position were also mentioned as important reasons for this decision.

Analytical criteria for sampling were that companies were: medium-sized in terms of employees; had taken and implemented a strategic decision during the year 2001; and were active in different industries. Several interviews lasting between 45 minutes and

two hours were conducted at each company in order to allow for an accurate description of the decisions, thus comprising the empirical body of the study. All in all, 19 interviews took place at four companies: 17 interviews were conducted to address the research questions, and two provided valuable background information. The decision-making team at each company was identified by means of a snowball technique, asking each respondent who the other actors were. Each interview was recorded and included in a case-study protocol for each firm (Yin, 1994). To ensure construct validity, documentation in the form of annual reports, press releases, newspaper clippings and overhead materials was used to augment the interview data. As in most case studies, the sample size is limited and external validity questionable. Therefore, due to potential fallacies, no attempt has been made to generalize beyond the sample. The study is built around a limited non-probability sample and, hence, the results should be viewed more as hypothetical for what we might expect to find in other decisions than true for decisions universally. Unfortunately, no records of these decisions could be found, a problem also encountered by Mintzberg *et al.* (1976, p. 248), who stated that "Investigation of records is often impossible because strategic decision processes seldom leave reliable traces in the files of the organization".

Results

With regard to the first research question (Why is information used in strategic decision making?), it can be said that information is used for the purpose of reducing or removing uncertainty, as defined by Duncan (1972) and Kaye (1995). This fact is stated by a majority of actors in all four firms. Different actors use different terms to describe this, for example, risk reduction, identification of opportunities and threats etc. but they all seem to refer to the same concept[2], which is uncertainty. A summary of data for RQ1-3 can be found in Table I.

Judging from the empirical observations, it seems that the decisions made by Alpha and Beta were associated with greater effect uncertainty than the ones made by Delta and Gamma. The uncertainty reported by respondents was, however, non-existent, low or moderate in all decisions. In Alpha, uncertainty was of both state and effect character. The reasons for this uncertainty were a lack of funds for the acquisition, value of stock and inventories, the fear that

management would lose focus after the acquisition, and the fact that the acquired company was bankrupt. In Beta, all uncertainty experienced was of effect character; the decision taken was seen as potentially harmful to an existing relation with a major customer. Moreover, some of the other actors bidding for the division that Beta bought were customers of Beta, something that created uncertainty. In Delta, none of the respondents experienced any uncertainty whatsoever. In Gamma, the uncertainty experienced was mainly of effect character; a division was sold before important partnerships had been established, and the reaction of the stock market could not be fully anticipated.

With regard to the second research question (What kind of information is used in strategic decision making?), a classification into hard and soft information was adopted. In Alpha, decision makers tended to rely on soft information on average. In Beta, Delta and Gamma, hard information dominated on average. It should be stated, though, that all companies used a combination of soft and hard information, even if some individual respondents relied exclusively on either one or the other. Worth noting is that, independent of company or specific decision

taken, the combination of soft and hard information seemed to vary over time. A majority of respondents indicated that, at the beginning of a process, soft information predominates. Most respondents start out with soft information (visions, ideas, cognitive structures, etc.), and then move to hard/numerical information as the process unfolds. The picture provided by respondents is that soft information serves as a base for interpreting which hard information is relevant and which is not. At that stage hard information becomes more important, leading to the application of analytical methods for studying figures. At the end of the process, however, many respondents returned to soft information again. As indicated by a majority of the respondents, it is impossible to "count all the way". At the time when the actual decision is taken (i.e. strategic choice), intuition, cognitive structures etc. again come into play.

With regard to the third research question (How do decision makers obtain the information used?), a classification into solicited and unsolicited information was used, based on the findings of Aguilar (1967). The results show that all companies tend to rely heavily on information received on a solicited basis. In Alpha, Beta and Gamma,

Table I

Uncertainty experienced, information used, and ways of obtaining information

	Uncertainty experienced			Information used		How information was obtained					
	State	Effect	Response	Hard %	Soft %	Solicited %	Exp. solicited %	Org. solicited %	Unsolicited %	Directed %	Undirected %
Alpha											
CEO	No	Yes	No	0	100	60	60	0	40	13.3	26.7
Controller	No	Yes	No	60-70	30-40	85	80	5	15	13	2
Board member	Yes	Yes	No	60-65	35-40	50	15	35	50	15-20	30-35
Chair of the board	No	Yes	No	50	50	80-85	24-25	56-60	15-20	0	15-20
Beta											
CEO	No	Yes	No	70-80	20-30	90	18	72	10	10	0
Marketing director	No	Yes	No	50	50	100	50	50	0	0	0
Business dev. dir.	No	Yes	No	50	50	70-80	49-56	21-24	20-30	15-24	4-6
VP division C	No	Yes	No	20	80	80	56-64	16-24	20	10	10
Director HR	No	No	No	80	20	100	100	0	0	0	0
Key acc. manager	No	Yes	No	80	20	50	45	5	50	0	50
Delta											
CEo	No	No	No	80	20	80	16	64	20	16	4
VP and CFO	No	No	No	70	30	100	20-30	70-80	0	0	0
CEO (subsidiary)	No	No	No	33	67	67	33.5	33.5	33	0	33
Gamma											
CEO	No	Yes	No	70-80	20-30	80	24	56	20	10	10
VP R&D	No	No	No	30	70	90	70	30	10	0	10
CFO	No	No	No	75	25	75	37.5	37.5	25	18.75	6.25
VP legal affairs	Yes	Yes	No	90	10	90	90	0	10	0	10

Note: Respondents have been asked to indicate proportions, for example, between hard and soft

the bulk of the solicited information was explicitly solicited, while organizationally solicited information dominated in Delta. In all companies, information classified as unsolicited was less frequently used, although it was nevertheless recognized as very important. In all companies, information classified as unsolicited was more undirected than directed. These findings run contrary to Aguilar's (1967) finding that a majority of the information was received on an unsolicited basis. Aguilar also found that organizationally solicited information was more important than that explicitly solicited and that directed unsolicited information was more important than undirected unsolicited information.

The fourth research question (Where do decision makers obtain the information used?) was addressed by making a distinction between external and internal sources, further divided as personal and impersonal sources. A summary of data for RQ4 is contained in Table II. The results show that Alpha and Beta both rank their customers as the most important source of information. Moreover, the top-three ranked sources in both companies are personal sources. In Delta and Gamma, performance reports (impersonal in nature) were deemed the most important source of information. Overall, our data show a pattern where internal sources of information seem to be preferred over external ones, Alpha being an exception. For the whole sample, four of the five most important sources are internal, a finding in line with that of Ghoshal (1988). Again for the whole sample, the two sources perceived as most important are personal: subordinates and customers, a finding in line with that of Aguilar (1967), Sawyerr *et al.* (2000) and others. Also worth noting is that many sources of information received low or very low values.

Discussion

Here, we shall allow ourselves to be a little bit more speculative, trying to provide theoretical as well as empirical suggestions on how our results can be interpreted. First, the experience of no, low or moderate uncertainty in these strategic decisions may have several explanations. First, if other options are few or non-existent, the experience of uncertainty may be lower, as would seem to be the case in the decisions of Delta and Gamma. Another explanation may be that of bounded rationality (March and Simon, 1958; Cyert and March, 1963). A limited conceptualisation of problems does

not require extensive knowledge or omniscience. Instead, cognitive heuristics and simplifying knowledge structures may reduce information processing demands. This explanation has previously shown itself to be applicable to strategic decision making (Dutton and Jackson, 1987).

A low degree of experienced uncertainty may also be due to expertise within an area, termed as an "expert model" for the processing of information by Lord and Maher (1990). Being an expert in a specific content domain would allow management to rely on existing knowledge structures to supplement simplified means of processing information. Thus, "uncertainty may be as much a function of the expertise of the decision maker as it is a function of a particular decision context" (Lord and Maher, 1990, p. 20). Finally, a low or non-existing degree of uncertainty might be due to retrospective rationalizations of prior actions. Managers may, in the words of Weick (1995, p. 11), "render that outcome sensible by constructing a plausible story that produced it", i.e. an interpretation that makes good sense.

Multiple explanations for the combination of hard and soft information are possible. First, the nature of the decision might play a role. Earlier research suggests that offensive decisions (i.e. build-up of capacity/market expansion) are associated with the use of soft information. The opposite, defensive decisions (i.e. reduction of capacity/market withdrawal), were associated with hard information (Häckner, 1988). The decisions of Alpha and Beta could be classified as offensive, while the ones of Delta and Gamma could be classified as defensive. This suggestion would, however, single out Beta as being an anomaly. Second, some respondents have indicated that they rely more on soft information, thus letting their employees "do the counting". Galbraith (1973) noted that organizations must process more information as their tasks increase in complexity, which might be the result following a strategic decision, at least when acquiring a division or company. Increased information-processing needs may result in hierarchical overload, which can be solved by letting other employees process hard information, i.e. division of labour. The specific combination may also be affected by an individual's decision-making style. Some may feel more confident with hard information and others with soft. A few respondents have indicated that they can use hard information as a substitute for soft information and vice versa, depending on what is available. This explanation might be

Table II

Importance of different information sources for the decisions in question

	Mean total	Mean alpha	Mean beta	Mean delta	Mean gamma
External/impersonal sources					
Business/financial publications	2.18	3.00	2.00	1.33	2.25
Trade publications	1.35	2.25	1.17	1.00	1.00
Technical/academic journals and books	1.35	1.00	1.17	1.33	2.00
Purchased research reports	1.59	1.00	1.50	1.00	2.75
Newspapers	1.94	2.25	2.00	1.33	2.00
Trade shows	1.82	1.25	1.17	2.67	2.75
Educational seminars	1.65	1.00	2.00	1.33	2.00
The Internet (including databases)	2.41	1.00	2.50	3.67	2.75
Industry-specific statistics	2.88	3.75	2.17	2.67	3.25
External/personal sources					
Bankers and financial advisers	2.24	2.75	1.17	1.33	4.00
Customers	3.53	5.00	4.50	2.33	1.50
Suppliers	2.29	4.25	2.00	1.33	1.50
Consultants	2.00	1.50	2.00	1.33	3.00
Accountants and lawyers	2.24	3.00	1.33	3.00	2.25
Competitors	2.76	3.75	1.83	2.67	3.25
Friends	1.59	1.25	2.00	1.00	1.75
Outside business and prof. associates	2.47	3.00	1.83	1.33	3.75
Friends and chance encounters	1.12	1.00	1.00	1.00	1.50
Internal/personal sources					
Superiors (line relationship)	2.71	1.25	2.67	4.00	3.25
Subordinates (line relationship)	3.71	4.25	3.83	3.00	3.50
Others (horizontal relationship)	3.18	1.75	4.00	2.33	4.00
Internal/impersonal sources					
Performance reports (acc., fin., prod.)	3.53	3.00	3.00	4.00	4.50
Salesmen call reports	3.18	2.50	3.83	3.33	2.75
Intelligence- or information-system	2.41	2.00	2.50	2.00	3.00
Reports or notes from internal meetings	3.12	2.50	3.17	4.00	3.00

Notes: A 5-point Likert-scale was used (1: lowest value; 5: highest value)

plausible in cases where a decision is taken under strong time-pressure, which was the case in Alpha. Another factor that might affect the combination is if the decision is perceived as very clear, which was the case in Beta. Then it might be possible to rely more on hard information. Still another possibility is that the combination of soft and hard information is influenced by managers' assumptions about the environment. If managers perceive the environment to be unanalysable, soft, qualitative information combined with judgement and intuition may play a major role in interpretation processes. The opposite might prove true if managers assume the environment to be analysable (see Weick, 2001, pp. 245 ff.). Finally, a clear majority in all companies were of the opinion that the combination of hard and soft information is contingent on the specific decision taken. This is logical, since information has no intrinsic value. Its value depends upon its context and its utilization by particular users on specific occasions, and the value of information to its users may be

impossible to determine in advance (Eaton and Bawden, 1991).

Multiple reasons may also lie behind the specific combination of solicited and unsolicited information. First, the tendency to rely heavily on solicited information might be an effect of the hierarchical level. As managers' time is limited, information may be requested (org. solicited) as well as sought (exp. solicited). The use of solicited information in preference to unsolicited may also depend on whether the "case" is straightforward or unclear/complicated. Having a good overview of the process may decrease the need for unsolicited information, which might be the case with Beta. However, several companies described unsolicited information as very important. Therefore, volume may not tell the whole story. To use a metaphor, yeast is very important when baking bread, although less used than flour in terms of volume. In some cases, the preference for organizationally solicited information may stem from the fact that the individual has only been with the

company for a short time, and is thus more dependent on other actors for information. On the other hand, the use of explicitly solicited information over organizationally solicited information may be the result of poor horizontal communication within the management team. A heavy emphasis on line communication may increase the need of individual respondents to find the information they require themselves.

How should the results about source utilization be interpreted? As noted by Daft *et al.* (1988), personal sources may be needed to interpret unclear issues. An enquirer may prefer to seek information from an individual perceived to be reliable, since the latter can supply not merely the facts required, but also advice, guidance, and encouragement (Kaye, 1995). This may be the case in the decisions of Alpha and Beta, pointing to the importance of customers as information source. It is tempting to claim that information from personal sources is soft in nature, but this may be taking the data one step too far. It should also be noted that impersonal sources may be appropriate when environmental events are discrete and analysable, which may be the case in the decisions of Delta and Gamma. Again, it is tempting to suggest that performance reports contain only hard information, but this is difficult to state with accuracy. Overall, the fact that internal sources are considered more important than external ones may be viewed in light of the findings of Sawyerr *et al.* (2000); the author noted a positive relationship between perceived source accessibility and frequency of usage. The fact that several sources have been given low or very low values may be due to the fact that scanning is costly and information is boundless. In practice, organizations can only cope with a small fraction of the information that keeps pouring in.

Implications for management and academia

As noted by Yin (1994), interviews should always be considered as nothing more than verbal reports. As such, they are subject to the common problem of bias, poor recall, and poor or inaccurate articulation. Although augmented by documentation, setting out policy recommendations based on a qualitative, descriptive study with a limited sample size is awkward. Only four firms/decisions were studied, and results and implications should be interpreted with that in mind. Some issues will, however, be commented upon. First, strategic decisions

similar to those studied here are likely to be uncertain in nature. Therefore, it might be useful to practise some out-of-the-box thinking, in order to obtain a realistic perspective on them. In terms of information use, a combination of soft and hard may be fruitful. Exclusive reliance on soft information could endanger the quality of the decision and distance it from reality. The opposite, a reliance on hard information only, may lead to difficulties in reaching a decision in the first place. In terms of information sources, it is difficult to say if any given source is better than any other. It is not the source that matters; it is the information obtained from it. Previous research has shown, however, that acquiring information from external sources can be a powerful tool for achieving the organization-environment alignment. These sources might be more difficult to reach, less accessible and more time-consuming but in line with Lozada and Calantone (1997) we suggest that ongoing monitoring of external sources may help decision makers in deciding when an in-depth search is warranted, thus helping them maximize limited resources and minimize uncertainty. Given limited resources, it might be wise to utilize personal/external sources – they usually have the advantage of speed, and may also provide advice and interpretation of information. Finally, when looking at how information is obtained, a combination of solicited and unsolicited information might be advantageous. Earlier research has shown that, if a preponderance of the information used is obtained on an unsolicited basis, performance can be questioned on the grounds that managers are not sufficiently active in seeking more of the important information they require. If the opposite proves true, performance could equally be questioned on the grounds that managers are not sufficiently sensitive to information other than that which they are actively seeking. Thus, the ideal would be to be both structured and flexible when searching for important information.

What, then, are the implications for further research? One interesting theme that emerged from this study was the fact that the combination of soft and hard information seemed to vary over time. Based on our knowledge, the terms “hard” and “soft” information are not widely used – nor do we know of any studies that have focused on the use of soft and hard information, how they interact, and their prevalence at different stages of decision-making processes. This is an interesting theme since we believe that these terms can add to our knowledge and further our understanding of

the mechanisms of organizational decision making. Preferably, such a study should be undertaken utilizing a more nomothetic approach than was the case in this study. Another interesting theme emerged from the discussion part of this paper. There, several different and sometimes contradictory explanations were given in order to shed some light on our empirical findings when trying to relate them to existing literature. The question then arises as to which explanation is the most accurate, i.e. which explanation has the highest degree of explanatory power? Different explanations/theories can be analysed in terms of coverage and depth; for a discussion see Bunge (1967). Although conceptually appealing, we realize that such a study is very difficult to conduct empirically, although it would be of great value.

Notes

- 1 Perhaps the term "intelligence" should have been used instead of "information". Intelligence is, however, a fairly new term in the academic literature, and mixing the two might create confusion instead of facilitating communication and an exchange of views. Information in the present context should, however, be thought of as value-added, enabled and actionable.
- 2 For a discussion on differences between terms and concepts, see, for example, Zetterberg (1968).

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Interview Guide

Introduction

1. *Your full name and position within the company?*
2. *This interview is intended to focus on decision x that your company made recently. Can you describe the decision, as you perceive it in terms of scope and content?*
3. *Who were the other participants in the decision-making process, i.e. what persons except from you were involved in taking this decision? Their names and their positions within the company?*
4. *Which were the results of the decision?*

Why is information used in strategic decision-making?

5. *Why did you use information for the decision at hand?*
6. *Did you perceive the decision as uncertain? If yes, why?*
7. *Did you experience any uncertainty in the external environment with regards to the decision at hand?*
8. *Could you anticipate the effects of the decision upon your organization at the time when the decision was taken?*
9. *Was this decision the only response option available to you and your organization? If not, which were the alternative options?*

What kind of information is used in strategic decision-making?

10. *When deciding on the decision at hand, did you make up your mind mainly on numerical information such as statistics regarding production, pricing, market development, information from accounting- or calculation system, or other kinds of information that easily can be quantified, or were your standpoint more based on images, visions, ideas or thoughts of what might be the outcome of the decision? That is, information that is more broad, subjective, and therefore difficult to quantify?*
11. *Can you indicate some proportion between the use of numerical, quantifiable information (i.e. "hard" information) and the use of non-numerical information (i.e. "soft" information) that is not quantifiable?*
12. *If you relied more on one type of information (hard or soft), did you to some degree combine that type of information with the use of the other type (hard or soft)?*
13. *Do you think that the information that you used to make up your mind were contingent on the specific strategic decision at hand?*

How do decision-makers obtain information?

Information might be classified as “solicited” and “unsolicited”. Solicited information means (1) all information that you explicitly sought for the decision at hand but also (2) all information that was given to you by your company for the decision at hand, for example information from your company’s information system if there is one. Unsolicited information is all other types of information, for example (1) a neighbour or friend notifying you about something, or (2) something that you just hear or note, for example in a general conversation.

14. In terms of proportions, how much information (in percent) used for the decision at hand would you characterize as being solicited and how much (in percent) would you characterize as being unsolicited?

Solicited information may be further divided as (1) information that you as an individual sought and used for the decision at hand, and (2) information that was given to you by your company.

15. For the decision at hand, how much information used (in percent) did you sought by yourself, and how much information used (in percent) was provided to you by your company?

Unsolicited information may also be further divided into two categories. That is, (1) information that is directed (intentional and purposeful), for example something that a neighbour tells you, or (2) undirected (something that you just happen to hear).

16. For the decision at hand, how much unsolicited information used do you consider to be directed (in percent) and how much do you consider to be undirected (in percent)?

Where do managers obtain information?

17. External – impersonal sources

Impersonal sources of information from outside your company include such things as trade magazines, newspapers (Daily newspapers, dagens industri), books, research reports and information from the Internet. Using the following scale, would you tell us how important these sources were in terms of information acquisition for the decision at hand? We ask you to include such sources that provided information that you used for the decision at hand. Material that you received but did not use should not be included. Then, how important were the following sources for your decision?

<i>Business/Financial publications</i>	<i>1----2----3----4----5</i>
<i>Trade publications</i>	<i>1----2----3----4----5</i>
<i>Technical/academic journals and books</i>	<i>1----2----3----4----5</i>
<i>Purchased research reports</i>	<i>1----2----3----4----5</i>
<i>Newspapers</i>	<i>1----2----3----4----5</i>
<i>Trade shows</i>	<i>1----2----3----4----5</i>
<i>Educational seminars</i>	<i>1----2----3----4----5</i>
<i>The Internet (including databases)</i>	<i>1----2----3----4----5</i>
<i>Industry-specific statistics</i>	<i>1----2----3----4----5</i>
<i>Other source (Please specify.....)</i>	<i>1----2----3----4----5</i>

18. External – Personal sources

Personal sources of information from outside your company include such things as customers, suppliers, friends, and competitors. Using the following scale, would you tell us how important these sources were in terms of information acquisition for the decision at hand? We ask you to include such sources that provided information that you used for the decision at hand. Material that you received or persons that you talked to but did not use should not be included. Then, how important were the following sources for your decision?

<i>Bankers & Financial advisors</i>	<i>1----2----3----4----5</i>
<i>Customers</i>	<i>1----2----3----4----5</i>
<i>Suppliers</i>	<i>1----2----3----4----5</i>
<i>Consultants</i>	<i>1----2----3----4----5</i>
<i>Accountants & Lawyers</i>	<i>1----2----3----4----5</i>
<i>Competitors</i>	<i>1----2----3----4----5</i>
<i>Friends</i>	<i>1----2----3----4----5</i>
<i>Outside business and professional associates</i>	<i>1----2----3----4----5</i>
<i>Neighbours & Chance encounters</i>	<i>1----2----3----4----5</i>
<i>Other (Please specify.....)</i>	<i>1----2----3----4----5</i>

19. Impersonal – Internal sources

Personal sources of information from inside your company include such things as superiors and subordinates. Using the following scale, would you tell us how important these sources were in terms of information acquisition for the decision at hand? We ask you to include such sources that provided information that you used for the decision at hand. Material that you received or persons that you talked to but did not use should not be included. Then, how important were the following sources for your decision?

<i>Superiors (line relationship)</i>	<i>1----2----3----4----5</i>
<i>Subordinates (line relationship)</i>	<i>1----2----3----4----5</i>
<i>Others (horizontal relationship)</i>	<i>1----2----3----4----5</i>
<i>Other (Please specify.....)</i>	<i>1----2----3----4----5</i>

20. Impersonal – Internal sources

Impersonal sources of information from inside your company include such things as performance reports or your company's intelligence-or information system if there is one. Using the following scale, would you tell us how important these sources were in terms of information acquisition for the decision at hand? We ask you to include such sources that provided information that you used for the decision at hand. Material that you received but did not use should not be included. Then, how important were the following sources for your decision?

<i>Performance reports</i>	<i>1----2----3----4----5</i>
<i>(Accounting, financial, production)</i>	
<i>Salesmen's call reports</i>	<i>1----2----3----4----5</i>
<i>Intelligence- or information system</i>	<i>1----2----3----4----5</i>
<i>Reports or memory notes from</i>	<i>1----2----3----4----5</i>
<i>Internal meetings</i>	
<i>Other (Please specify.....)</i>	<i>1----2----3----4----5</i>

Intervjuguide

Introduktion

1. *Ditt namn och din befattning inom företaget?*
2. *Denna intervju är tänkt att fokusera på beslut X som ditt företag nyligen fattade. Kan du beskriva beslutet i termer av omfattning och innehåll, såsom du uppfattar det?*
3. *Vilka var de andra deltagarna i beslutsprocessen, dvs. vilka var de andra personerna förutom du som var involverade i detta beslut? Deras namn och deras befattningar inom företaget?*
4. *Vilka blev resultaten av beslutet?*

Varför används information vid strategiskt beslutsfattande?

5. *Varför använde du information för detta beslut?*
6. *Uppfattade du beslutet som osäkert? Om ja, varför?*
7. *Upplevde du någon osäkerhet i företagets externa omgivning med avseende på detta beslut?*
8. *Kunde du vid beslutstillfället förutspå effekterna av detta beslut på ditt företag?*
9. *Var detta beslut det enda tänkbara för dig och ditt företag? Om inte, vilka var de andra alternativen?*

Vilken typ av information används vid strategiskt beslutsfattande?

10. *När du var med och fattade det aktuella beslutet, baserades din uppfattning med avseende på beslutet på numerisk information såsom statistik från produktion, prissättning, marknadsutveckling, information från redovisningssystem eller annan information som på ett enkelt sätt kan kvantifieras, eller baserades din uppfattning mer på bilder, visioner, idéer eller tankar om vad beslutet kunde tänkas leda till? Det vill säga, sådan information som är mer bred, subjektiv, och därmed svår att kvantifiera?*
11. *Kan du ange någon proportion mellan användningen av numerisk (kvantifierbar), s.k. "hård" information, och användningen av icke-numerisk, s.k. "mjuk" information för detta beslut?*
12. *Om du förlitade dig mer på en typ av information (hård eller mjuk), kombinerade du detta med användning av den andra typen av information (hård eller mjuk) till någon grad?*
13. *Tror du att den typ/kombination av information du använde för att fatta detta beslut var beroende av det speciella strategiska beslutet som fattades?*

Hur erhåller beslutsfattare information?

Information kan klassificeras som "efterfrågad" och som "icke efterfrågad". Efterfrågad information innebär (1) all information som du explicit sökte för det aktuella beslutet men även (2) sådan information som gavs till dig av ditt företag det aktuella beslutet, till exempel information från företagets informationssystem om ett sådant finns. Icke-efterfrågad information är all annan typ av information, till exempel (1) en granne eller vän som berättar något för dig om någonting, eller (2) någonting som du hör eller noterar, till exempel i ett samtal.

14. Hur stor del av informationen som du använde för föreliggande beslut skulle du karaktärisera som "efterfrågad" och hur stor del av informationen som du använde för föreliggande beslut skulle du karaktärisera som "icke efterfrågad"? (uttryckt i procent).

Efterfrågad information kan i sin tur delas in i (1) sådan information som du som individ sökte och använde för det aktuella beslutet, och (2) sådan information som gavs till dig från ditt företag.

15. För det föreliggande beslutet, hur mycket av den information som du använde (i procent) sökte du fram själv, och (2) hur stor andel av informationen gavs till dig från ditt företag (i procent?).

"Icke efterfrågad" information kan också delas in i två kategorier. (1) Sådan information som sänds och riktas till dig med avsikt från en viss källa, till exempel något som en granne berättar för dig, eller (2) sådan information som inte riktas till dig med ett visst syfte, till exempel något "som du bara råkar höra".

16. I föreliggande beslut, hur mycket "icke efterfrågad" information anser du vara riktad och sänd till dig med avsikt, och hur stor del anser du vara "oriktad"? (i procent).

Varifrån erhåller beslutsfattare information?

17. Externa –Icke-personliga källor

Exempel på icke-personliga källor i ditt företags externa miljö är bland annat tidningar (exempelvis morgontidningar eller dagens industri), böcker, forskningsrapporter, och information från Internet. Kan du, genom att använda följande skala, svara på hur viktiga dessa källor var i termer av informationsinhämtning för det aktuella strategiska beslutet? Vi ber dig inkludera sådana källor som gav information som du använde för det aktuella beslutet. Material som du erhöll från en viss källa men inte använde skall inte räknas! Alltså, hur viktiga var följande källor för det föreliggande beslutet?

Finans- eller ekonomitidningar	1----2----3----4----5
Handelsrelaterade publikationer	1----2----3----4----5
Tekniska/akademiska tidningar och böcker	1----2----3----4----5
Inköpta forsknings- eller konsultrapporter	1----2----3----4----5
Dagstidningar	1----2----3----4----5
Mässor	1----2----3----4----5
Utbildningseminarier	1----2----3----4----5
Internet (inklusive databaser)	1----2----3----4----5
Branschspecifik statistik	1----2----3----4----5
Annan källa (vilken?.....)	1----2----3----4----5

18. Externa – Personliga källor

Exempel på personliga källor i ditt företags externa miljö är bland annat kunder, leverantörer, vänner, och konkurrenter. Kan du, genom att använda följande skala, svara på hur viktiga dessa källor var i termer av informationsinhämtning för det aktuella strategiska beslutet? Vi ber dig inkludera sådana källor som gav information som du använde för det aktuella beslutet. Material som du erhöll från en viss källa men inte använde skall inte räknas! Alltså, hur viktiga var följande källor för det föreliggande beslutet?

<i>Bankpersonal & finansiella rådgivare</i>	<i>1----2----3----4----5</i>
<i>Kunder</i>	<i>1----2----3----4----5</i>
<i>Leverantörer</i>	<i>1----2----3----4----5</i>
<i>Konsulter</i>	<i>1----2----3----4----5</i>
<i>Revisorer & Advokater</i>	<i>1----2----3----4----5</i>
<i>Konkurrenter</i>	<i>1----2----3----4----5</i>
<i>Vänner</i>	<i>1----2----3----4----5</i>
<i>Affärskontakter utanför ditt företag</i>	<i>1----2----3----4----5</i>
<i>Grannar & tillfälliga kontakter</i>	<i>1----2----3----4----5</i>
<i>Annan källa (vilken?.....)</i>	<i>1----2----3----4----5</i>

19. Icke-personliga – Interna källor

Exempel på personliga källor inom ditt företag är bland annat överordnade och underordnade. Kan du, genom att använda följande skala, svara på hur viktiga dessa källor var i termer av informationsinhämtning för det aktuella strategiska beslutet? Vi ber dig inkludera sådana källor som gav information som du använde för det aktuella beslutet. Material som du erhöll från en viss källa men inte använde skall inte räknas! Alltså, hur viktiga var följande källor för det föreliggande beslutet?

<i>Överordnade (linjerelation)</i>	<i>1----2----3----4----5</i>
<i>Underordnade (linjerelation)</i>	<i>1----2----3----4----5</i>
<i>Andra anställda (horisontell relation)</i>	<i>1----2----3----4----5</i>
<i>Annan källa (vilken?.....)</i>	<i>1----2----3----4----5</i>

20. Icke-personliga – Interna källor

Exempel på icke-personliga källor inom ditt företag är bland annat statistik om försäljning eller produktion, eller information från företagets informationssystem om ett sådant finns. Kan du, genom att använda följande skala, svara på hur viktiga dessa källor var i termer av informationsinhämtning för det aktuella strategiska beslutet? Vi ber dig inkludera sådana källor som gav information som du använde för det aktuella beslutet. Material som du erhöll från en viss källa men inte använde skall inte räknas! Alltså, hur viktiga var följande källor för det föreliggande beslutet?

<i>Interna rapporter</i>	<i>1----2----3----4----5</i>
<i>(Redovisning, finans, produktion)</i>	
<i>Rapporter från företagets säljkår</i>	<i>1----2----3----4----5</i>
<i>Företagets informationssystem</i>	<i>1----2----3----4----5</i>
<i>Rapporter eller minnesanteckningar</i>	<i>1----2----3----4----5</i>
<i>från interna möten</i>	
<i>Annan källa (vilken?.....)</i>	<i>1----2----3----4----5</i>

