Market-Oriented Product Development as an Organizational Learning Capability: Findings from Two Cases

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Abstract

Conceptualizing market orientation at the level of the product development process is relevant, because market orientation is a highly critical factor for new product success and this conceptualization can be used as a starting-point to transform the whole organization into a more market oriented one. Market-oriented product development appears to be more than carrying out a number of marketing activities in a product development process. Using concepts from resource-based theory and organizational learning theory, we draw up a conceptual framework of market-oriented product development as an organizational learning capability substantiated by findings from two case studies. This capability encapsulates the values and norms, knowledge and skills, technical and managerial knowledge systems, which enable learning about markets through information processing behavior in product development and improve this market learning behavior. This conceptualization stimulates research on operationalizing market orientation in the managerial context of a critical business process and research on enhancing the degree of market orientation.

Keywords: Market orientation, new product development, organizational learning, knowledge management

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Introduction

Since the 1980s, market orientation pervades academic research and management practice. It is rooted in marketing theory as the operationalisation of the marketing concept. Market orientation concerns learning about the market, in other words: developing an understanding of the market, and using it for marketing actions. To date, market orientation studies emphasize the conceptualization of market orientation and the validation of measurement scales. Market orientation is conceptualized as a culture or philosophy on the one hand or a set of information processing activities on the other. Both conceptualizations are operationalised and used to investigate the relationship with business performance indicators. Most of these studies report a positive, and in some cases moderated, relationship between market orientation and business performance indicators for various markets (e.g. Avlonitis and Gounaris 1997; Baker and Sinkula 1999a; Baker and Sinkula 1999b; Gatignon and Xuereb 1997; Greenley 1995; Han et al. 1998; Hurley and Hult 1998; Jaworski and Kohli 1993; Narver and Slater 1990; Pelham and Wilson 1996; Ruekert 1992; Slater and Narver 1994; Slater and Narver 1996; Slater and Narver 2000).

The product development literature emphasizes the importance of market orientation as well. In 1979, Cooper already concluded “a strong market orientation makes all the difference when it comes to separating successful versus unsuccessful industrial products” (Cooper 1979). Various product development studies consider market orientation a driver of product development performance and one of the controllable factors influencing new product success (Atuahene-Gima 1995; Barclay 1992; Cooper 1983; Cooper and Kleinschmidt 1993; Cooper and Kleinschmidt 1994; Cooper and Kleinschmidt 1995; Li and Calantone 1998; Montoya-Weiss and Calantone 1994; Wren et al. 2000). In their meta-analysis, Montoya-Weiss and Calantone (1994) conclude that a large number of studies state that, among others, factors related to market orientation determine new product performance. These factors can either be considered a part of market orientation (such as proficiency of predevelopment activities, proficiency of marketing activities, and protocol) or as a consequence of having a market orientation (such as product advantage).

Although both the marketing and product development literature acknowledges the importance of having a market orientation, hardly any study reports about the conceptualization and operationalization of market orientation in the managerial context of critical processes, e.g. product development (Barclay 1992; Day 1994b; Poolton and Barclay 1998). This conceptualization and operationalization of market orientation in the managerial context of critical processes is relevant for two reasons.

First, when managers do not know how to operationalize market orientation in management practice, in other words, how to identify what needs to be changed, they may perceive the cost of being market-oriented as a real barrier (Harris and Piercy 1997). However, these managers fail to realize that *not* being market-oriented is very costly to a business, resulting in: “high levels of customer complaint and expensive response mechanisms; maintaining expensive services and product attributes that are not valued by customers; holding prices too low, because customer values systems are not understood; constantly investing in promotional and selling activities to win new business to replace that lost to competitors, because they are better drivers of customer satisfaction; and lost opportunities to develop new markets from a platform of a secure customer base held in place by sustained service and quality performance” (Harris and Piercy 1997). Therefore, we agree with Han et al. (1998) that “a market orientation remains incomplete if practitioners do not understand the modus operandi that gives rise to superior customer value and corporate performance”.

Second, a conceptualization and operationalization of market orientation at the level of critical processes will stimulate academic research on implementing and enhancing market orientation. In addition to not knowing what to change, managers perceive a dearth of guidelines about the implementation of market orientation in their organization. In other words, they do not know how to change, among other arguments, because academic research does not provide these guidelines (Day 1994b; Kahn and Mentzer 1994; Narver et al. 1998; Ruekert 1992).

This paper focuses on product development to become market-oriented, for two main reasons. First, as we can conclude from the aforementioned studies, “having a market orientation in product development has proven to be a highly critical factor for new product success” (Biemans and Harmsen 1995). Developing new products is one of

the most critical business processes. New products are the lifeblood of an organization ensuring future sales and company growth. Therefore, the question arises what product development looks like in a market-oriented organization. In this respect, a market orientation should be designed keeping in mind that innovativeness and innovations (e.g. product and administrative) drive organizational performance in achieving a competitive advantage (Han et al. 1998; Hurley and Hult 1998). Second, several authors argue that product development can be used as a starting-point to transform the whole organization into a market-oriented one (Barabba 1995; Day 1994b; Deschamps and Nayak 1995: p 40-43). A market-oriented organization aims at creating value for customers. To obtain a market orientation, the distinct values, functional structures and processes need to be changed. Product development is the core process for creating customer value through a superior product, which because of its interfunctional nature is related to various other critical business processes.

This paper explores the conceptualization of market orientation in the context of product development. Based on the literature of market orientation, product development, the resource-based view of the firm and organizational learning, we construct a conceptual framework of market-oriented product development. We start with describing and evaluating various perspectives on market orientation. Next, we discuss the research that links market orientation with product development. Then we explain why we use the organizational learning perspective as a theoretical starting-point for integrating market orientation with product development. In the subsequent sections, we discuss the major elements of the conceptual framework, illustrate them with examples from two real-life cases and further explore the relationships between the elements.

Market orientation

Market orientation is philosophically founded in the marketing concept (Kohli and Jaworski 1990; Narver and Slater 1990). However, the marketing concept is not a sufficient philosophical foundation, because market orientation focuses not only on customers, but also on competitors, several organizational issues and numerous exogenous

factors that influence the needs and preferences of customers (Hunt and Morgan 1995). Market orientation has been approached from three different basic perspectives: market orientation as organizational cognition (i.e. as a business philosophy, knowledge and skills), market orientation as organizational behavior (Day 1994b; Dreher 1993), and market orientation as the combination (Avlonitis and Gounaris 1997) or integration of these two perspectives (Cadogan and Diamantopoulos 1995; Tuominen and Möller 1996).

The difference between the first two perspectives represents a distinct shift in emphasis (Dreher 1993; Tuominen and Möller 1996). According to behaviorists, market orientation reflects marketing behavior or activities, consisting of the generation and dissemination of market intelligence, as well as the responsiveness to this market intelligence (e.g. Gatignon and Xuereb 1997; Jaworski and Kohli 1993; Kohli and Jaworski 1990; Ruekert 1992) or in more general terms “the set of cross functional processes and activities directed at creating and satisfying customers through continuous needs-assessment” (Deshpandé and Farley 1998a; Deshpandé and Farley 1998b). According to the cognitive perspective, this behavior is a consequence of having a market orientation, with the concept of market orientation referring to a set of shared beliefs that put the customer’s interests first, as well as the required knowledge systems and structures (see e.g. Deshpandé et al. 1993; Deshpandé and Webster Jr 1989; Han et al. 1998; Harris and Piercy 1997; Hurley and Hult 1998; Narver et al. 1998; Narver and Slater 1990; Narver and Slater 1998; Slater and Narver 1995). Note that although Narver and Slater (1990) and authors other following them such as Morgan et al. (1998) conceptualize it as a culture they operationalize market orientation using behavioral-based issues.

Both perspectives received some criticism. The criticism, directed at the cognitive perspective, mainly concerns the measurement of the shared beliefs and values, which is subject to conceptual and methodological problems, although not impossibilities (e.g. Allard-Poesi 1998), and which does not result in knowledge about desired organizational behavior. The behavioral approach has been criticized for lacking a theoretical foundation (e.g. Dreher 1993).

A number of studies take both the cognitive and behavioral perspective (Avlonitis and Gounaris 1997; Baker and Sinkula 1999a; Baker and Sinkula 1999b). For example, Avlonitis and Gounaris (1997) see market orientation as the combination of attitude and

activities. Other authors integrate both perspectives and view market orientation as a resource in organizational learning (Day 1994a; Day 1994b; Day and Nedungadi 1994; Hunt and Morgan 1995; Moorman 1995; Sinkula 1994; Slater and Narver 1995; Tuominen and Möller 1996). This integrated view to market orientation is analogous to the notion of the content of knowledge-based organizational learning which consists of cognitive associations and behavioral outcomes reflecting these cognitions (Day and Nedungadi 1994; Tuominen and Möller 1996). This paper follows a similar line of reasoning.

Market orientation integrated with product development

As mentioned in the introduction, many studies relate market orientation to product development, but mainly in terms of new product success or performance. Only few of these studies conceptualize the integration of market orientation and product development (see also Workman Jr 1993). Most of these authors do not label this conceptualization as market-oriented product development, but use the market orientation concept or ideas closely related to it. These studies can be classified using the distinction between the cognitive and behavioral perspective described in the previous section.

From a cognitive perspective, according to resource-based theory, a firm employs both assets and capabilities to realize its objectives. Assets are resource endowments a firm has accumulated, such as investments in the scale, scope, and efficiency of facilities. Capabilities refer to the accumulated knowledge, skills, systems, methods, values and norms (Leonard-Barton 1992; Leonard-Barton 1995) which enable a firm to coordinate activities and use its assets (Day 1994b). In the context of market orientation, capabilities such as market sensing enable an organization to carry out market information processing activities.

Organizations have capabilities for various activities, ranging from product development to order fulfillment. However, one may also consider market orientation as an overarching organizational capability. That is, market-oriented firms possess certain skills, knowledge, values, and norms that distinguish them from non-market-oriented

firms such as technology-oriented or sales-oriented firms. Interpreting product development and market orientation from a resource-based perspective allows the identification of the distinctive capabilities that constitute market-oriented product development. Studies taking such an organizational cognition perspective on the integration of market orientation with product development use 1) theoretical concepts such as competence and capability (Harmsen 1994; Lukas 2000), 2) describe market orientation as features of a product development team (Burchill and Fine 1997), or develop market information tools and techniques with product development (Griffin and Hauser 1993; Hauser and Clausing 1988; Nijssen and Frambach 2000; Workman Jr 1993; Workman Jr 1998).

From a behavioral perspective market orientation is conceptually integrated with product development in terms of market information processing activities (Sandell 1994) or market-related functional activities (Cooper 1983; Cooper and Kleinschmidt 1994) in the product development process. Market-oriented product development can be described as a series of market-related information processing activities. Information is collected inside and outside the organization, disseminated through the organization, and used to perform various product development activities. Product development and market orientation can both be regarded as information processing activities. In other words, developing products from a market-oriented perspective consists of technical and market information processing activities.

In this paper, we consider market-oriented product development from an integrated cognitive and behavioral perspective, which views market-oriented product development as the combination of an organizational capability and the accompanying information processing behavior directed at learning about markets (see also Adams et al. 1998). This integration of cognitive and behavioral perspectives is best understood from an organizational learning point of view as is explained below. Organizational learning can be described as a number of sequential information processing activities (see figure 1) (Day 1994a; Fiol and Lyles 1985; Huber 1991; Sinkula 1994). An organization learns about the market through its sequential information processing activities in terms of the acquisition, distribution, interpretation and utilization of market information (i.e. the behavioral part of market orientation). The interpretation of market information occurs

through a process of sorting, classification, and simplification. This learning process generates market information and converts it into market knowledge that is part of organizational cognition.

However, the way these information processing activities are executed is determined by organizational cognitive elements as well. These cognitive elements include the individual and shared beliefs, knowledge and skills, which reside in the collective knowledge systems (such as databases, decision rules and standard operation procedures). These knowledge systems, together with existing shared mental models, function as the organization's memory (Day and Nedungadi 1994; Deshpandé et al. 1993).

The evaluation of outcomes of the information processing activities, and reflecting on these activities, may lead to cognitive development in terms of changing existing knowledge and skills or even shared beliefs and accordingly the firm's knowledge systems (augmented memory) to improve the information processing activities (i.e. behavioral development) and to start a new information processing cycle. Similarly, Morgan et al. (1998), although they do not see market orientation as a capability, argue that organizational learning capabilities contribute to developing a market orientation by encouraging market-oriented thinking and behavior.

Thus, the cognitive and behavioral elements from market orientation are closely related through the concept of organizational learning.

Insert Figure 1 about here

This organizational learning perspective can also be applied to the context of product development. In creating a new product, a firm needs to make a number of decisions. Each decision triggers an information inquiry leading to the information acquisition, distribution, interpretation and utilization activities, according to the procedures and decision rules of existing knowledge systems and shared mental models. Through the activities depicted in figure 1, a firm gathers and combines market and technical

information into knowledge about product specifications, product concepts, prototypes et cetera. Evaluation of these activities may contribute to knowledge and skills to improve these activities or result in a search for missing knowledge to improve these activities¹. Thus, evaluation of activities contributes to a firm's product development knowledge and skills. The second half of this paper describes these information processing activities and their cognitive counterpart in greater detail and illustrates them with examples from real-life cases.

We propose to study market-oriented product development from an integrated cognitive and behavioral perspective for two reasons. First, a full understanding of market orientation requires knowledge of both actual behavior of organizations, and the quality of this behavior (Jaworski and Kohli 1996). To investigate the quality of organizational behavior we need insight in underlying beliefs, knowledge, structures and systems (Tuominen and Möller 1996). Second, the integrated cognitive/behavioral perspective is necessary when the aim is to generate managerial guidelines for changing an organization's degree of market orientation. On the one hand, taking only a behavioral perspective would not suffice, because changes in behavior may occur without the corresponding development of a firm's cognitive systems. And organizational learning theory demonstrates that while cognition may influence behavior, "one is not necessarily an accurate reflection of the other" (Fiol and Lyles 1985). On the other hand, taking only a cognitive perspective would not suffice either, because changes in cognition may occur without the resulting changes in organizational behavior. Thus, organizational learning theory, which integrates the cognitive and behavioral perspective offers a more holistic approach to market-orientated product development and theoretically founds the organizational change point of view.

Method

Two in-depth, exploratory case studies were conducted in order to obtain an understanding of how market-oriented product development can be conceptualized as an organizational learning capability. These case studies employ the comparative replication

and extension logic (Eisenhardt 1991; Yin 1994), served to illustrate the cognitive and behavioral elements, and develop the relationship between these elements in the product development context. The cases involve two industrial firms in the Netherlands: Cordial and Nice². Although we focus on both organizations' generic product development processes of vehicles (Cordial) and printing machines (Nice), we will also refer to examples from specific development projects. The project at Cordial concerns the development of a new vehicle version, while the project at Nice involves the development of a new printing machine.

Both case studies comprised in-depth interviews and document analysis. A total of 12 in-depth interviews were mainly aimed at obtaining a better understanding of the presence and reciprocal influence of the cognitive and behavioral elements. The respondents included general managers, marketing managers, project leaders, and R&D managers. General managers were interviewed to determine the degree of market information processing, to identify relevant respondents and documents and to get access to respondents and documents. R&D and marketing managers were interviewed to approach the phenomenon in question from different and possibly opposing angles. Project leaders were included to get information about product development activities at various stages of the process. A letter explaining the research project, emphasizing the confidentiality of the data and a short-list of topics that would be discussed preceded the interviews. The interviews took on average about one and a half hour, were recorded, transcribed and processed in interview reports, which were checked by the respondents on accuracy and completeness. In addition to in-depth interviews, product development process documents were analyzed. These documents contained detailed descriptions of the development tasks, activities, milestones and responsibilities assigned to people involved in the development process. This document analysis provided additional information, but also enabled us to check the interview data, concerning the procedures incorporated in technical and managerial knowledge systems.

Substantiating the framework

While the cognitive elements embodied the organization's product development capability, in terms of knowledge, skills and systems, the behavioral elements consist of information processing activities in each stage of the product development process. Figure 2 shows product development as a cognitive/behavioral construct.

Insert Figure 2 about here

The balance of this paper describes the organizational cognitive elements, how these elements influence organizational behavior, and how the information processing activities in turn influence the cognitive elements. But first we describe the information processing activities that are typical for product development in industrial firms. These activities make product development market oriented and consist of collecting, disseminating and utilizing market information.

When developing new products, an industrial firm may collect information about both direct and indirect customers through group discussions, customer visits, direct observation, sales meetings, market tests, customer satisfaction studies, published market research reports, line of business reports, archival information (e.g. postmortems on previous product development projects) and the Internet. In addition to information about customers, firms also need to collect information about competitors, market trends, new technological developments, laws and governmental regulations. What type of information is collected and how it is collected depends on the stage of the development process. For example, in the idea generation stage market studies are relevant, whereas in the concept stage one needs input about customer requirements and in the testing stage, customer evaluations of developed prototypes are needed.

Subsequently, the gathered market information needs to be disseminated across functions. Market information is disseminated through formal channels, such as written documents (memo's, newsletters, customer visit reports), e-mail networks, presentations

and meetings, as well as through informal channels (e.g. informal communication networks inside the firm). The critical issue concerns the determination of the kind of information that is needed by certain functions at a particular moment in time. Depending on the stage of the development process, different functions need to be involved. When more functions are involved in gathering market information, there may be less need for dissemination. For example, the Marketing and R&D departments of Nice jointly collect market information through customer visits at an early stage of the development process, which does not necessitate distributing this information to either one of these two departments.

During all product development stages, the collected and disseminated market information needs to be utilized in combination with the available technical information. During the early stages, the technical and commercial feasibility need to be determined before substantial amounts of money get committed to the project. But also during later stages, market information plays an important role in decision-making about product concepts, prototypes and launch strategies.

These activities which are performed during each stage of the product development process are aimed at creating market knowledge and ultimately converting this knowledge into a successful product. These market learning activities are enabled by the organizational learning capability, in other words, the execution of these activities is embodied in market information processing knowledge and skills, technical systems and managerial systems, all of which are embedded in the organization's values and norms.

All these information processing activities may be hindered by barriers, such as avoiding ambiguity, compartmentalized thinking, and inertia (Adams et al. 1998). These barriers influence the actual as well as the espoused way of performing these activities. In addition, the actual way of performing these activities may not necessarily coincide with the espoused way of performing, due to another type of barrier. This type of barrier is the result of the difference between organizational thinking and acting (Pfeffer and Sutton 2000). Solving both types of barriers is part of the learning process through which the market learning activities can be improved. In this paper, we focus on the latter type of barrier.

The next section describes the organizational cognition elements and how the firm's collection, dissemination and utilization activities are enabled by the organizational learning capability. We also describe how the evaluation of these activities may lead to enhanced knowledge and consequently, improved technical and managerial systems, in other words how market learning can be improved.

Organizational cognition

Organizational cognition consists of the shared cognitive models which can be broken down in definable organizational elements analogous to the capability concept. The cognitive part of market-oriented product development consists of specific values and norms, knowledge and skills, technical and managerial knowledge systems (Leonard-Barton 1992). Together they form the organization's market learning capability and they are described in detail below.

Values and norms

The market-oriented *values and norms* refer to individual and shared beliefs which put the customer's interest first before historically rooted technical competence (Deshpandé et al. 1993; Lichtenthal and Wilson 1992). Sinkula (1994) refers to these fundamental values and norms as axiomatic knowledge, in other words "why are things done the way they are?". This knowledge is used to make sense of the product development context, e.g. the served markets and the relevance of market information. In a market-oriented organization, the values and norms reflect the understanding that market information, especially customer and competitor information, is a critical input for the development process. This understanding is reflected by the firm's product development philosophy. Nice follows the philosophy of developing new printing machines, which enable customers to attain good results without any understanding of the printing technique. This means that Nice needs to translate printing experience and expertise into product characteristics. With respect to competitor information, Cordial demonstrates this understanding when it closely analyses competitor products to see how competitors dealt

with technical issues and how Cordial can learn from it (a practice that is also known as reverse engineering). These values and norms support the other three dimensions of organizational cognition in the sense that they direct the content and interpretation of knowledge in these dimensions. In addition to information about customers and competitors, information about other relevant stakeholders, such as indirect customers, suppliers, complementors, government and research institutes needs to be taken into consideration.

The existence of market-oriented values and norms in product development needs to be distinguished from the firm's product development strategy, which can be described in terms of market-pull versus technology-push (Cooper 1983). With a market-pull strategy, the market explicitly demanding specific product functions initiates product development. Having market-oriented values and norms does not necessarily mean that one should start with explicit market demand and follow a market-pull strategy. An organization with market-oriented values and norms can also employ a technology-push strategy or a balanced combination of both market-pull and technology push. However, in the case of a technology-push strategy, being market-oriented requires investigating at an early stage of the development process whether there is sufficient market demand for the new technological functions to be developed.

Knowledge and skills

Knowledge and skills³ in the context of market-oriented product development comprise a detailed individual and shared understanding of the kind of market information that is needed, why, when and how it should be acquired, disseminated, and combined with technical information in order to create successful new products. Sinkula (1994) classifies this tacit knowledge in endorsed and procedural knowledge. Endorsed knowledge refers to an organizational system of policies and strategies, in other words, “the espoused way of doing things”, which are the rules for acquiring, disseminating and interpreting information about markets. Procedural knowledge is represented in a task system governed by tacit rules, in other words, the routines “how things are actually done”. This individual and shared understanding is analogous to managerial representations, or mental

models. It refers to the potential information processing behavior, the evaluation of the information and determines the quality of the required information (Day and Nedungadi 1994).

This understanding concerns knowing exactly what kind of market information is needed at every stage of the development process. For example, does a firm need market information at the level of the individual customer, at the level of the market segment or at the level of the total market (Wayland and Cole 1997)? At the level of the individual customer the firm may ask which customers might be interested in joint development projects. At the market segment level it may ask which segments appear most promising for rapid diffusion of the new product. And at the market level, the firm may wonder about market potential and market growth. Cordial realized that it typically used market needs and wants too late in the development process and has started to use market information at an earlier stage.

Market information does not only consist of customer information, but also of information about external factors that influence customer needs and wants. For instance, when Nice discovered that their main competitors offered higher image quality and lower prices to customers, they responded by improving their own image quality, lowering product costs and adding a new service that competitors did not offer yet.

In addition to knowledge about the kind of market information, a market-oriented firm also needs skills to collect this information (e.g. the ability to perform an effective beta test), disseminate the information and to combine this information with technical information as input for making product development decisions. On industrial markets, direct contact with customers is an important source of information, for example to define customer requirements or to evaluate prototypes (Cooper 1983; Gouillart and Sturdivant 1994). Direct contact with customers sometimes takes the form of a structured customer visit program (McQuarrie 1991). In industrial firms, it is important to identify the business functions and individuals that are in contact with customers in order to co-ordinate these contacts and create consistent marketing messages, since co-ordination problems are bound to occur due to the large number of different persons having contact with customers.

Distributing all the gathered information across all functions will easily result in information overload, and prevent the firm from tracking the main issues. The format in which the information is presented is important as well and is closely related to the use of information. In addition, cultural differences between business functions are critical and may prevent the existence of shared mental models concerning product development. Especially, the differences between Marketing and R&D hinder the effective information exchange and co-ordination (e.g. Griffin and Hauser 1996; Gupta et al. 1986; Moenaert and Souder 1990a; Moenaert and Souder 1990b; Song and Parry 1992).

Both Cordial and Nice translate functional customer requirements into technical product specifications and employ cross-functional development teams. Nice starts with formulating product specifications on the basis of cross-functional meetings with customers. Based on this market information and knowledge of technological aspects (and using Quality Function Deployment), the technical specifications are drawn up and refined. In addition, market tests are used to determine whether sufficient market demand exists for a product with these technical specifications. The information from the first market test is described in a standard format report including recommendations and “lessons learned” about the product characteristics that are important for potential customers. Subsequently, potential customers test the developed prototype under real-life conditions. Based on the results of the second market test, recommendations and “lessons learned” are formulated about the prototype's functioning, the development of accompanying services and other customer expectations. Next, specific recommendations are drawn up and executed.

These knowledge and skills not only reside in individual mindsets, but are also formalized in technical knowledge systems.

Technical knowledge systems

Technical knowledge systems constitute the formalizations of the above-mentioned endorsed knowledge and skills that enable market information processing behavior. These systems are the result of long structuring and codification processes, which visualize and de-individualize knowledge and skills, and thus put individual knowledge and skills into

explicit organizational memory. Thus, this explicit knowledge can be examined, challenged and assessed. Common explicit procedure rules, which may be formalized into manuals, are for example: starting the product development process with a brainstorm session which involves major customers and key suppliers, installing customer-involved apprenticeships, and developing and testing prototypes with key customers.

An example of information-gathering activities that are part of the technical knowledge system is the aforementioned customer visit program, which states which information is required, how it can be obtained, who is involved, and who plays what role. The information dissemination activities may also be embedded in procedures, which determine the format and the receivers of the information.

Nice formulated procedures for the participation of suppliers in the development team, regular meetings with research institutes, and contacts with internal specialists, who keep track of governmental regulations. Other examples of technical knowledge systems are market information processing tools used during product development (Nijssen and Frambach 2000; Nijssen and Lieshout 1995). Cordial and Nice both use Quality Function Deployment, because they need a thorough, systematic and complete system for translating customer needs into product specifications⁴.

Managerial knowledge systems

Managerial knowledge systems represent formal and informal ways of controlling and creating the knowledge and skills that enable the market learning process. Knowledge-controlling systems facilitate the systematic use of knowledge and skills, and the operation of technical systems. Knowledge-creating systems enable processing organizational information resulting in new knowledge and skills that may lead to modification of both technical and managerial systems. Again, actual market information processing may differ from what is espoused by the firm. Learning about this difference between the espoused and actual way of doing things may generate knowledge about how things “should be done” in the future, in other words resolve barriers to market information processing. It may lead to a re-assessment of market information processing rules, policies and strategies and, for example in the case of an inconsistency, result in different norms and strategies,

which is referred to as augmented knowledge (Sinkula 1994). The resulting new policies and strategies may reside in both technical and managerial systems. An example of a critical managerial knowledge-creating system is Total Quality Management (TQM). Nice uses TQM among other things, to improve its market information processing activities. TQM consists of procedures that describe the evaluation content, the evaluation process, and the formulation of improvement projects (e.g. to adjust the procedure for conducting market tests). Other examples of managerial knowledge-creating systems are rewarding employees on the basis of customer satisfaction, training programs, internships, and co-operation with external partners.

Two knowledge-controlling systems that are essential to facilitate the use of knowledge and skills, as well as the operation of technical systems to process market information, are the product development organization structure and a product development process model. The way the product development function is structured within the organization influences market information processing. This is analogous to the notion from organizational learning theory that variables such as openness (participative and reflective), centralization and formalization influence market information processing (Hult and Ferrell 1997; Jaworski and Kohli 1993). Cordial has a separate department, called product planning, that exists outside the hierarchical functional management lines of R&D and Marketing & Sales. This department gathers market information, uses it to develop broad insight into customer needs and wants and competitor product characteristics, and shares these insights with technical engineers. An existing organizational structure connects the various functions involved in product development, for example through a project matrix structure. This allows for the creation of a cross-functional product development team and facilitates interfunctional co-ordination during information processing activities.

A product development process model or method is based on project management principles used by the firm to structure product development process activities such as the famous stage-gate model (Cooper 1983). Both Cordial and Nice use a model consisting of several (parallel) development tasks, evaluation and decision moments and responsibilities. Within this model, technical knowledge systems, such as procedures and tools (e.g. QFD), are incorporated depending on the complexity of the product and the

required flexibility in the development process. Such a systematic and structured approach to product development enables a firm to control development costs, product quality and time-to-market. A product development process model may also function as a knowledge-creating system. The evaluation moments at the end of every stage, as well as the postmortem after the development project is concluded, allow for reflection on the available market knowledge, the quality of the technical knowledge systems and the quality of the process model. A systematic evaluation of a firm's product development efforts is essential to get feedback on information processing activities (Crawford 1986). When the process model and the embedded technical systems are adjusted on the basis of this feedback and the improved model is applied to future product development projects, the firm increases its knowledge about how, when and why information processing activities need to be carried out. Other examples of knowledge-controlling systems are the firm's product development strategy, and technology/product roadmaps (Capon and Glazer 1987; Groenveld 1997; Willyard and McClees 1987).

So far, we have described the managerial knowledge systems and how these are linked to technical knowledge systems and information processing activities, without making a distinction between these activities. However, these activities differ and due to their differences each of these activities is embedded (through technical knowledge systems) differently in the managerial knowledge systems.

With respect to the collection of information, the managerial knowledge systems incorporate both the technical knowledge system and organizational structure. The development process model contains the information collection procedure; it is planned when the customer visit is prepared, needs to take place and when and how it is evaluated. The organizational structure, which is for example a matrix structure, facilitates determining the responsible people involved and the application of teamwork principles. The evaluation of a customer visit may show that the quality of the gathered information is insufficient. This may be caused by the customer being unprepared or by a flawed customer visit procedure. In the former case a new customer visit needs to be arranged. In the latter case, the procedure needs to be redesigned. For instance, in the case of Nice, the information exchange between technicians did not result in the required information. Nice learned and adjusted this procedure in two ways. The technicians were trained in customer

visiting and account managers were asked to participate in the customer visits. With respect to collecting information, Nice stimulates direct contacts between its own technicians and customer technicians, but uses account managers to co-ordinate the flows of communication. It facilitates this co-ordination by following a procedure for customer visits (technical knowledge system) and using an organizational matrix structure (managerial knowledge system) to control information processing.

Information dissemination as well as information utilization procedures are established in a product development process model. Simply having a procedure will not automatically result in dissemination of market information according to this procedure (see also Rochford and Rudelius 1992). Not every member of the product development team of Nice understands that the different functions need market information, resulting in insufficient cross-functional dissemination. Within Nice, market information is largely limited to the hierarchical functional line: “Marketing receives marketing information, but does not receive production information” as one respondent noted. In addition, Rochford and Rudelius (1992) demonstrate that different functional areas do not always actually use information. Evaluating actual dissemination and utilization practices may be necessary and may lead to adjustment of the technical system and managerial systems. For example, in an evaluation, the above-mentioned dissemination problems with respect to the format and the receivers can be assessed, resulting in the appropriate adjustments into procedures. These adjustments are, for example, a standard format for documents and a distribution list of persons (technical knowledge system) and incorporating prescribed distribution patterns in the product development process model (managerial knowledge system).

Thus, the actual information activities are supposed to be carried out according to the procedures (technical knowledge systems) embedded in knowledge-controlling systems, translating knowledge from customers and other relevant parties into a product. Evaluation moments (go/no go decisions) residing in knowledge-creating systems can be used to determine whether the available market knowledge meets the required quality standards and whether additional information needs to be gathered. These evaluation moments can also be used to determine whether existing procedures for information collection, dissemination or utilization (technical knowledge systems) need to be adjusted

or whether managerial knowledge systems need to be altered to better embed these technical knowledge systems.

Capabilities and activities at two levels

The capability and information processing activities of market-oriented product development and their relationship cannot only be applied to the individual stages of the development process, as mentioned above, but also to the development process as a holistic process. At the level of individual stages, information processing activities are found in every stage of the process. Moreover, in every stage, the emphasis is supposed to be on combining market information with technical information. At the level of the holistic development process, market-oriented product development can be thought of as organizational learning about markets and about developing new products. This learning process consists of information acquisition, distribution, interpretation, and utilization of information about previous development projects (experience and know-how), market trends and technology developments. For instance, evaluation of the product development process may bring to light that a changed competitive situation requires a faster time-to-market. This may result in the establishment of concurrent engineering, collaborative efforts with various partners and investments in information systems.

Conclusions

The concept of market-oriented product development is extremely complex and organizations differ in the extent to which they have a market-oriented product development process. In other words, the issue is the extent to which a firm's product development is market-oriented rather than whether or not it is market-oriented (Biemans 1995; Biemans and Harmsen 1995; Kohli and Jaworski 1990).

Resource-based theory facilitates the integration of market orientation and product development. The cognitive and behavioral elements of market orientation correspond to the capability and information processing activities of product development. Combining the cognitive and behavioral perspective of market orientation reveals that the

emphasis lies on the quality of the activities, rather than the extent to which activities are performed (see Jaworski and Kohli 1993; Jaworski and Kohli 1996). For example, before market information is collected, it is important to have an accurate understanding of the kind of market information required. In addition, from an organizational change perspective, combining these two perspectives seems necessary for obtaining managerial guidelines for creating market-oriented product development. Cognitive development influences, but is not necessarily an accurate reflection of, behavioral development and vice versa (Fiol and Lyles 1985).

Market-oriented product development appears to be more than just carrying out a product development process and performing a number of marketing activities. Using the capability concept from resource-based theory to describe market-oriented product development, we maintain that market-oriented product development is about having a basic understanding of the fact that market information is needed, the kind of market information that is required in addition to technical information, the way market information can be gathered and disseminated, and the way it can be combined with technical information to develop successful products. This basic understanding facilitates performing information processing activities to develop a product and check whether these activities are conducted according to existing organizational knowledge and skills embodied in the technical knowledge systems and controlled by the managerial knowledge systems. These learning activities can take place at the level of the holistic product development process and at the level of individual development stages.

A firm can obtain or enhance this basic understanding, in other words learn how to learn, through information processing activities, conceptualized as an organizational learning process aimed at creating knowledge, which are incorporated in the managerial knowledge systems. This is a short-term (repetitive) process for knowledge and skills, and technical knowledge systems, but a long-term (iterative) process for managerial knowledge systems, and values and norms. Therefore, we argue that market-oriented product development can be visualized as an organizational learning capability, which exists at both levels of product development. That is, it is all about learning about market trends and technological developments which affect the whole process, and learning from

customers, competitors, other stakeholders, and product development activities, which affect individual stages.

For market-oriented product development to be a superior capability, a firm needs an organizational learning process that is more systematic, thoughtful and anticipatory than in other firms (Day 1994b). That is, the continuous execution of market information process activities should be second nature to all parties involved, requiring individual and shared mental maps that focus on present and future market requirements, competitor actions, and interfunctional coordination.

Implications for research and management practice

We used existing literature about market orientation and product development to formulate a conceptual framework of market-oriented product development. This framework was given further substance by conducting two exploratory case studies at large industrial firms, by describing the process and analyzing the relationship between cognitive and behavioral elements of market-oriented product development. However, the cognitive and behavioral elements, as well as the relationship between them, may differ across firms of different sizes and from different industries, vary according to the extent of product newness and product development characteristics (Atuahene-Gima 1995; Atuahene-Gima 1996). Further research should be aimed at operationalizing the framework beyond the existing market orientation measurement constructs, because these constructs measure the extent of market orientation at the level of the organization or business unit as a whole, and predominantly measure market orientation as a behavioral activity, therefore excluding the cultural or philosophical component (Deng and Dart 1994; Jaworski and Kohli 1993; Kohli et al. 1993; Narver and Slater 1990; Ruekert 1992). Integration of the cognitive and behavioral perspective, viewing market-oriented product development as an organizational learning process about markets, offers a more holistic view on how managers may influence the degree of market-oriented product development. Integration of these perspectives implies that information processing activities need to be embedded in the very fabric of the organization. Further research

should be directed at the way market-oriented product development can be implemented and/or improved within the organization. More specifically, answers should be found to the following questions. What problems might occur when a firm tries to increase its level of market-oriented product development? How can we solve these problems? What are the antecedents, obstacles and facilitators for implementing market-oriented product development? Gaining insight into these issues necessitates the operationalization of the cognitive part of market-oriented product development (Biemans 1995; Biemans and Harmsen 1995).

Firms need to cope with increasing global competition, forcing them to closely monitor competitors, decrease the costs of organizational processes and continuously map market requirements. However, firms still spend huge amounts of time and money on unsuccessful product development projects (Page 1993). A market orientation helps firms to increase the chances of successful product development. Preferably, firms should start implementing market orientation in a core organizational process, for example product development (Barabba 1995; Day 1994b; Deschamps and Nayak 1995). This paper offers some first steps in assisting managers in conceptualizing market-oriented product development as an integrated construct, combining cognitive and behavioral elements, using it to enhance organizational learning about markets and creating a competitive advantage (Slater and Narver 1995).

FIGURE 1

An Organizational Learning Process (Based on Day 1994b)

FIGURE 2

Cognitive and Behavioral Perspective on Product Development

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¹ The evaluation of information processing activities (see figure 1) need not be necessarily restricted to the end of the organizational learning process. Each of these activities can be continuously evaluated and as a result have a link with organizational memory.

² The names of the companies are fictitious for confidentiality reasons.

³ Skills refer to the ability to apply knowledge in action.

⁴ Cordial uses Quality Function Deployment only in developing a complex product that is new to the market and the company.