

**NPD gate decision criteria – a consequence of strategic orientation or  
decision-maker expertise**

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**ABSTRACT**

All NPD projects are evaluated at some point of time during the course of the process. These evaluations require the use criteria for deciding whether to carry on or ‘kill’ the project. The focus of this paper is on the origin of decision criteria and what determines the prioritisation of various criteria at the decision gates. Results from a sample of 132 NPD practitioners studied a simulated NPD process show that the importance of decision criteria is influenced by both the strategic orientation of the company and individual decision-making expertise. Especially the proactive and aggressive strategic orientations influence the prioritisation of decision criteria.

**Keywords:** NPD management, decision criteria, strategic orientation, decision-making

## INTRODUCTION

The use of decision criteria at project reviews during the new product development (NPD) process has only recently become a focus area for researchers (Carbonell, Escudero & Aleman, 2004; Carbonell-Foulquié, Munera-Alemán & Rodríguez-Escudero, 2004; Hart, Hultink, Tzokas & Commandeur, 2003; Tzokas, Hultink & Hart, 2004) and there is still little knowledge on the importance of the various decision criteria and no agreement in existing literature on the origin of specific criteria. Other levels of decision-making in a NPD context have been investigated for decades and has put much attention on the link between strategy and decision-making at the program portfolio level (Cooper, Edgett & Kleinschmidt, 1999, 2001; Cooper & Kleinsmith, 1988). A central question regarding decision criteria is whether they can be defined as operationalisations of strategy (Christensen & Raynor, 2003) and innovative orientation (Siguaw, Simpson & Enz, 2006) or whether they are project management tools, i.e. tools for monitoring project progress (Perks, 2007) applied according to individual decision-maker expertise.

This paper investigates the proposed link between visions and decisions in new product development specifically focusing on what determines the prioritisation of decision criteria in the NPD process. We know from literature that the success of new products and company performance in general is linked to strategy, and that some strategic orientations are more successful than others (Cooper, 1984; Gatignon & Xuereb, 1997; Morgan & Strong, 2003; Slater & Narver, 1993; Venkatraman, 1989). Regardless of whether we believe that the essence of strategic work lies with top management or is found in the company culture (Zien & Buckler, 1997) we acknowledge that day-to-day management and decision-making is how companies

attempt to translate strategic visions into appropriate actions and performance. Knowledge and awareness of the origins of NPD decision criteria are important steps towards a coherent NPD management system where all decision levels in the NPD process are consistent: from the strategic decisions to the day-to-day project level decisions (McCarthy, Tsinopoulos, Allen & Rose-Anderssen, 2006) aiming at alignment of decisions with the current corporate strategy (Richter & Schmidt, 2005). The notion of coherence between strategy and management systems is also found in performance measurement which seeks to link the 'balanced scorecard' to strategy (Kaplan & Norton, 1996). However, the prioritisation of decision criteria may also be a result of the current expertise of individual decision-makers. If there is no alignment of decision criteria it may lead to the development of products with poor performance (Cooper et al., 2001; Hart et al., 2003; Tzokas et al., 2004) and it may lead the company in unwanted directions e.g. marketing myopia and low levels of innovativeness (Day, 1999; Levitt, 1960).

The knowledge we develop will give researchers further insight into the origins of decision criteria at the review gate in the NPD process and the 'handles that may be turned' with the aim of aligning NPD decisions with the overall goal of the organisation and making sure resources are allocated in the best possible way.

We start with a review of current literature focussing on the gaps we have identified and which lead to the proposed conceptual framework. Subsequently, our methodological approach is described and results presented.

## LITERATURE REVIEW

### **NPD project review decision criteria**

Existing studies on project review decision criteria show that the criteria used vary according to the NPD evaluation gates, and that results are stable across industries and countries (Hart et al., 2003; Tzokas et al., 2004). Research on the importance of various criteria for performance shows that the relevance of the various evaluation criteria depends on the stage of the NPD process. Strategic and market-related criteria are most crucial in the front end and technical and financial later in the process, while the exception is the customer-related criteria which are equally important to success throughout the whole of the NPD process (Carbonell et al., 2004). These studies offer little explanations of the origin of decision criteria and little knowledge on what determines the prioritisation of decision criteria during the NPD process.

Hart et al. (2003) found that companies use the same decision criteria regardless of innovation strategy and level of product newness (innovation strategy defined as: prospector, analyser and defender, and product newness defined as: line adoption, improvement and completely new). Carbonell et al. (2004) studied the influence of newness of technology and found a clear effect on some of the criteria: strategic fit criteria are positively related to the success of highly technologically innovative products while market opportunity and financial dimensions show negative relations. Thus, there is no agreement in existing literature on the relationship between strategy and decision criteria and authors call for further research on the influence of strategic objectives. Hart et al. also call for research on actual behaviour rather than relating on managers' memory and furthermore on the effect of environmental conditions such as time pressure and hostile competitive environments (Hart et al., 2003). This reveals a gap in the

current knowledge on the relationship between strategy and decision criteria. Studies should also have focus on actual behaviour and environmental conditions. In order to gain further insight into this research gap we look at the context of strategy and decision criteria and explore their role in NPD management.

### **NPD resource allocation decision-making**

Decision criteria in general can be seen as a part of company resource allocation. Strategic management literature is quite explicit on the need for resource allocation or investments (Christensen & Raynor, 2003; Venkatraman, 1989). Resource allocation is part of the organisational competences designed to enable a company to implement its strategic direction and innovative orientation (Siguaw et al., 2006). It is also viewed as a way of institutionalising individual and group learning, defined as the process of ensuring the embedding of routinised actions in systems, structures, and procedures (Crossan & Bedrow, 2003).

Christensen and Raynor (2003) describe the intuitive links between strategy, resource allocation and decisions in the following manner: *'The resource allocation process is the filter through which all strategic actions must flow'*. The resource allocation process is thus manifested through the day-to-day decisions at all levels of the organisation where managers and employees are involved in and responsible for investment decisions that are central to the manifestation of the strategy conveyed by top management (Christensen & Raynor, 2003). Hence, strategy represents top management's prioritisation rules and act as input to the resource allocation process. The goal is consistency in strategy and behaviour and refers to the *'extent to*

*which firm behaviour (in terms of resource allocation decisions) is aligned with the firms intended course of action (corporate strategy concept)' (Richter & Schmidt, 2005).*

Companies implement structures and processes that are designed to allocate resources effectively and in accordance with company strategy. NPD processes are no exception. In new product development, resource allocation is concerned with which projects to fund, a decision that must be made both at the *program* level when deciding on the portfolio of new projects and at the *project* level with go/no-go decision in the product development process (Cooper et al., 1999; Cooper, 2001; Perks, 2007). Decision criteria are thus a way of focussing and implementing strategy in decision-making (Hart et al., 2003).

### **NPD decision-making levels**

In NPD management it is possible to identify at least three levels of decision-making as depicted in figure 1: 1) the strategic project portfolio level is concerned with the pool of NPD projects 2) the project review level evaluates projects between the stages of the NPD process, and 3) the in-stage decisions are concerned with the operations in the NPD process (McCarthy et al., 2006; Perks, 2007).

### **Insert figure 1 around here**

At the upper level top management uses NPD portfolio management to allocate resources to projects that support the market and product strategies (Cooper & Kleinschmidt, 1986). The importance of a strategic focus for managing the NPD project portfolio is clear from studies that show how the most successful companies pick the right set of projects (Cooper et al., 1999, 2001) and how this relates to the NPD process (Englund & Graham, 1999). Senior managers

decide the project portfolio while different levels of decision-making agents make decisions at the other levels (McCarthy et al., 2006).

At the bottom level, the intra-stage decisions taken by NPD project team members from marketing, R&D and production may secure resource allocation through the specific decisions taken in relation to the day-to-day activities in the project (Cooper, 2001). These decisions are related to project progress at each stage (Krishnan & Ulrich, 2001) and largely subject to the influence of the individual NPD decision-maker (McCarthy et al., 2006). There may be cause for concern that decisions at the lower levels are not aligned with the chosen strategy due to managerial distance. However, a study of the consistency between strategy and individual resource allocation decisions shows that managers at the operational decision-making level are just as likely to make resource allocation decisions which conform with corporate strategy compared to higher level managers (Richter & Schmidt, 2005).

At the middle level, end-of-development-phase project reviews are concerned with the decision whether or not to continue the development process (Cooper, 1994; McCarthy et al., 2006). Projects are evaluated by individual or teams of middle managers based on criteria which differ in the course of the project progress (Carbonell et al., 2004; Hart et al., 2003). If the project fails to get a positive review based on the criteria set up, resources are redirected to other projects.

### **Decision-making expertise**

We know from organisational theory and cognitive psychology that human expertise is central to organisational memory (Simon, 1991). Within the NPD literature research has largely

focused on the team member level and investigated e.g. the influence of personality in NPD teams (Reilly, Lynn & Aronson, 2002) or both group and individual variables on the performance of project groups (Keller, 1986). Gate reviews are not typically the responsibility top management nor placed with project team (Cooper, 2001) but usually done by middle managers either the project or functional level (Katz & Allen, 1985). However, we know very little about the influence of the individual characteristics of these decision makers.

Based on the literature review we will investigate how the prioritisation of decision criteria is influenced by ‘top down’ strategic orientations and ‘bottom up’ decision-maker characteristics. This will give insight to the origin of decision criteria for project reviews and knowledge of what determines the prioritisation of the criteria dimensions.

## **CONCEPTUAL FRAMEWORK**

Figure 2 illustrates the conceptual framework designed based on the literature review.

**Insert figure 2 around here**

### **Strategic orientation**

The traditional approach to strategy in the management literature is a classification approach where typologies of strategies are identified. Examples of these are the Miles and Snow (1978) prospector, analyser and defender typologies (Miles & Snow, 1978) and the Porter (1980) low cost, differentiation and focus typologies (Porter, 1980 ). NPD literature has also applied the

typologies approach, e.g. Cooper (1984). However, companies often find it difficult to identify with one single archetype (Morgan & Strong, 2003).

An alternative is the comparative approach where strategy is evaluated on multiple dimensions identifying a company's strategic orientation (Morgan & Strong, 2003; Venkatraman, 1989).

Venkatraman (1998) proposed six strategic orientation dimensions: Aggressiveness, Analysis, Defensiveness, Futurity, Proactiveness and Riskiness. The study finds three of the dimensions (Defensiveness, Proactiveness and Analysis) to be positively related to performance, while Riskiness and Aggressiveness are negatively related to performance; there is no significant affect of Futurity. The study is based on consumer and capital goods.

Morgan and Strong (3003) replicated the study on the business performance of the strategic orientations and found a similar overall picture, see table 1. Morgan and Strong's study, which was based on medium and large, high technology industrial manufacturing firms, concludes that among these companies conservative strategies have the best performance whereas entrepreneurial strategies are not positively related to performance.

**Insert table 1 around here**

A recent study investigated the effects of four dimension (Analysis, Proactiveness, Aggressiveness and Riskiness) on market and technological performance and found positive effects for three of the orientations while a risk-adverse, not a risky orientation drives new product performance (Talke, 2007). We have included three strategic orientations in this study: Aggressiveness, Risk-adverse and Proactiveness. We expect the prioritisation of specific criteria

to differ depending on whether respondents currently work in companies with strategic orientation that are either Aggressive, Risk-adverse or Proactive.

### **Proactiveness and decision criteria**

Companies with a highly proactive strategic orientation are focused on exploiting emerging opportunities in the market; they continuously pursue new market opportunities and are very responsive to signals from the market (Morgan & Strong, 2003; Venkatraman, 1989). They have focus on developments in the market and end-user needs (Narver, Slater & MacLachlan, 2004). These companies would therefore be expected to continuously check whether the project is aligned with company strategy and whether it lives up to customer satisfaction and is accepted in the market.

*Hypothesis 1:* Companies with a high level of proactiveness place higher importance on strategic and customer-related criteria and lower importance on market, financial and technical criteria.

### **Risk-adverse and decision criteria**

Companies with a high-risk strategic orientation (the opposite of risk-adverse) are characterised as opportunistic, venture-seeking and rule-breaking (Morgan & Strong, 2003). Their riskiness is reflected in their resource allocation decisions, e.g. choice of products and markets (Venkatraman, 1989). They allocate resources to uncertain projects, new markets, and have a progressive technological strategy (Talke & Hultink, 2007). Risk-adverse companies are conservative and seek non-risky returns and are therefore expected to focus highly on the financial, customer- and market-related criteria and less on the strategic and technical.

*Hypothesis 2:* The more risk-adverse companies are, the higher the importance of financial, customer- and market-related criteria and the lower the importance of strategic and technical criteria.

### **Aggressive and decision criteria**

Companies with a highly aggressive strategic orientation focus on allocating resources for improving market positions faster than competitors and they focus intensely on market share (Venkatraman, 1989). They are motivated by sales growth, market share development and profitability. They exploit resources more effectively than competitors and (Morgan & Strong, 2003). These companies are therefore expected to focus on market shares and the financial criteria.

*Hypothesis 3:* Companies with a highly aggressive strategic orientation give higher importance to market and financial decision criteria (and lower importance to strategic, customer and technical criteria. Hypotheses 1-3 are summarised in table 2.

**Insert table 2 around here**

### **Decision-maker experience and decision criteria**

Decision-makers with high expertise (Simon, 1991) and long experience (Keller, 1986) with NPD are expected to possess the knowledge related to which of the decision criteria are most important and are better able to prioritise the criteria.

*Hypothesis 4:* Decision-making expertise and experience with new technologies and new markets results in stronger prioritisation of specific criteria.

H4a: Decision-makers with experience in working with new technologies prioritise the technical criteria.

H4b: Decision-makers with experience in working on new markets prioritise the customer- and market-related criteria.

### **Competitive turbulence**

We expect differences in the use of decision criteria as a result of variation in NPD projects' situational and environmental conditions (Hart et al., 2003). Becoming aware that competitors are working on a similar project, a company will try to reduce cycle time, which may affect the criteria used at the evaluation gates and differences are expected to occur in the prioritisation of specific criteria. A recent study on the effects of turbulence on strategy planning in NPD found that environmental turbulence requires more risk-taking behaviour (Calantone, Garcia & Dröge, 2003). Competitive turbulence is treated as a control variable.

## **METHODOLOGY**

### **Choice of methodology**

This study is based on a virtual, simulated NPD process, which is an approach that combines a number of different methods. The NPD process simulation exploits the advantages of

the role-play<sup>1</sup> and the scenario<sup>2</sup> while maintaining the quality of data collected by means of a questionnaire (reliability and comparability) as well as the dynamics offered by experimental designs. Using the Internet as medium, these four business research methods were combined and applied as the backbone of the simulation. The aim of the simulation was to have NPD practitioners go through an interactive process of selecting NPD activities and evaluating a product from idea to launch based on the information generated by the selected NPD activities. Table 3 presents how the methodologies acted as the building blocks of the virtual NPD process.

**Insert table 3 around here**

### **The data collection process**

The basic structure of the data collection process is illustrated in figure 3. The questionnaire contained several measures, e.g. respondent background and experience, newness of past NPD projects and strategy as well as a question on current NPD budget.

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<sup>1</sup> The advantage of role-playing is that roles influence a person's perception of a situation. More importantly, the similarity between laboratory research and role-playing is well documented Dabholkar, P. (1994). Incorporating choice into an attitudinal framework: Analyzing models of mental comparison processes. 21: 108-118.

<sup>2</sup> The scenario is the situation in which the role-play is acted out by the participants and is therefore the heart of the simulation. The advantage of using scenario as a frame for the decision-making process is that it makes the respondents relate more directly to the posed subjects and makes it possible to create a realistic context. Also, when respondents are presented with a scenario before decision-making, their attention is guided towards the relevant problem area. As all respondents are provided with a standard stimulus, the outcome will be more accurate responses Fredrickson, J. W. (1984). The comprehensiveness of strategic decision processes: extension, observation, future directions. *Academy of Management Journal*, 27 (3): 445-466, Fredrickson, J. W. (1985). Effects of decision motive and organizational performance level on strategic decision processes. *Academy of Management Journal*, 28 (4): 821-843, White, J. C., Varadarajan, P. R. & Dacin, P. A. (2003). Market Situation Interpretation and Response: The Role of Cognitive Style, Organizational Culture, and Information Use. *Journal of Marketing*, 67 (3): 63-80.. The key is to structure the scenario in accordance with the decision process under investigation in order to maintain realism in the simulation.

In the simulation the NPD practitioners were asked to initiate NPD activities for the purpose of evaluating a new product project as it evolved through the NPD process. At each stage, they were given a short description of the latest progress followed by a list of possible NPD activities for that specific stage. Participants rated these and decided which NPD activities to perform. Subsequently, a list of the selected NPD activities appeared, allowing the participants to access the information. Based on their newly gathered information, participants were asked to evaluate the new product project before continuing to the next stage of the NPD process. The simulation ended with a decision whether to launch or not.

**Insert figure 3 around here**

## **Measurement**

The decision criteria dimensions were derived from Carbonell et. al, (2004). In the simulation, at the end of each phase of the NPD process respondents were asked to assign 100 points to the five criteria dimensions. These points represent the importance attributed to the criteria at this gate in the process.

The strategic orientations were measured using nine items in the questionnaire respondents filled in before beginning the simulation. Items were measured on a scale from 1-100. The items for the Risk-adverse orientation were derived from Venkatraman (1989) and Morgan and Strong (2003). The Aggressiveness items were primarily derived from Talke (2007) and Talke and Hultink (2007). The items regarding Proactiveness were developed with inspiration both from the strategic orientation literature mentioned above and the market orientation literature (Narver et al., 2004).

Decision-maker expertise was also measured in the initial questionnaire with questions on experience with product development, the newness of the technology used in existing work and the newness of the market for the current products. NPD experience was measured on five levels: 0-2 years, 3-5 years, 6-10 years, 11-15 years and over 15 years. Newness of technology was measured on four levels: small changes, large steps, new but related technology and totally new technology. Newness of market was measured on four levels: existing customers, new niche, new segment, new market. Both newness measures are based on the work of (Danneels & Kleinschmidt, 2001). Decision-maker experience is represented by three dummy variables: (1) more than 5 years experience with NPD, (2) currently working with new, related or totally new technology and (3) currently working with new niches, new segments or new markets.

Competitive turbulence is represented by two dummy variables: medium turbulence and high turbulence (no turbulence is the base level). Turbulence is part of the experimental setup in the simulation, introduced only in the concept and design phases.

## **Sample**

The population consists of Danish product/service developing companies with more than 50 employees in Denmark. Companies were identified through database searches. The companies were contacted by phone in order to identify the person in charge of product development. A total of 798 companies subsequently received an e-mail with a link to the simulation homepage. Data were collected in September-November 2007.

A total of 132 NPD practitioners had carried out the simulation by December 1<sup>st</sup> 2007. Twenty percent of the respondents operate on the industrial market while 80 percent operate on

the consumer market. Sixty nine percent are manufacturing companies (Food 18%, Electronic 17%, Textile 6%, Wood & Paper 5%, Machinery 4%, Other 19%) and 31 percent are service companies (Financial 5%, Other private service 13%, Other public service 13%).

## ANALYSIS

### **Descriptive analyses**

Means for the five decision criteria dimensions are calculated. Scale reliability analysis with Cronbach's alpha are performed on the strategic orientation items and are checked for normal distribution by means of a Kolmogorov-Smirnov test. The relationship between the decision-maker experience levels are analysed using Chi-square.

### **Analyses of the conceptual model**

Hypotheses H1 to H4 are tested by analysing the results of 25 (five phase x five criteria) separate multiple regression analysis with dummy variables. The general model used to test these hypothesis is:

$$DCimportance_{ij} = \beta_0 + \beta_1 strategy_{ijk} + \beta_2 decision-maker_{ijh} + \beta_3 competitive\ turbulence_{ij} + \epsilon$$

$i$  = review gate,  $j$  = participant,  $k$  = strategic orientation,  $h$  = decision-maker expertise type. The strategy scales and the decision-making experience levels are the independent variables of interest. They represent the relative importance of the strategic orientations and importance of the levels of decision-making experience, while competitive turbulence is a control variable and  $\epsilon$  represents the error term.

## **RESULTS**

This section will first report descriptive statistics for decision criteria, strategic orientation and decision-maker experience, then report the results of the hypothesis tests with focus on the impact of the strategic orientation and decision-maker experience.

### **Descriptive statistics for decision criteria**

Figure 4 shows the prioritisation of the decision criteria at the five evaluation gates following the idea, concept, design, test and commercialisation phases.

**Insert figure 4 around here**

If all five criteria dimensions were rated equally important, respondents would allocate 20 points out of the total of 100 points to each. Focus of attention is therefore on which criteria are above and which are below the 20-point level. The criteria rated most important are the customer and technical criteria while the financial criteria floats just around the 20 point line during the entire process. The market and strategic criteria are rated least important.

### **Descriptive statistics for strategic orientation**

As mentioned above the strategy questions are based on items from earlier studies by Venkatraman (1989) and Morgan and Strong (2003). Scale reliability tests as reported in table 4 do not show convincing figures for this sample. Only the Proactiveness scale approximates an acceptable level of Cronbach's alpha when one item is deleted.

**Insert table 4 around here**

A Kolmogorov-Smirnov test in table 5 shows that only strategy items 1, 5 and 6 have a normal distribution. This may explain the lack of scale reliability. We conclude that the original three strategic orientations cannot be identified in this sample. The effects of the strategy questions will be analysed separately in the regression analysis, identifying their individual effects on the importance of the five decision criteria dimensions.

**Insert table 5 around here**

The lack of reliability for this sample may be due to the original orientations Risk-adverse and Aggressiveness being developed for overall strategic management, while the focus of this study is exclusively on new product development and the wording in the items was moderated to fit this purpose.

**Descriptive statistics for decision-maker experience**

Just above half of the respondents (52%) have more than five years experience with new product development, 59 percent work with existing technologies, while 54 percent develop products to existing customers. Table 6 shows that of the 52 percent respondents with more than five years of experience, 39 percent work with new technologies and 54 percent on new markets in their new product development.

**Insert table 6 around here**

**Results for the conceptual model**

Results of the multiple regression analysis are shown in table 7A and 7B. In Hypotheses 1 we proposed that a high level of *Proactive strategic orientation* would lead respondents to

prioritize strategic and customer-related criteria and not focus so much on market, financial and technical criteria. The results shows that respondents from companies with a highly proactive orientation attach more importance to *strategic* ( $\beta_{\text{Strategy3\_Idea}} = 0.18, p < 0.05$ ) and *customer-related criteria* ( $\beta_{\text{Strategy1\_Idea}} = -0.27, p < 0.01$ ) at the idea phase gate and more importance to *market-related criteria* ( $\beta_{\text{Strategy3\_Test}} = 0.19, p < 0.05$  and  $\beta_{\text{Strategy2\_Commercialisation}} = 0.21, p < 0.05$ ) at the test and commercialisation gates. The proactive rating of the *technical* criteria shows a mixed picture; they rate the technical criteria less important ( $\beta_{\text{Strategy2\_Concept}} = -0.21, p < 0.05$  and  $\beta_{\text{Strategy3\_Concept}} = -0.20, p < 0.05$ ) at the concept gate, but more important at the test gate ( $\beta_{\text{Strategy1\_Test}} = 0.25, p < 0.05$ ), while the relationship are both positive and negative for the commercialisation phase ( $\beta_{\text{Strategy1\_Commercialisation}} = 0.22, p < 0.05$  and  $\beta_{\text{Strategy2\_Commercialisation}} = -0.27, p < 0.01$ ). Based on the overall picture of these findings we conclude that being proactive does have an effect on the prioritisation of the decision criteria and H1 is supported.

Hypothesis 2 proposed that the more *Risk-adverse* companies are, the higher the importance of financial, customer- and market-related criteria, while they would find strategic and technical criteria less important. Results in table 7A show no effect of the Risk-adverse orientation at the idea and concept phase gates, while table 7B shows that the more conservative companies are the less important respondents find financial criteria at the test gate ( $\beta_{\text{Strategy4\_Test}} = 0.18, p < 0.05$ ). Since this was the only significant relationship found we conclude that being risk-adverse has very little effect on the prioritisation of decision criteria and since it is opposite of what we proposed H2 cannot be supported.

Hypothesis 3 proposed that the *aggressively oriented* pay more attention on market-related and financial criteria and less on strategic, customer-related and technical criteria. Results

show that aggressive companies prioritise *technical* ( $\beta_{\text{Strategy9\_Idea}} = 0.25, p < 0.01$ ), *strategic* ( $\beta_{\text{Strategy9\_Idea}} = 0.18, p < 0.05$ ) and *market-related* criteria ( $\beta_{\text{Strategy9\_Idea}} = 0.21, p < 0.05$ ) at the idea phase gate. The aggressive orientation also influences the *customer-related* criteria in the idea gate, but this picture is more mixed. If focused on being first on the market *more* importance is placed on customer-related criteria ( $\beta_{\text{Strategy7\_Idea}} = 0.25, p < 0.05$ ), while if focus is on being technologically ahead *less* importance is placed on customer-related criteria ( $\beta_{\text{Strategy9\_Idea}} = -0.27, p < 0.01$ ). Although we do find effects of the aggressive orientation on the prioritisation of decision criteria, only the relationship regarding the market-related criteria is completely in line with the hypothesised relationships and we therefore conclude that there is only weak support for H3.

Hypothesis 4 proposed that expertise and experience in decision-making would lead to more prioritisation of decision criteria. Results show that respondents with *more than five years of NPD experience* find *strategic* criteria less important ( $\beta_{\text{NPD+5\_Concept}} = -0.23, p < 0.05$ ) at the concept phase gate, while *technical* criteria are more important ( $\beta_{\text{NPD+5\_Concept}} = 0.32, p < 0.01$ ) at the design phase gate. In hypothesis 4a we proposed that respondents experienced with new technologies would focus more on the technical criteria. Respondents experienced with *new technology* place more importance on *market-related* criteria ( $\beta_{\text{Newtech\_Concept}} = 0.22, p < 0.05$ ) in the concept phase gate, while they find *customer-related* criteria less important ( $\beta_{\text{Newtech\_Test}} = -0.21, p < 0.05$  and  $\beta_{\text{Newtech\_Commercialisation}} = -0.21, p < 0.05$ ) at the test and commercialisation gates. In hypothesis 4b we proposed that respondents who have experience working on new markets would prioritise customer- and market-related criteria. Results show that respondents experienced with *new markets* found the *financial* criteria less important ( $\beta_{\text{Newmar\_Idea}} = -0.22,$

p<0.05) at the idea gate. Overall results show that decision-maker experience does influence the prioritisation of decision criteria and we therefore support H4, while H4a and H4b are only weakly supported.

*High turbulence* resulted in respondents putting more importance to the *customer-related* criteria at the concept phase ( $\beta_{\text{HighGate2}} = 0.24$ ,  $p < 0.01$ ). Turbulence was added in the concept and in the design phase. Medium turbulence had no effect.

**Insert table 7 around here**

It should be noted that R squares for several of the models are very low ( $R^2 < 0.10$ ) indicating that for these models the independent variables explain less than 10 percent of the variation in the importance of the decision criteria. These effects should therefore be analysed with prudence. The rest of the R square are between 0.10 and 0.19, explaining up to 19 percent of the variance. Results on the proposed hypotheses are summarised in table 8.

**Insert table 8 around here**

## **DISCUSSION**

The results of this study show that a firm's chosen strategic orientation does offer some explanation to the prioritisation of decision criteria in the NPD process. It should be stressed that the explanation is only partial, since we found some effect of a proactive strategic orientation, a partial effect of an aggressive strategic orientation, while hardly any effect of a risk-adverse orientation. The proactive companies in this study prioritise the strategic, customer- and market-

related criteria, while the financial are less important. These results are in line with the expectations we have for a the NPD of a proactively market-oriented company (Narver et al., 2004; Narver, Slater & Tietje, 1998) where the focus is on the satisfaction of customers and high quality products that are accepted by the market, but without being blind to the overall company strategy. The aggressive companies prioritise the strategic, market-related and technical criteria which also paints a clear picture of companies with high focus on market growth and technical resources, but also with the strategic goals in mind. For these orientations we see the signs of coherent management systems where orientation and decision-making are aligned. We find evidence that decision-making expertise influences the prioritisation of decision criteria, focussing more on market-related and technical criteria. This indicates that managers know from experience that it is central to consider whether technical resources are available and find out whether the market is attractive enough.

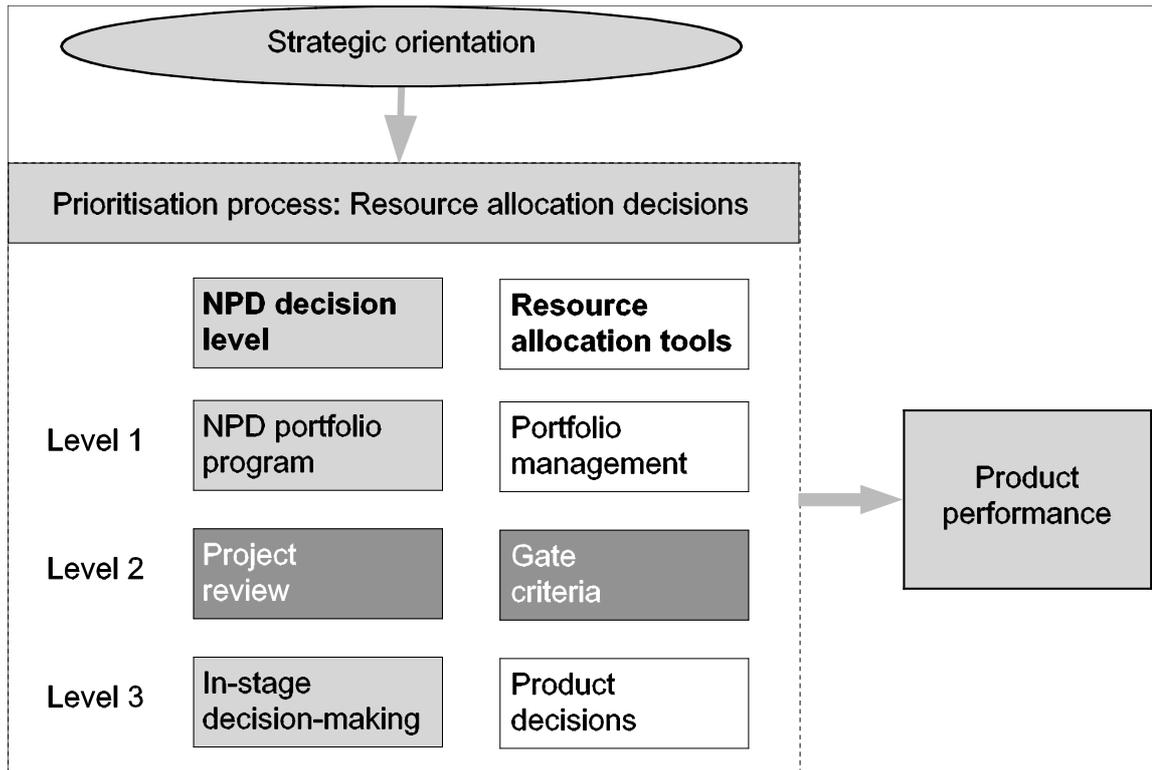
Given that the explanation from strategic orientation and decision-maker experience is only partial, this leaves us with the central question of what then explains the major part of the difference in the way decision criteria are prioritised? Do decision-makers rely on gut-feeling? Do companies use standard procedure checklists with next to no prioritisation of the decision criteria or is the application of criteria a question of coincidental company practice? Companies could be applying the same process model, with exactly the same suggestions for evaluation of go/no-go decision. This notion may be proposed as part of an explanation as to why companies find it so hard to develop radical innovations, a very challenging task indeed if they always use the same set of criteria and never vary their prioritisation. Areas for further research into decision criteria prioritisation would be to look deeper into the decision-maker expertise and experience

by investigate the effect of various personality traits (Reilly et al., 2002) and to investigate the effects of a broader range of strategic orientations.

Based on the results in this paper managers, responsible for NPD, may consider the strategic orientation of their company on the one side and whether this is translated into the prioritisation of decision criteria and on the other side how their own expertise affects this prioritisation.

**FIGURE 1**

**Strategy and NPD decision-making levels**



**FIGURE 2**

**The conceptual framework for investigating NPD decision criteria**

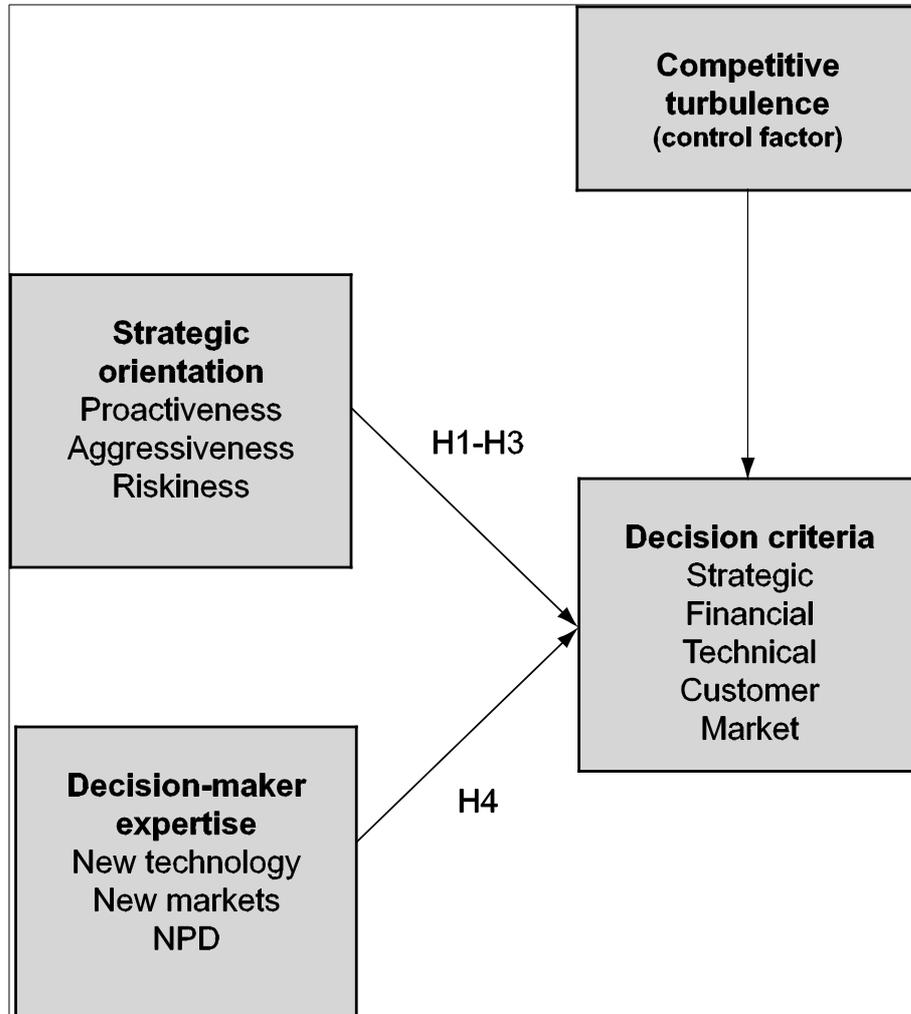


FIGURE 3

The data collection structure

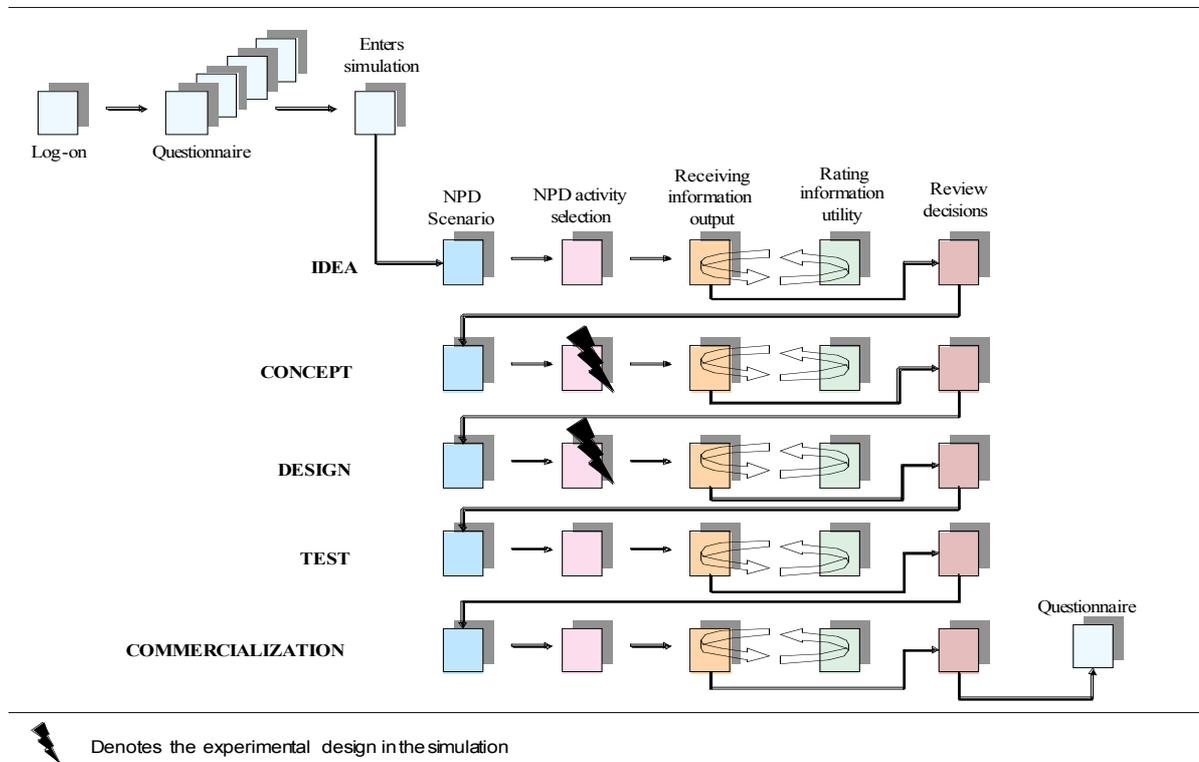
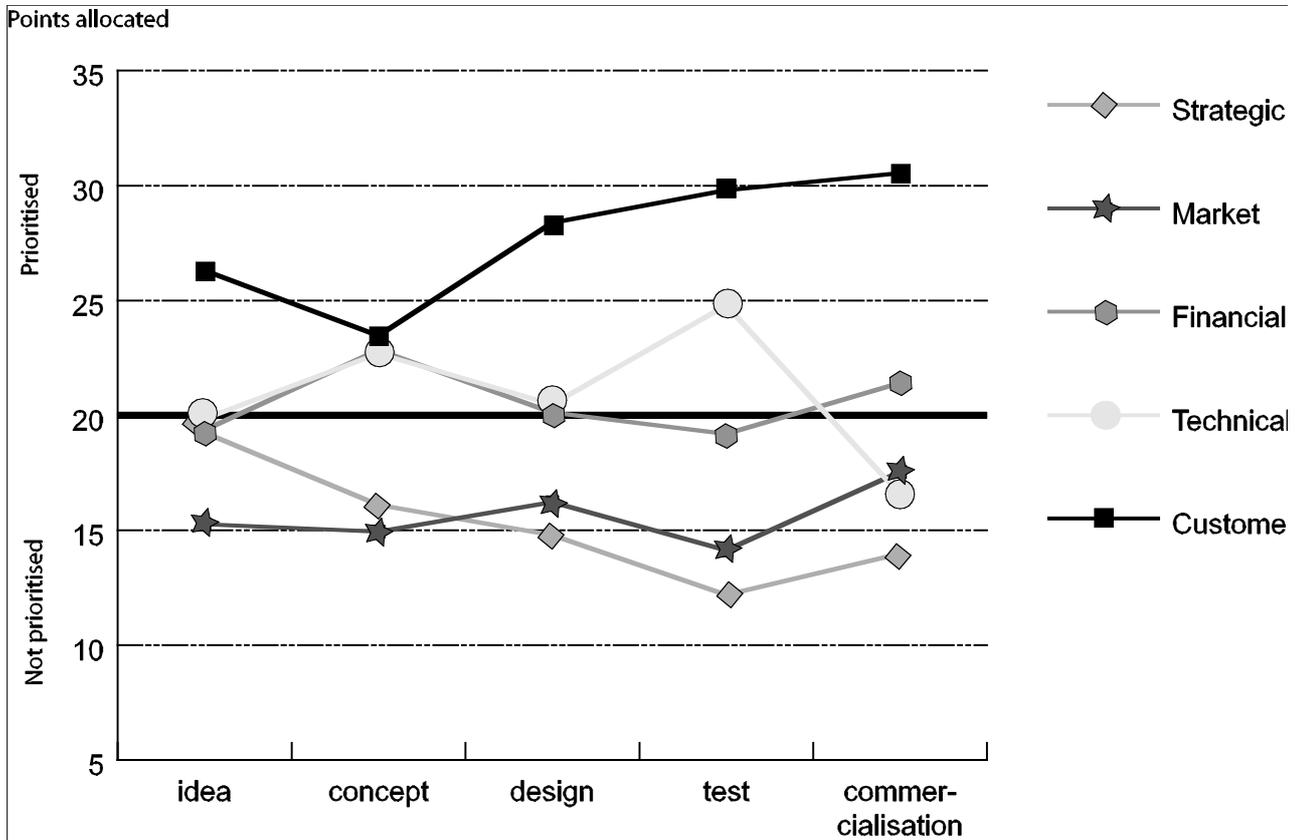


FIGURE 4

The prioritisation of decision criteria in the simulated NPD process



**TABLE 1****Direct effects of strategic orientation on performance**

Strategic dimension	Aggressiveness	Riskiness	Analysis	Defensiveness	Futurity	Proactiveness
Venkatraman (1998)	-	-	+	+	n.s.	+
Morgan & Strong 2003	-	-	+	+	+	-
Talke (2007)	+	-*	+	Not tested	Not tested	+

\*risk-adverse: +

**TABLE 2****Summary of proposed hypotheses H1-3 (importance)**

Criteria / Orientations	Proactive (H1)	Risk-adverse (H2)	Aggressive (H3)
<b>Strategic criteria</b> Alignment with company strategy Window of opportunity	High	Low	Low
<b>Customer-related criteria</b> Customer satisfaction Product quality Market acceptance	High	High	Low
<b>Market-related criteria</b> Market growth Market share	Low	High	High
<b>Financial criteria</b> Margin rate Internal rate of return Sales volume	Low	High	High
<b>Technical criteria</b> Availability of resources Leverage of firm's technical resources Project total cost	Low	Low	High

**TABLE 3****Methodologies and simulation elements in detail.**

<b>Questionnaire</b>	<b>Scenario</b>	<b>Role-play</b>	<b>Experiment</b>
Background characteristics of participant and organization	Status for each stage of the NPD process	Job description	Competitive turbulence
Importance of each NPD activity at each stage	NPD activities	The company's internal business environment	
Selecting a NPD activity	The new product project	The company's external business environment	
Information utility of each NPD activity		The company information acquisition budget	
Prioritisation of decision criteria			
New product project evaluations			

**TABLE 4****The reliability of the strategic orientation scales**

Strategic orientation	Cronbach's alpha	If item deleted
Strategy1-9	.40	
Strategy1-3: Proactive	.56	.66 (item 3 deleted)
Strategy4-6: Risk-adverse	.36	.47 (item 4 deleted)
Strategy7-9: Aggressive	.44	.49 (item 8 deleted)

**TABLE 5****Test for normal distribution of the strategy items**

Strategy item	S1	S2	S3	S4	S5	S6	S7	S8	S9
Mean	77.86	64.56	68.71	52.25	73.79	53.67	50.31	38.25	34.94
St. deviation	21.09	27.11	12.27	27.26	25.04	28.04	24.96	25.74	25.12
Komogorov-Smirnov Z	1.69*	1.17	0.85	0.72	1.70*	1.27+	0.60	1.12	1.02

Significance of the Kolmogorov-Smirnov Z: \*p<0.05, +p<0.10

**TABLE 6****Cross tabulations of decision maker experience dummy variables**

		Newness of technologies		Newness of markets	
		Existing technology	New technology	Existing customers	New customers
<b>NPD</b>	≤ 5 years	57%	43%	62%	38%
<b>Experience</b>	> 5 years	54%	39%	46%	54%

Newness of technology: Chi-square = 0.19, n.s. and Newness of market: Chi-square = 3.20, p<0.10