

Creation of a model that identifies and rates the factors that influence NPD success within SME's without using hard data.



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Preface

This thesis was written to complete my Master Business Administration at the university of Twente. The road in reaching the ability to write previous sentence was long and hard. Almost a year ago, I was ready to start with my master thesis. Although being ready for it I had not no clue which topic to pick and to spend the rest of the year reading, researching, typing and talking about. By coincidence I contacted dr. M. de Visser with some ideas about a possible master thesis. Well ideas that maybe could have better fitted with studies like economy or politics. But as a good supervisor he turned out be, he provided me with his PHD research and soon I found an idea for an eventual thesis topic. Assessing the relation between exploration, exploitation and its influence on sales. But after more than about a 50 phones calls, 100 mails, 6 meetings at different firm, and 4 months in time it turned out to be not so easy to gather the required data.

Eventually, via dr. M. de Visser and dr.ir. A. Veenendaal I was brought into contact with [REDACTED] [REDACTED] who were looking for a student to write a thesis about innovation. So, to finish my [REDACTED] offered me the opportunity to graduate within their firm and use their connections to gather the data required. [REDACTED]

[REDACTED] So, at the end of September we decided to pull the plug out of the first thesis attempt and to start a new one. As you can guess the second attempt turned out be more achievable. This time dr. M. de Visser asked me if I was interested in creating an innovation scan. Well this sounded interesting so I decided to take the offer. A decision which I don't regret. During this seemingly short period I gained a lot of knowledge about innovation and product development within firms and had the opportunity to have some interesting conversations with firm representatives about the topic. [REDACTED]

To recap I would first like to thank dr. M. de Visser for keeping fate in my research and his support at all moments when possible. Second I would like to thank dr.ir. A. Veenendaal for bringing me into contact with [REDACTED] allowing me to finish my thesis after all. Of course, my thanks also go to [REDACTED] who offered me the possibility to

graduate within their firm. Additionally, all the firms who participated within my research also need special some special thanks. And finally, I would like to thank my parents, brother and friends for supporting me throughout the whole research.

In the end the most important thing I learned during this thesis is that it is sometimes better to take your loss, but to never give up, never.

Management summary.

The aim of this research was to find out whether it is possible to create a framework to value the factors that influence the success of new product development within small and medium enterprises without using hard data. Due to increased competition, changing markets, shortening life cycles firms and the increasing pressure from shareholders, firms are forced to increase profits and to create sustainable competitive advantages. To create a sustainable competitive advantage and meanwhile increase their profits firms should be innovative. An important factor in being innovative is the creation of new products. To assess the strength of new product development within firm's scholars have created best practice models that enable firms to compare their practice with the best practice. This enables managers to gain an insight into their current new product development (NPD) performance and gives direction for eventual improvement. One of the shortcomings of the existing models is that they are not suitable for small and medium enterprises (SME's) who for instance often lack the resources that large firms do have. To fill this gap, we created a model to value NPD within SME's. Based on a meta analyses we took the factors that are ought to be related to the success of new products and translated them into a 3-level scale. Together all these factors including their 3-level scale form our final model. Eventually we tested our model within 4 firms by conducting interviews, internal and external firm valuation based on our model, and the evaluation of our model by firm representatives. By conducting an analysis over the previously indicated testing methods we found that our model might be considered valid as a tool to value NPD within firms albeit that some factors and the measurement method will need some future adjustment. Specifically, our model still contains some factors that might be unachievable due to the possible absence of required resources and clearly defined departments within SME's. Furthermore, the factor product advantage might not be suitable for firms who produce products on demand of their customers. Additionally, we found that products who are radically new for a market, the usage of customer input might be of less importance. To create more accurate scores per factor the model might be adjusted to use statements per factor instead of pre-defined levels.

New product development is
considered to be “the lifeblood
of companies, large and small”

(Lynn, Abel, Valentine, & Wright, 1999, p.320)

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1.Introduction

Increased competition, changing markets, shortening life cycles and the increasing pressure from shareholders, are forcing firms to increase their profits and to create sustainable competitive advantages (Ahmed, 1998; Gama, Silva, & Ataíde, 2007; Griffin, 1997). “There are two well-known approaches to increase profits and create a sustainable competitive advantage: a short-term one via operational cost reduction and a longer term one by differentiation being innovative”(Gama et al., 2007, p.1). Apart from the long term competitive advantage offered by successful innovation, innovation is found to increase firm performance, is related to firm growth (Calantone, Cavusgil, & Zhao, 2002; Zahra & Covin, 1994), and is even considered critical for firm survival (Zahra & Covin, 1994). So “in order to both sustain their competitive position and to strengthen it, organizations and economies must innovate and promote innovation”(Baregheh et al., 2009, p.1324). The development of new products (NPD) specifically plays an important role in innovation and is considered to be “the lifeblood of companies, large and small” (Lynn, Abel, Valentine, & Wright, 1999, p.320).

By tracking innovation managers are enabled to make informed decisions and to align firm innovation with firm goals (Muller, Välikangas, & Merlyn, 2005). Firms might for instance want to know how they perform in NPD “because innovation can support differentiation and generate sustainable competitive advantage for organizations” (De Medeiros, Ribeiro, & Cortimiglia, 2014, p.76). Unfortunately innovation includes the creation of intangible value making it hard to measure (Gama et al., 2007). Additionally many firms don’t “pay attention to the process of innovation management” or simply don’t “have the internal structures to measure innovation” (Gama, Silva, & Ataíde, 2007, p.2). To overcome this firms can measure and value the factors that enable NPD within firms via a best practice model. Therefore various authors have tried to identify the so-called success factors that drive the success of new product development within firms (Cooper & Kleinschmidt, 1987; Cooper, 1990; Cooper, 1996, 1999; Cooper & Edgett, 2003; Cooper, Edgett, & Kleinschmidt, 2004b). An example of an identified success factors that is argued to increase NPD success is the usage of a stage gate system (Cooper, 1990). A stage-gate system is “a blueprint for managing the new product process to improve effectiveness and efficiency”(Cooper, 1990, p.44). Over the years, this and other success factors have been gathered by authors and combined into so called best practice NPD models to compare the actual

practice with best practice (Ahmed, 1998; Ernst, 2002; Kahn, Barczak, & Moss, 2006; Kahn, Barczak, Nicholas, Ledwith, & Perks, 2012; Nicholas & Ledwith, 2006). ‘‘Best practices would be those practices that appear to result in the most favorable outcomes’’ in NPD (Kahn et al., 2012, p.182). By using a best practice model, firms can get an ‘‘overview of a company’s strengths and areas for improvement with regard to product innovation management, highlighting those areas that require attention’’(Cormican & O’Sullivan, 2004, p.819).

Although the research on best practice within NPD has been widespread, the majority has been based on large firms data and are also mainly constructed for large firms, making its applicability for small and medium firms (SME’s) questionable (Nicholas, Ledwith, & Perks, 2011). SME’s would be those firms that have between 10 and 250 employees and a turnover ranging between €2 million and €50 million (European Union, 2003) and together account for more than 90% of all firms worldwide (Singh, Matthews, Mullineux, & Medland, 2009). In comparison to large firms, SME’s might lack the resources to implement practices that are identified as best practices (Dowling & Helm, 2006; Knudsen, 2007; Nicholas & Ledwith, 2006; Nicholas et al., 2011). Although SME’s also hold certain advantages over large firms, such as for instance having shorter decision taking cycles (Nicholas & Ledwith, 2006; Nicholas et al., 2011). These advantages are not regarded as an advantage in existing best practice frameworks but rather as a disadvantage. Kahn et al., (2006) for instance argue that in order to have a best practice process within NPD, firms should implement a formal stage model as argued by Cooper (1990). It is found that implementation of highly formalized processes can delay processes within firms (Griffin, 1997). So, by implementing this best practices SME’s could possibly be throwing away their advantage over large firms instead of expanding them.

So, existing models to value NPD within firms are mostly focused on larger firms with more skills, resources and other structures making them not suitable for smaller firms (Cooper, 1999; Eisenhardt, 1989; Ernst, 2002; Evanschitzky et al., 2012; Kahn, Barczak, & Moss, 2006; Nicholas & Ledwith, 2006). Although these just where some examples of the shortcomings within existing NPD best practice models we argue there is need for a model that enables SME’s to value their NPD while respecting their differences in comparison to larger firms. Our intention is to fill this gap by creating a best practice model that is suitable for SME’s and enables

managers to track and influence the factors that influences NPD success. Additionally, we found that in practice many firms lack hard data such as detailed NPD project descriptions, financial data, and performance measures regarding NPD. Therefore, we add that our model should also be suitable for firms that lack these types of data. Hereafter we will refer to this type of data as hard data. So, our research question can be formulated as following: How can SME's identify and rate the factors that influence NPD performance without using hard data?

In order to answer our research question and to develop the suggested best practice model, we will use the success factors in NPD as found by Evanschitzky et al., and make them if possible applicable for SME's. Each identified success factor will be discussed individually and will function as a parameter in the to be developed best practice model. The reason why we will not start from scratch but use existing models instead is quite simple. "It is not desirable to reinvent the wheel from scratch, repeating all the error previously made" (Stenmark, 2000, p.5). To test our "wheel", the model will be tested in multiple Dutch SME's.

2. Research design

As argued by Ritchie & Lewis (2003, p.5) qualitative methods can be “used to address research questions that require explanation or understanding of social phenomena and their contexts” and are “well suited to exploring issues that hold some complexity”. As our research question contains a rather explorative character of developing and reviewing a best practice model within firms we will also use a qualitative method. Maxwell (2009) argued that qualitative research cannot be described as a certain method with clearly defined stages but that it is a more dynamic process instead in which many steps are being taking simultaneous that influence each other. Indeed, during the research, we followed a rather intuitive approach instead of following a clear method or sequence. In order to describe this intuitive approach we will use the interactive model of Maxwell (2009) (figure 1) to describe how we conducted our research. This model holds the five factors that are of importance within qualitative research.

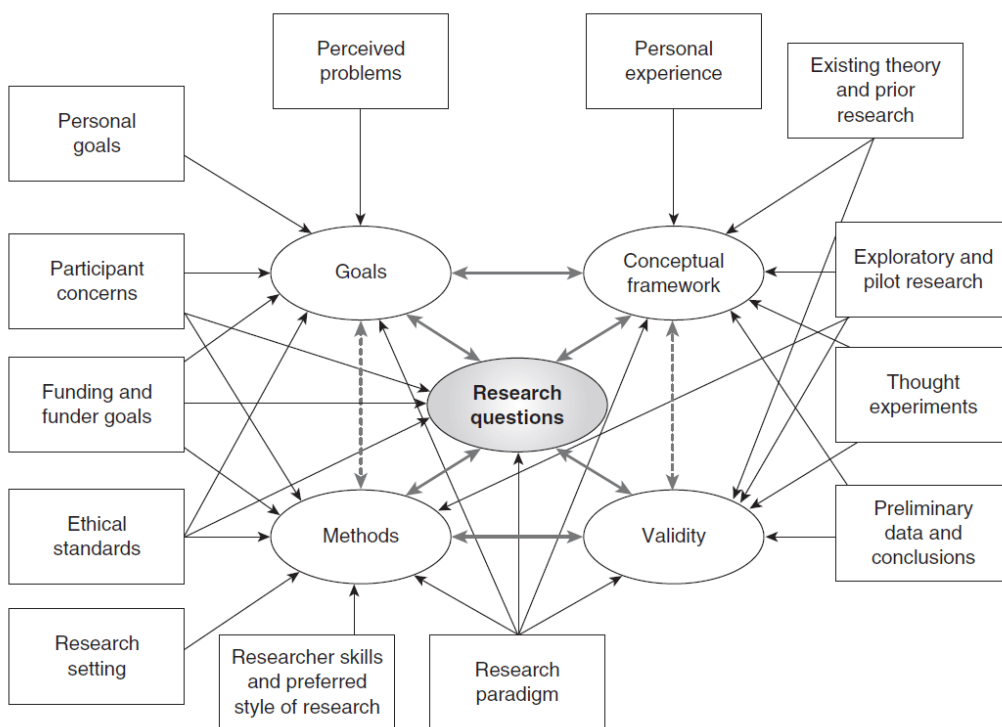


Figure 1: Contextual Factors Influencing a Research Design

Source: (Maxwell, 2009, p.218)

2.1 Goals

‘ ‘Why is your study worth doing? What issues do you want it to clarify, and what practices and policies do you want it to influence? Why do you want to conduct this study, and why should we care about the results?’ ’ (Maxwell, 2009, p.216). As mentioned earlier under the tabs practical and theoretical contributions this research should contribute in creating a best practice framework for NPD within SME’s without using hard data. The reason why we want to conduct this research is that from previous research experience we have found that within SME’s there is demand for such a framework. As argued by Strauss & Corbin, (1990) the reason to conduct a certain research does not always have to originate from theory but may also come from personal experience.

2.2 Research questions

‘ ‘What, specifically, do you want to learn or understand by doing this study? What do you not know about the things you are studying that you want to learn? What questions will your research attempt to answer, and how are these questions related to one another?’ ’ (Maxwell, 2009, p.216). As indicated the aim of this research is to see whether it is possible to create a best practice framework that values NPD within firms within SME’s without using hard data. To answer our research question, we have multiple underlying questions that will need to be answered. First, why are existing best practice models not suitable for SME’s? Answering this question would give us the criteria that the to be designed best practice model should cope with to make it suitable for SME’s. Second, which factors are related to the success of NPD within SME’s. Third how can we make these factors measurable and applicable for SME’s? And fourth is our final model based on the identified factors indeed suitable for usage within practice?

2.3 Conceptual framework

‘ ‘What do you think is going on with the issues, settings, or people you plan to study? What theories, beliefs, and prior research findings will guide or inform your research, and what literature, preliminary studies, and personal experiences will you draw on for understanding the people or issues you are studying?’ ’ (Maxwell, 2009, p.216). As mentioned earlier our research question is partially based on personal experience that thought us that there is demand for a tool that values NPD within SME’s without using hard data. This hard data would for instance include detailed NPD project descriptions, financial data, and performance measures regarding NPD.

Based on a preliminary study into the topic we found one model that values NPD within SME's (Nicholas & Ledwith, 2006), but this model still has its shortcomings for usage within SME's. To further develop our conceptual framework, we will execute a thorough literature research regarding existing best practice framework in NPD and the factors involved in NPD.

2.4 Methods

“What will you actually do in conducting this study? What approaches and techniques will you use to collect and analyze your data, and how do these constitute an integrated strategy?”

(Maxwell, 2009, p.216). To conduct this study, we first will review existing best practice framework and why they might or might not be suitable for usage within SME's. Based on the results of this review we can specify which features the to be developed model should have. Based on these specifications we will conduct a literature research regarding the NPD literature to see how can construct a tool that values NPD within SME's. And important, which factors should be included within this model and how to operationalize them? The literature review and operationalization of the discussed factors will be a synchronous process which eventually leads to the assembly of the different factors into one model. To test our model, we will be conducting case studies at four firms. The units of analysis within these cases will be SME firms that develop and produce new products in-house. SME firms will be those firm that have between 10 and 250 employees and a turnover ranging between €2 million and €50 million turnover.

As argued by Yin (1994) if replication logic in the form of **multiple cases** is used to find support for a theory, the result should be similar and whereas the results differ the reason for this should be included within the theoretical framework. To review whether the theory that grounds our model holds ground within these cases, and thus assesses its usability and validity for usage within these firm, we will use the following approach. To start we will interview firm representatives regarding the factors that are included in our model. Based on this information we will be able to give this firm a score according our model. At the same time the firm representative will have the opportunity to rank its own firm based on our model. In order to prevent firm representatives to give more favorable answers as suggested by Podsakoff (1986) their ranking scale will be mixed in order to prevent to give more favorable answers. After this step each firm representative will be confronted with the rating they gave their own firm

according our model. During this step the firm representative will have the opportunity to give feedback on the model we created. This feedback step has the aim to assess the validity of the model we created.

2.5 Validity

‘‘ How might your results and conclusions be wrong? What are the plausible alternative interpretations and validity threats to these, and how will you deal with these? How can the data that you have, or that you could potentially collect, support or challenge your ideas about what’s going on? Why should we believe your results? ’’ (Maxwell, 2009, p.216). Maxwell, (2009) has proposed multiple methods or strategies to assure the validity of a research. One of those methods is gathering rich data by for instance conducting an interview (Maxwell, 2009), as mentioned earlier to we will initially start with an interview at each firm. The information gathered during this interview will be noted and if necessary will be used to validate the research outcomes.

As indicated we will provide participants with a feedback form to check the validity of our model. The participants will have the opportunity to give feedback on each separate factor that is included within our model. The first question on the feedback form will be about whether the firm representative does agree with the valuation of their firm according the model, and if not we will ask them to motivate their disagreement. Eventual disagreement with a certain factor could for instance indicate that they are biased towards their firms own performance, or in other words are under or overestimating it. At the other hand, it could also indicate that the levels we constructed are invalid. To find the source of disagreement we will review the specific firm motivation to disagree and the information they provided to us during the interview against the literature we used to build our model on. This method is referred to as ‘‘searching for discrepant evidence and negative cases’’(Maxwell, 2009, p.244).

The second question will be related to whether the firm representative does or does not agree with the importance of a specific factor and the accompanied levels we identified based on the theory. The last question will be related to the achievability of the best practice level of each factor within a firm. Again, for both previous questions we will search for discrepant evidence and negative cases. Furthermore, we will review eventual differences between the rating we

awarded to the firm and how the firm rated itself. The degree of discrepancy between the both could indicate whether the tool is or is not suitable as an external valuation tool of a firms NPD. Additionally we will use a “quasi-statistics method” (Maxwell, 2009, p.245) by calculating the average agreement over the previously mentioned evaluation questions. Large levels of disagreement could be a signal to reinvestigate certain factors within the model. Eventual shortcomings in validity or usability will be discussed and if possible be grounded with theory.

3. Literature review

3.1 What is innovation?

Innovation is “the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace”(Baregheh, Rowley, & Sambrook, 2009, p.1334). This definition was formulated by reviewing different definitions of innovation throughout different disciplines consisting of: business management, economy, Innovation and entrepreneurship, technology & science engineering, knowledge management, marketing and organization study. The following needs to be considered when speaking about innovation: “a discovery that goes no further than the laboratory remains an invention. A discovery that moves from the lab into production, and adds economic value and adds economic value to the firm (even if only cost saving) would be considered an innovation”(Garcia & Calantone, 2002, p.112). To clarify the difference between inventions and innovation, “an invention is the first occurrence of an idea for a new product or process” whereas “innovation is the first commercialization of the idea”. To be able to turn an invention into an innovation a firm normally needs to combine several different types of knowledge, capabilities, skills and resources” Fagerberg (2009, p.3). This capability of a firm to transform ideas or inventions into successful product innovations underlies a firms NPD capabilities.

3.2 What is innovation management?

Simply stated innovation management is concerned with managing “the process of transforming business opportunities into tangible products and services” (Cormican & O’Sullivan, 2004, p.820). In order for firms to develop innovation and to survive they need to have an innovation management system (Cormican & O’Sullivan, 2004; Tuominen, Piippo, Ichimura, & Matsumoto, 1999). Or more specific, “in order to achieve a competitive advantage in the market the establishment of an effective product innovation management system is the most important management need for every manufacturing enterprise” (Tuominen et al., 1999, p.135). Figure 2 displays the basic concept of product innovation management. As indicated, the firm’s strategy combined with the costumers needs and available technological opportunities shape the management of innovation within firms (Tuominen et al., 1999).

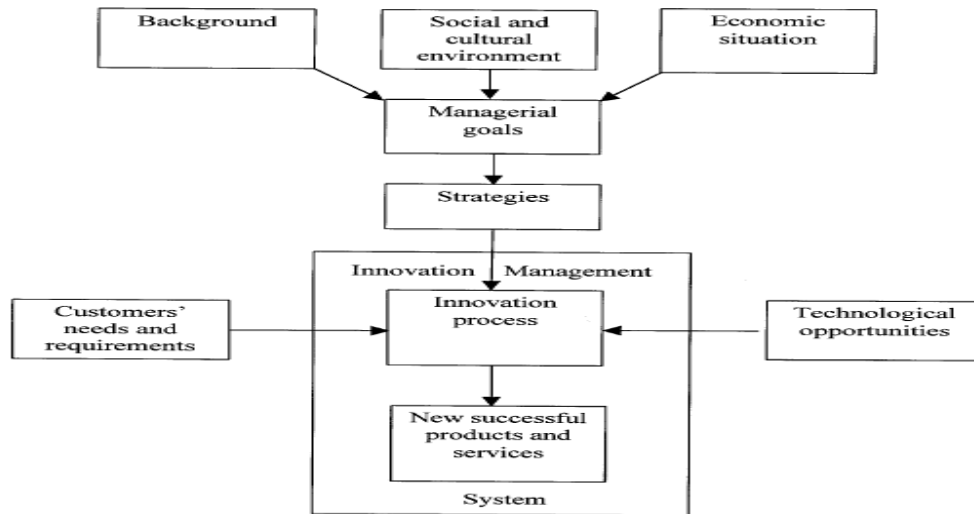


Figure 2: Basic concept of product innovation management.

Source: (Tuominen et al., 1999, p.138)

A firm's innovation management system is thus concerned with transforming inputs into outputs as displayed in figure 3. "In order to get good results of the innovation process the quality of all the required outputs of the management system should be on a proper level" (Tuominen et al., 1999, p.139). Or as Lewis, (2001, p.185) argues, "successful new products are the outcome of effective NPD processes. One wrong output, for instance a premature product launch, could lead to a failure of the process entire (Tuominen et al., 1999). We can argue that for each firm the inputs differ which leads to different outputs. Firm A might for instance have costumers that demand a quick development of products, while firm B's costumers allow more time but demand more specific features on a product.

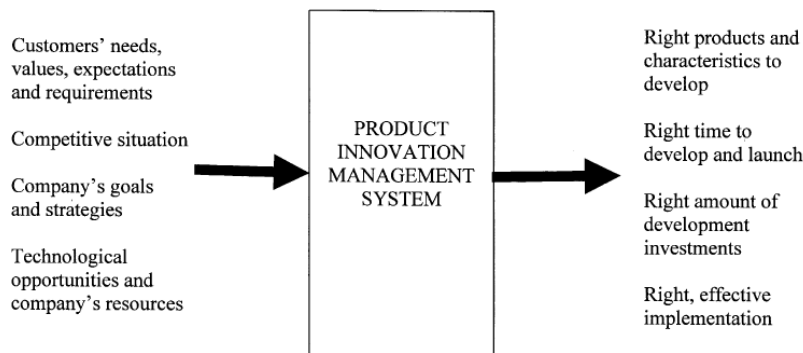


Figure 3: Required inputs and outputs of successful product innovation management system.

Source: (Tuominen et al., 1999, p.139)

3.3 Existing NPD management valuation models.

To value NPD within firms several authors have described success factors in areas that are related to the success of NPD (Cooper, 1999; Cooper & Kleinschmidt, 1987; De Medeiros et al., 2014; Ernst, 2002). Based on these and other success factors authors have created best practice models to rate firms practice regarding the development of new products (Cooper, 1999; K. M. Eisenhardt, 1989; Kahn et al., 2012; Kahn et al., 2006; Nicholas & Ledwith, 2006; Cormican & O'Sullivan, 2004; Ahmed, 1998). To value whether current existing models satisfy the need of SME's demand for a best framework we will now discuss some existing frameworks.

Cormican & O'Sullivan, (2004) developed a PIM scorecard model to value NPD management within firms. This scorecard contains 50 statements, so ten statements for each of the following topics: strategy and leadership, culture and climate, planning and selection, structure and performance, communication and collaboration. The PIM model works by rating previous factors ranging from 1 representing strong agreement to 5 which represents strong disagreement. Although the research has indicated that the model has been successfully introduced in a range of firms, it has only been tested in medium to large firms with team or function oriented structures. Since SME's are argued to lack clearly defined departments (Nicholas & Ledwith, 2006) this model might not be suitable for SME's. Another model constructed by Ahmed (1998) is based on the information gathered from 206 firms ranging from medium sized to large. So again, this model has been based on large firms instead of SME's making its usability within small firms questionable. Another model created by (Kahn et al., 2006) includes factors which might be perceived not to be achievable by SME's. These factors are for instance the usage of software to track NPD and its performance. As argued SME's might lack the resources and time (Nicholas & Ledwith, 2006) to implement such practices. For an overview of all the main differences between SME's and large firms we refer to appendix 7.

Although the previous models have had a lot of attention throughout the literature, it might be argued they are inapplicable for SME's due to the previous mentioned critics. In order to overcome this, Nicholas & Ledwith (2006) adjusted the model developed by Kahn et al., (2006). This model holds that product NPD management has six key areas existing of strategy, portfolio management, process, market research, people and metrics & performance evaluation (Kahn et

al., 2006; Nicholas & Ledwith, 2006). Figure 4 displays an example of the Key process area strategy within their (Nicholas & Ledwith, 2006) best practice model. By identifying the actual strategy practice with the model below managers can rate their firms practice. Firms that for instance have no NPD strategy would according the model be rated as initial. To improve this rating a manager could implement the development of clear NPD goals within the firm.

A field test of the model of Nicholas & Ledwith (2006) has shown that the model needed some adjustments in order for it to become suitable for SME's. The main points of criticism where that: Firms with "less than 80 employees often have no defined departments". So, for firms without defined departments it would be hard to value within the model. "Another respondent saw "context as a crucial limiting which drives/challenges NPD. This context includes resources (financial, skill, time) which handicaps SME's" (Nicholas & Ledwith, 2006, p.11). In other words, small firms could for instance not be able to implement certain best practices due to the lack of resources. Furthermore "the fact that organizational structure is dependent on organizational size" for instance holds that "the decision cycle is much faster in small companies" (Nicholas & Ledwith, 2006, p.11).

Initial	Under Development	Defined	Managed	Optimised
No NPD strategy Short-term view of NPD NPD not recognised as being crucial to long-term survival of organisation Availability of funding drives project selection	Unclear NPD strategy Some NPD projects are aligned with NPD strategy but in general do not fit NPD strategy not in line with overall organisational mission statement NPD projects are identified during budget process and resources allocated accordingly	NPD strategy has been defined but may be vague in parts NPD strategy mostly aligned with organisations mission statement Most NPD projects are aligned with NPD strategy allowing a certain amount of flexibility NPD strategy can be redirected in real time to respond to market forces Organisational mission and NPD strategy drive NPD project selection	Clearly defined NPD strategy NPD strategy clearly aligned with organizations mission statement All NPD projects are aligned with NPD strategy unless they were approved by senior management Quantitative goals for NPD Strategic plan identifies arenas of opportunity Market study is undertaken to guide strategic plan	Clearly defined strategy with organisational awareness of the strategy Mission and strategic statement define strategic arenas for new opportunities NPD strategy is continually being reviewed and updated to be kept in line with the organisations strategy and to reflect changes to the market place Long-term strategic view of NPD

Figure 4: Key Process Area: Strategy.

Source: (Nicholas & Ledwith, 2006, p.7)

3.4 Success factors in Product innovation

To overcome the previously mentioned critics, we suggest that a model for SME's should value factors that are found to increase the success of NPD instead of valuing the road to archive this factors. Or as Kahn et al., (2012, p.182) argue "there is no "one best way" to high performance but rather different routes to the same end goal." This will leave room for managers to come up with a custom solution that fits with the company's resources and characteristics.

As a starting point to set these goals we will use the findings of Evanschitzky et al., (2012) who conducted an extensive literature review regarding the success factors of product innovation within firms. They (Evanschitzky et al., 2012) conducted a meta-analysis of 233 scientific papers ranging from 1999 to 2011 to identify the predictors of product innovation success. Figure 5 displays the predictors that were identified to be statistically significant related to the success of new products, albeit either negative or positive directed. Compared to a previous study using the same analysis method they (Henard & Szymanski, 2001) found that the importance of certain success factors has been decreasing. They (Evanschitzky et al., 2012) argue that knowledge of the previously identified factors might have become more widespread among managers making it more hard for managers to use these factors to create a competitive advantage. This argument stresses the importance of using recent inputs for our best practice model and the recognition of the possibility that the importance of the indicated success factors could eventually decrease.

Furthermore the input for this meta-analysis consists of researches conducted in firms ranging from small to large, which are on average found to be related to the success of NPD within firms (Evanschitzky et al., 2012). This implicates that the specific impact of these factors on NPD success in SME's is unknown. One can argue that these factors would thus not be suitable as an input for our model and recommend the usage and adjustment of existing best practice models instead. Again, we could come to the same conclusion then. The success factors or parameters used in existing best practice models are also mostly based on large firms. Adjusting those parameters to SME's would lead to the same effect of being uncertain whether such a factor indeed has an impact on NPD success within SME's. Therefore, we will stick with what is known, and to verify whether the selected success factors are indeed suitable for SME's we will extensively discuss each factor and its impact on NPD success in the following chapters.

Concluding to the discussion of each included success factor we will create a 3-level score of each success factor. In comparison to existing models that use 4 or even 5 levels (Kahn et al., 2006; Nicholas & Ledwith, 2006) we opted to set 3 levels. Firstly it could be argued that many of the success factors identified by Evanschitzky et al., (2012) are rather dichotomous in nature. For instance, regarding the success factor product advantage, a product developed by a firm either offers an advantage over competitive offerings or it simply doesn't. NPD projects that have products without a product advantage as an output would clearly be seen as bad practice whereas products **that do offer advantages** over competitive offerings as a best practice (Cooper et al., 2004c). In reaching this it is argued that firms should have a mechanism of checking whether products offer an advantage (Cooper et al., 2004c). We operationalize this by setting a bad practice level for firms that have no checks on product advantage, causing products without a product advantage over competitive offerings to enter the development phase. A best practice level for firms that have adequate checks that prevent products without any competitive offerings to enter the development phase. And a middle of the road level (level 2) for firms that have a system to check products on their advantage but somehow fail and still allow product without an advantage to enter the development phase. Furthermore, as mentioned earlier our aim is not to describe the path to a certain success factor but to differentiate between the characteristics of good and bad practice of each success factor. The path of reaching a best practice level can vary between each firm. Therefore, setting much specific levels could put too much emphasis on the path of reaching certain practice instead of the practice itself.

Additionally, during the research, we found that certain factors could not be seen separate from each other and have therefore been merged within the discussion and within the final model. Dedicated human resources and company resources have been merged into company and R&D resources, all factors within marketplace characteristics have been merged, and all factors within organizational characteristics except for external relations have also been merged. External relations have been omitted due to many conflicting research outcomes.

Product characteristics	Z-test	Strategy characteristics	Z-test
<i>Product advantage</i>	16.08***	<i>Dedicated human resources</i>	11.17***
<i>Product technological sophistication</i>	2.04*	<i>Company resources</i>	9.79***
Process characteristics		<i>Strategic orientation</i>	8.17***
<i>Market orientation</i>	17.78***	<i>Technological synergy</i>	7.97***
<i>Predevelopment task proficiency</i>	10.25***	<i>Marketing synergy</i>	6.24***
<i>Cross-functional integration</i>	9.93***	<i>Dedicated R&D resources</i>	3.69***
<i>Launch proficiency</i>	8.92***	Marketplace characteristics	
<i>Marketing task proficiency</i>	7.72***	<i>Market potential</i>	8.63***
<i>Cross-functional communication</i>	7.36***	<i>Environmental uncertainty</i>	3.64***
<i>Senior management support</i>	5.88***	<i>Competitive response intensity</i>	3.59**
<i>Structured approach</i>	5.54***	<i>Likelihood of competitive response</i>	1.96*
<i>Customer input</i>	2.41**	Organizational characteristics	
<i>Reduced cycle time</i>	2.12**	<i>Organizational climate</i>	8.72***
Significant at * p < .05, ** p < .01, *** p < .001.		<i>External relations</i>	7.36***
		<i>Organizational design</i>	4.15***
		<i>Degree of formalization</i>	3.69***

Figure 5: Relationship between Predictor Variables and New Product Success

Source: Data retrieved from (Evanschitzky et al., 2012)

3.5 Product characteristics

3.5.1 Product Advantage

Henard & Szymanski, (2001, p.364) indicate that product advantage is the ‘‘superiority and/or differentiation over competitive offerings’’. It is found that the advantage a product offers is positively related to a NPD’s success (Evanschitzky et al., 2012; Henard & Szymanski, 2001; Langerak, Hultink, & Robben, 2004). In line with the research outcomes, Cooper et al., (2004) express that product advantage is one of the most important factors in successful NPD. Langerak et al., (2004) state that products that offer costumers superior benefits are the most likely to be successful. Cooper et al.,(2004, p.12) express certain ways how firms can create product advantage such as by offering customers/users ‘‘main benefits that are important to them’’, ‘‘new and unique benefits’’, ‘‘ Better value for money for the customer’’, ‘‘ Superior to competitors’ products in terms of meeting customer needs’’ or ‘‘ Offering product with superior quality to competitive products’’.

They (Cooper et al., 2004c) argue that the product advantage should be known before a product enters development. They suggest that a stage gate model might be implemented to prevail products going into development before one of the previous advantages are known. At the other hand it is known that SME’s might lack certain resources like time and skills to implement a formal model such as a stage gate model (Loch, 2000; Nicholas & Ledwith, 2006). Furthermore Nicholas & Ledwith, (2006) indicate that the decision cycle within smaller firms is much faster in small firms. Implementing such a formal process could slow down this decision cycle due to unnecessary bureaucracy (Griffin, 1997). Therefore, we suggest it is not about the process itself but whether firms allow products without an advantage in development or not. The implantation of how they reach this might be different for each firm. Or as Loch (2000) indicates, there is no such thing as an NPD best practice, each firm should develop its own optimal processes.

To rank firms on this specific success factor we suggest the following scale. Firms that are ranked as level 1 have no process to check if there is a product advantage over competitive existing offerings, products without advantages over competitive offers could thus enter development. As product advantage is one of the most important success factors in NPD (Cooper et al., 2004c; Evanschitzky et al., 2012) it could lead to a failure of the product which could lead to a waste of

resources. Level 2 firms have implemented a method to check if products offer an advantage, but this method is inadequate as it still allows products without an advantage into development. Level 3 firms have an adequate method to check whether a product offers an advantage meaning that no product without an advantage over competitive offerings can enter development. This offers firms the possibility to be critical and terminate product development before they enter development. This could prevent firms from wasting resources and to focus on the products that do offer advantages.

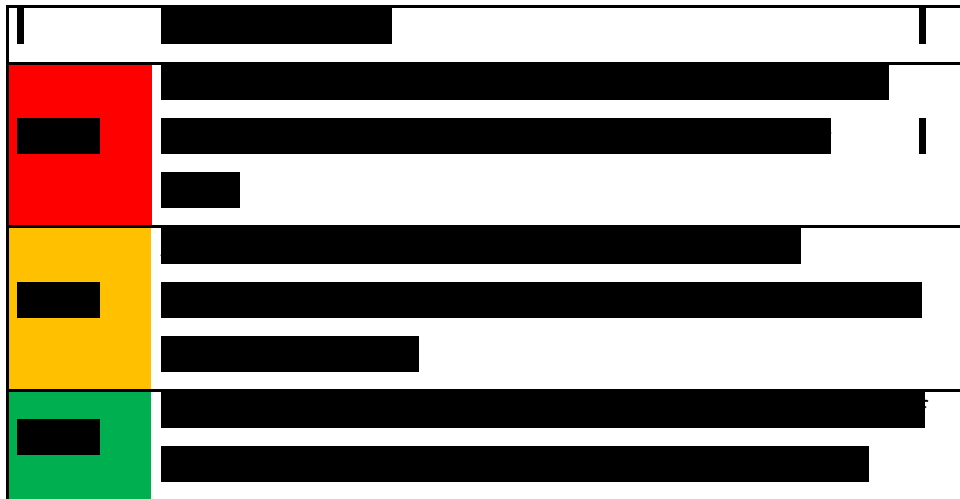


Figure 6: Product advantage.

3.5.2 Product technological sophistication:

Henard & Szymanski, (2001, p.364) indicate that technological sophistication relates to the “perceived technological sophistication (i.e., high-tech, low-tech) of the product”. They explain that the perceived technological sophistication of a product relates to the market it is being sold. In other words, the technological sophistication of a product should be consistent with the market it is being sold on. Selling industrial machines to households could for instance cause that costumers are not correctly perceiving the actual quality of this machines. At the other end of the spectrum, selling household machines to industrial users could lead to an underestimation of these machines. Although these products might be good, they are not suitable for this market.

To measure how good firms are able in translating actual technological product sophistication into the correct perceived product sophistication we suggest the following scale. Level 1 firms are producing products that are not sophisticated and are also not perceived as sophisticated by

costumers. An example would be selling low quality household vacuum cleaners within a b2b market where customers demand sophisticated solutions.

Level 2 firms produce products that are sophisticated but are not able to transfer this sophistication into the perception of the costumers. Selling high end household vacuum machines within a b2b industry would lead to un underestimation of the sophistication of the product. In other words, a mismatch between the product and the market in which it is being sold.

Level 3 firms produce technological sophisticated products that are also perceived as sophisticated by their customers. Would the previously mentioned high end household vacuum machine being sold within a consumer market it would be perceived as more sophisticate due to a better fit between the product and the market.



Figure 7: Perceived technological product sophistication.

3.6 Process characteristics

3.6.1 Market orientation

Henard & Szymanski, (2001, p.364) describe market orientation as the ‘‘Degree of firm orientation to its internal, competitor, and customer environments’’. It has been argued that market orientation will improve a firm’s profitability by incorporating customer and competitor orientation accompanied with interfunctional coordination between different organizational functions (Narver & Slater, 1990). ‘‘Customer orientation is the sufficient understanding of one’s target buyers to be able to create superior value for them continuously’’ (Narver & Slater, 1990, p.21). Whereas competitor orientation is concerned with understanding current and potential competitor’s capabilities. The outcomes of these orientations function as the input for firms in order to create products that create value for buyers (Narver & Slater, 1990). Additionally it is argued that the interfunctional coordination within firms should prevent a new product to be

solely based on customer or competitor orientation which is argued to lead to reduced product performance (Gatignon & Xuereb, 1997). Different organizational functions should thus work together in creating superior value for customers (Narver & Slater, 1990).

Other scholars express that market orientation is not directly positively related with NPD success, but it is positively related to the factor product advantage (Langerak, Hultink, & Robben, 2004). They explain that market orientation functions as a moderating factor between product advantage and NPD success. They indicate that ‘‘market-oriented culture helps in creating such an advantage through actively scanning customers’ wishes in the context of the competitive environment and then through analyzing, distributing, and using the resulting insights throughout the new product team to create value for customers’’(Langerak et al., 2004, p.89). So basically, the gathered market orientation results function as the inputs for the product advantage parameters. To increase the success of NPD they (Langerak, Hultink, & Robben, 2004) indicate that market orientation input should be implemented in all stages of the NPD process. An important comment has to be made, firms who are solely depending on market orientation as an input for product innovation are likely to only produce incremental innovation since this input is mostly based on existing products (Baker & Sinkula, 1999). It is therefore argued that firms should also have a strong learning orientation that critically values market and learns from orientation instead of directly using it as an input for the NPD process (Baker & Sinkula, 1999).

So, to rank firms on their market orientation skills we suggest the following scale. Level 1 firms do not use market data causing for instance they cannot know which advantages a new product will bring which could lead to products that offer no advantages over existing products. Level 2 use market orientation as input for their NPD process but findings regarding customer and competitor orientation are not shared via interfunctional coordination causing products to be either solely customer or competitor oriented lowering its potential success (Gatignon & Xuereb, 1997). Level 3 use market orientation as input for their NPD process and transfer findings regarding customer and competitor orientation via interfunctional coordination. They furthermore have a learning orientation which enables them to critically value and learn from market input and prevents them from only producing incremental innovation (Baker & Sinkula, 1999).



Figure 8: Market orientation benchmark.

3.6.2 Predevelopment task proficiency.

Henard & Szymanski, (2001, p.364) define predevelopment task proficiency as the ‘‘Proficiency with which a firm executes the prelaunch activities (e.g., idea generation/screening, market research, financial analyses)’’. Langerak et al., (2004) support this partially by the findings that the proficiency of certain predevelopment tasks is positively related to NPD success. They identify idea generation and strategic planning as main drivers in proficient predevelopment tasks. Although they found that idea screening and business analysis are not directly positively related to NPD success they stress these parts are crucial for the predevelopment process. Furthermore, they (Langerak, Hultink, & Henrys, 2004) stress that market orientation can positively mediate the predevelopment task proficiency by providing input.

So, to rank firms on their predevelopment task proficiency we suggest the following scale. Level 1 firms have no proficiency in predevelopment task, e.g. there is no process of idea generation / screening, market research or financial analysis before a product enters development. Level 2 firms do execute these processes but do not base them on market orientation input. Level 3 firms execute these based processes on market orientation input.



Figure 9: Predevelopment task proficiency.

3.6.3 Cross-functional communication & integration.

Henard & Szymanski, (2001, p.364) indicate that cross-functional integration refers to the “degree of multiple-department participation in a new product initiative”. It is found that by involving different people from departments (for instance commercial and research based departments) the intellectual competition increases which leads to breakthroughs that a sole department would have never reached. The reason for this is that departments with different backgrounds have different views on things causing the problems to be approached different and innovatively (Ahmed, 1998).

Gemser & Leenders (2011) found however that cross-functional integration is not always the best way to go. They found that the effectiveness of the usage of cross-functional integration for NPD depends on the risk of the NPD project. They describe risk as the degree of uncertainty, for instance the pursue of technology or markets that are new to a firm. NPD projects with low risks have comparable success rates as when firms do or do not use cross-functional integration. Implementing costly cross-functional integrating mechanism in low risk are considered as a waste of costly resources. Usage of cross-functional integration in high risk NPD project however does increase the success rate. Therefore they (Gemser & Leenders, 2011) add that firms should adapt their cross functional integration level over time according the risk of the NPD project in order to prevent the waste of scarce resources.

Additionally they (Gemser & Leenders, 2011) add that the level of openness of information between departments also influences the necessity of cross functional integration. Openness of information between departments or cross-functional communication is considered as the ‘‘ level of communication among departments in a new product initiative’’ (Henard & Szymanski, 2001, p.364). Gemser & Leenders, (2011) argue that the openness between departments enables the same mechanism of internal information sharing without the costs of cross functional integration. High openness of information between departments is therefore argued to make cross functional integration unnecessary in low risk projects. They therefore conclude by stating that cross functional teams should only be used in high risk projects when the to be gathered knowledge is new for the firm and therefore hard to gather solely via internal information sharing. Due to scarce resources (Nicholas & Ledwith, 2006) within SME’s it can be argued that these resources should be invested wisely. By increasing this information sharing the costs of cross functional integration can be reduced. Firms should thus enhance the internal sharing of information between departments for instance marketing, R&D. Since SME’s often lack clearly defined departments (Nicholas & Ledwith, 2006) it here refers to the information sharing between people from different disciplines. Furthermore, firms should only use cross functional integration depending on the risk of a certain NPD project, again also to prevent resource wasting.

To rank firms on cross functional integration we propose the following scale. Level 1 firms have no communication between departments or persons, using cross functional integration here is suggested to lead to NPD failure and as a waste of resources (Gemser & Leenders, 2011). Level 2 firms have an openness of information between departments or persons but fail in the correct usage of cross functional integration depending on the risk of a project. This could lead to project failure or unnecessary resource spending (Gemser & Leenders, 2011). Level 3 firms have a high openness between persons or departments and only use cross functional teams in high risk NPD projects which is argued to reduce costs and increase the possibility to NPD success.

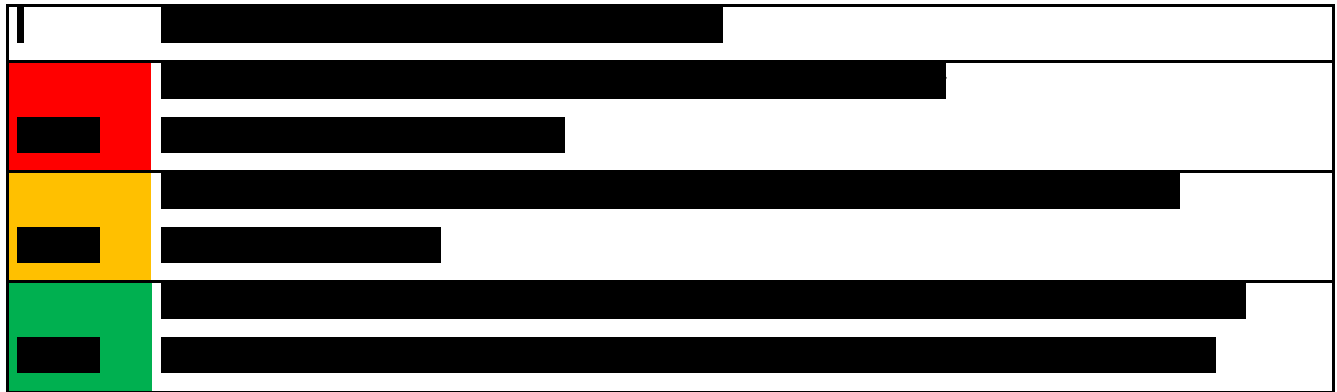


Figure 10: Cross functional integration.

3.6.4 Launch proficiency.

Henard & Szymanski (2001, p.364) describe Launch proficiency as the “ Proficiency with which a firm launches the product/service” Research indicates a positive relation between launch proficiency and NPD success (Evanschitzky et al., 2012; Henard & Szymanski, 2001; Langerak, Hultink, & Robben, 2004). Additionally Langerak et al., (2004) found that launch proficiency is also positively related to market orientation. They argue that market orientation supports the success of launch proficiency by providing market input which on its turn increases launch proficiency. To rank firms on their launch proficiency we suggest the following scale. Level 1 firms have no proficiency in launching new products. Level 2 firms are proficient in launching new products but do not use market orientation input to base their launch strategy on. Level 3 firms are proficient in launching new products and base their launching strategy on market orientation input.

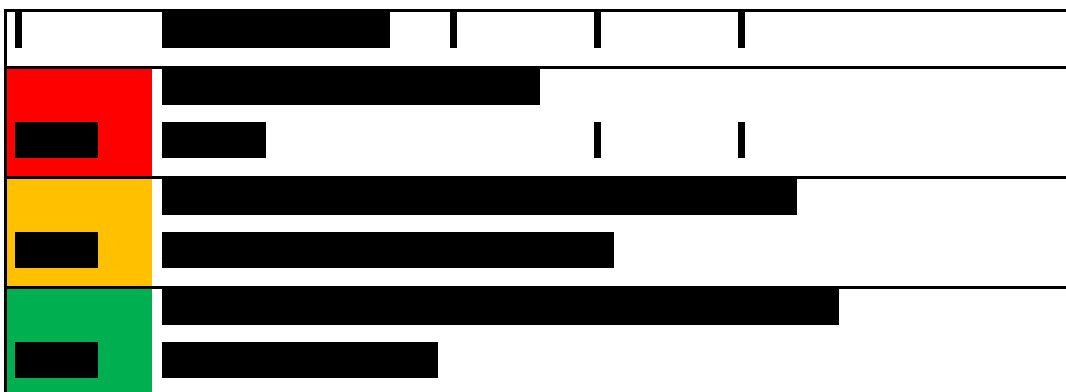


Figure 11: Market proficiency benchmark.

3.6.5 Marketing task proficiency.

Henard & Szymanski, (2001, p.364) describe marketing task proficiency as the “ Proficiency with which a firm conducts its marketing activities”. It is found that the proficiency of executing

marketing tasks is positively related to NPD success (Cooper, 1982; Ernst, 2002; Evanschitzky et al., 2012; Henard & Szymanski, 2001). The literature regarding the influence of marketing on NPD has indicated multiple marketing factors that influence the success of NPD, gradually becoming more specific during the time (Ernst, 2002). Cooper (1982, p.222) for instance indicated that “marketing research, advertising and promotion, and salesforce/distribution” are the most important factors for NPD success. Current research separately indicated the influence of market orientation on NPD Success (Evanschitzky et al., 2012), of which marketing research can be considered as a part of. Although the research field has become more specific, the inputs such as skills and resources for proficient marketing execution have remained the same (Ernst, 2002).

Therefore, to value a firms marketing task proficiency, we suggest the following scale. Level 1 firms lack the skills and resources to successfully conduct marketing task. They have for instance no skilled workers nor the resources to conduct the market research required in for instance the market orientation. Level 2 firms lack either resources or skills which could lead to the failure of for instance market orientation. Level 3 firms have the resources and the skills to conduct marketing tasks as market orientation successfully.

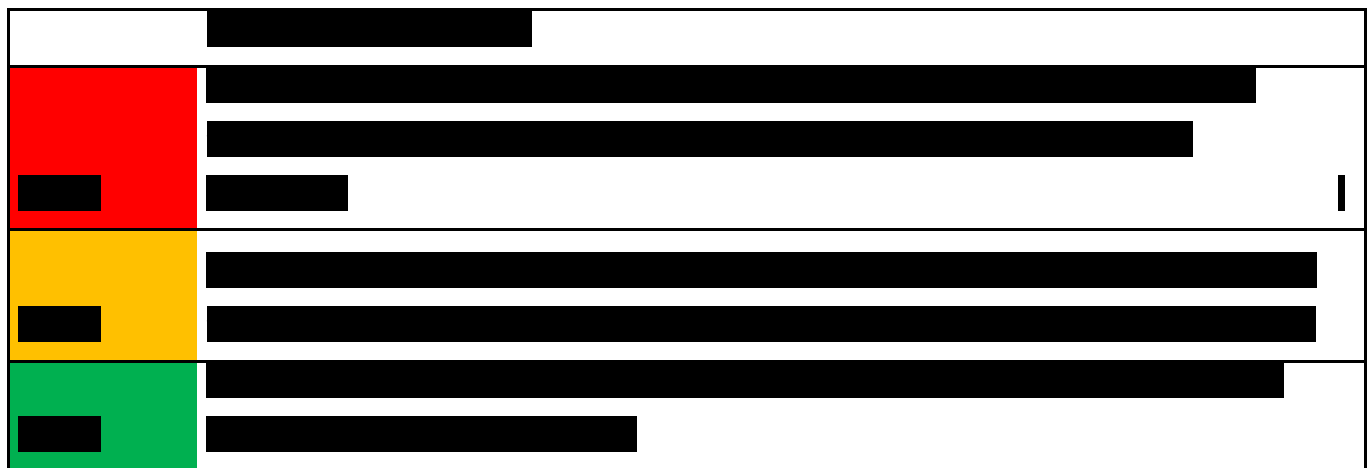


Figure 12: Marketing task proficiency.

3.6.6 Senior management support.

Senior management support is considered as the “Degree of senior management support for a new product initiative” Henard & Szymanski, (2001, p.364). Senior management support is found to have a positive influence on NPD success (Ernst, 2002; Henard & Szymanski, 2001; Sarin &



Figure 13: Senior manager support.

3.6.7. Structured approach

Structured approach refers to the “employment of formalized product development procedures” (Henard & Szymanski, 2001, p.364). Several authors argue that a structured approach increases NPD success (Ernst, 2002; Evanschitzky et al., 2012; Henard & Szymanski, 2001). Although opposing, it is also found that when a firm introduces a new product into more turbulent or dynamic environments a less structured development procedure is beneficial because products in turbulent environments tend to become obsolete quickly (Henard & Szymanski, 2001). In order to prevent products in turbulent environments to become obsolete firms are required firms to engage in exploration (Jansen et al., (2006). “Organizations that engage in exploratory innovation pursue new knowledge and develop products and services for emerging customers and markets” (Benner & Tushman (2003) and Jansen et al.,(2006) as cited in Jansen, Vera, & Crossan, 2009, p.5). To enhance exploration, firms need to decentralize decision making and semi-formalize their development processes (Ireland & Webb, 2007). Exploitation at the other hand is found to be successful in stable environments (Jansen et al., 2006). “Organizations pursuing exploitative innovation build on existing knowledge resources and extend existing products and services for current markets” (Benner & Tushman (2003) and Jansen et al.,(2006) as cited in Jansen, Vera, & Crossan, 2009, p.5). In order to enhance exploitation firms are argued to centralize and formalize decision making (Lavie et al.,2010). It has to be noted that too much bureaucracy due to formalization can lower NPD success (Cooper, 1999). Additionally it has been found that firms that have no formal process or follow some kind of informal process in NPD can also be successful (Griffin, 1997). The costs of formalizing in SME’s that have limited resources (Nicholas & Ledwith, 2006) could therefore be seen as waste of resources. To conclude, firms should base their decision to employ formalized development procedures dependent on the degree of environmental dynamism surrounding the NPD project, but should avoid to over formalize their processes (Henard & Szymanski, 2001; Jansen et al., 2006).

To rank firms on their ability to successfully use formalization in NPD processes we suggest the following scale. Level 1 firms lack either form of formalization within NPD processes and have no structure at all to guide projects, not even an informal process as suggested by Griffin, (1997).

Level 2 firms use formalization but not based on the environmental dynamism of NPD. This might for instance cause over formalization leading to failures in radical projects exploration. Due to rigid formalization managers create a culture that might resist employees from looking for new solutions outside their own tasks and responsibilities instead of exploring new solutions (van der Panne, van Beers, & Kleinknecht, 2003). Furthermore the incorrect usage of formalization, or over formalization, could hurt the success of NPD projects due to the fact the process becomes the goal instead of the project (Cooper, 1999). Level 3 firms use formalization dependent on the dynamic environment of the NPD project. NPD projects with exploitative characters would for instance be characterized by higher formalization whereas explorative projects are characterized by low formalization (Duane Ireland & Webb, 2007; Lavie et al., 2010). These firms avoid over formalization in all situations to increase the NPD success rate (Cooper, 1999).

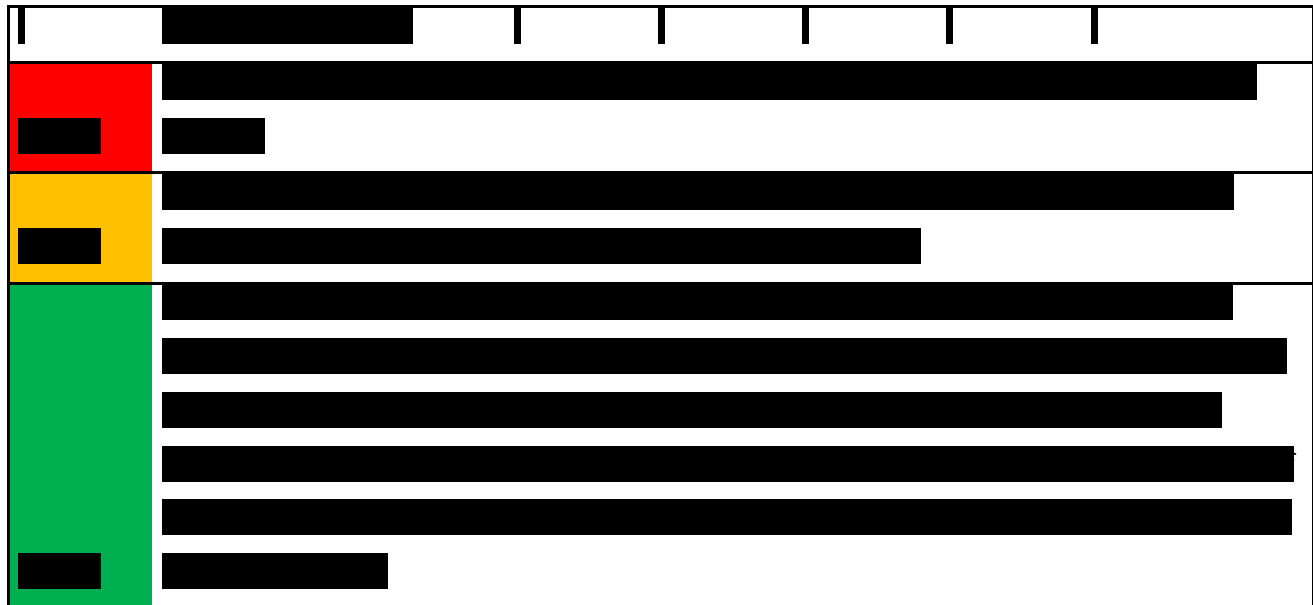


Figure 14: Structured approach.

3.6.8 Customer input

Customer input is considered as the ‘‘ incorporation of customer specifications into a new product initiative’’ and is found to be positively related to NPD success (Henard & Szymanski, 2001, p.364). Customers used to be considered as passive buyers and users of new products whereas nowadays there are trends towards the so-called co creation of products by customers

(O'Hern & Rindfleisch, 2008) in the B2B market as well in the B2C market (Ernst, Hoyer, & Rübsaamen, 2010). Even the input of consumers is for instance already used in a wide variety of markets ranging from the creation of open source software to the creation of new Boeing airplanes (O'Hern & Rindfleisch, 2008). The reason for even involving end consumers in the "NPD process" is that it "can improve product quality, reduce risk, and increase market acceptance" (Wire, 2001 as cited in Hoyer, Chandy, Dorotic, Krafft, & Singh, 2010, p.283).

In order to gather the correct information from costumers it is suggested that firms should use the input from the right costumers (Cooper et al., 2004c; von Hippel, 1986). If a firm "works with average customers, one gets average ideas, but innovative customers are likely to be the source of much more innovative ideas"(Cooper et al., 2004a, p.8). Therefore firms should use the input from lead users which are users "whose present strong needs will become general in a marketplace months or years in the future" (von Hippel, 1986, p.791).

Apart from gathering the input from the correct customer is argued that firms should not always intensively use the input from costumers in NPD processes. The required intensity of customer interaction, or the intensity of the process to gather costumers input, in NPD processes should depend on the newness of a product and the embeddedness of the product with the customers environment (Bonner, 2010). The newness of the product can be considered as the degree of newness of the product for the firm and the market (Olson, Walker, & Ruekert, 1995), whereas the of embeddedness of a product indicates its influence on the user (Bonner, 2010). It is argued that NPD projects with a high degree of newness or embeddedness should use more intensive costumers interaction to generate customer input than NPD projects with a low degree of newness or embeddedness (Bonner, 2010). It is found that the quality of information, or customer input is only positively related with customer interaction in situation where the to be developed products have a high degree of newness and or highly embedded into the customer. The reason for this is that products with a high degree of newness or embeddedness are surrounded by complex demands from the customer side which are not easy to transfer. A high degree of interaction with the customer thus enables the transfer of this knowledge to the firm. Since the quality of customer input is lower in situations where product newness and embeddedness are lower, investing in high customer interaction in these situation could be seen as a waste of resources (Bonner, 2010).

So although it is argued that ‘‘customer or user ought to be an integral part of the development process’’ and ‘‘ should be a key input to product design’’ (Cooper et al., 2004a, p.8) firms should make wise decisions when and when not to use intensive interaction with the customer to gather this input.

To rank firms on their ability to use customer input in NPD processes we suggest the following scale. Level 1 firms do not use customer input at all, according scholars not using customer input is considered as a worst practice (Cooper et al., 2004c). Level 2 firms use customer input but fail to either select the correct the users or time the usage and intensity of customer interaction to gather input wrong. An example of using the input of the wrong customer would using the input from so called late adopters (Rogers, 1976) who have the needs of yesterday instead of tomorrow. Additionally firms that use intensive customer interaction to develop incremental products would be considered to use the wrong customer interaction timing (Bonner, 2010). Level 3 firms use customer input from lead users and adjust their customer interaction intensity to gather customer input dependent on the degree of newness and embeddedness of the to be developed products.



Figure 15: Customer input.

3.6.9 Reduced cycle time

Reduced cycle time is referred to be the ‘‘reduction in the concept-to-introduction time line (i.e., time to market)’’ (Henard & Szymanski, 2001, p.364). It is found that there is a positive relation between the reduction of a products time to the market and its eventual success on the market (Afonso, Nunes, Paisana, & Braga, 2008; Evanschitzky et al., 2012; Henard & Szymanski, 2001; Lynn et al., 1999). It is argued that due to increased competition on markets products get outdated faster which reduces their life cycle. Reduced life cycles cause that products remain less long on

the market and thus also decrease the time these products create revenue streams for firms. By introducing products faster to the market firms can increase the life cycle of products and thus also the revenue stream that stem from these products (Afonso et al., 2008).

In order to decrease the time to the market of a product it is found that firms should have two critical drivers in place, firms should have a long term view and structured NPD process in place (Lynn et al., 1999). A long-term view implies that a firm should have a long-term planning for a project and does research upfront to get the required specs of the to be developed product to be clear. Doing this prevents that certain steps have to be taken twice and thus prevent a waste of time (Cooper & Edgett, 2003; Cooper & Kleinschmidt, 1995; Lynn et al., 1999). Second firms should have a structured NPD process in place which clearly defines which task should be done and when they should be done. The long term planning should function as a goal setting mechanism whereas a structured NPD process functions as a plan to get there (Lynn et al., 1999). As the correct usage of structured approach has been discussed in the success factor structured approach we will now solely focus on the correct usage of a long term-view.

So, to rank firms on their ability to reduce cycle times we propose the following scale. Level 1 firms have no long-term planning in NPD projects and the specs of the to be develop products are not clear before an NPD project starts. So, in this situation the goal setting mechanism of a long-term planning is missing causing it to be unclear which steps should be taken during an NPD process. Level 2 firms lack either a long-term planning or don't have clear which specs the to be developed product should have before an NPD project starts. Due to lacking long term views both level 1 and level 2 firms could have problems that could lead to doing certain steps twice causing the development time to increase (Cooper & Edgett, 2003; Cooper & Kleinschmidt, 1995; Lynn et al., 1999).

Level 3 firms have a long term view which include a long term planning and clearly indicate which specs the to be developed product should have before the start of an NPD projects which lead to reduced cycle time (Lynn et al., 1999).



Figure 16: reduced cycle time.

3.7 Strategy characteristics

3.7.1 Dedicated human resources

Dedicated human resources is the “focused commitment of personnel resources to a new product initiative” Henard & Szymanski, (2001, p.364). The focused commitment of human resources to NPD is found to be positively related to NPD success (Evanschitzky et al., 2012; Henard & McFadyen, 2012; Henard & Szymanski, 2001; Kandemir, Calantone, & Garcia, 2006). Research has shown that a lack of focus on the project by team members in NPD is one the main reasons for failure. This lack of focus originates from the problem that NPD team members often have too many projects or are not able to focus on the projects at all due to other tasks. Problems that are caused by a lack of focus or dedication to a projects are, poor execution of tasks, not doing tasks at all, increasing time to the market, don’t executing NPD projects at all, making the project simpler and suffering team morals (Cooper & Edgett, 2003). To overcome these problems and to enable employees to focus on their designated NPD project Cooper & Edgett, (2003) argue that firms should implement a portfolio management process. The bottom line of this process is to assign the right amount of human resources to the correct projects, depending on their importance in relation to the firm’s strategic objectives. As our model is intentioned to set certain goals or levels instead of the path of reaching it we won’t explicitly prescribe the usage of certain models but solely prescribe its functioning. First should thus have some kind of method in assigning the right amount of time to the right projects that are in line with the firms strategic goals.

So, to rank firms on their ability to dedicate human resources to the correct NPD projects we propose the following scale. Level 1 firms have employees that have a lack of time and are thus not able to dedicate themselves to NPD projects. As humans resources are the main resource to produce product innovation (Henard & McFadyen, 2012), firms lacking the dedication of human resources in NPD will thus not succeed in innovation. Level 2 firms have employees that can dedicate themselves to NPD projects but due to various reasons like too many work or projects they are not able to focus on certain projects. Furthermore, these firms don't base their decision to assign their employees time to projects on the strategic importance of a project. Level 3 have time of personnel available to dedicate to NPD projects whereas this time spending on certain NPD projects is based on their strategic importance for the firm.

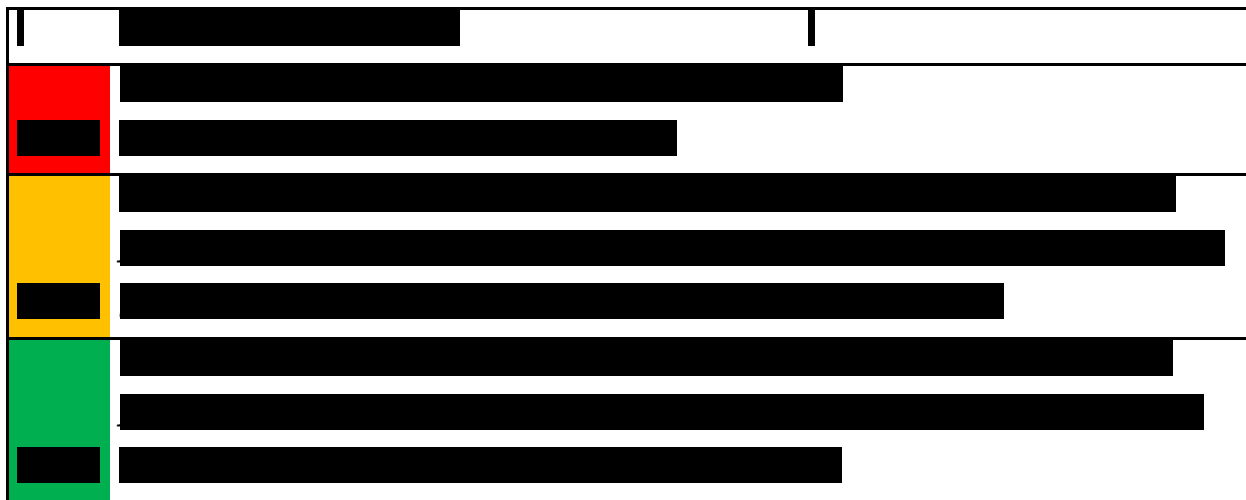


Figure 17: Dedicated human resources.

3.7.2 Company resources and Dedicated R&D resources

Company resources are the “commitment of (other) company resources (e.g., knowledge, patents) to new product development initiatives” (Evanschitzky et al., 2012, p.37).

Whereas dedicated R&D resources are the “focused commitment of R&D resources to a new product initiative” Henard & Szymanski, (2001, p.364). The commitment of sufficient resources is simply required “to achieve the NPD program objectives”(Ernst, 2002, p.24). Many scholars

have stressed the importance of the commitment of resources in order for NPD to succeed (Cooper & Kleinschmidt, 1995; Cooper & Edgett, 2003; Ernst, 2002). It is found that in firms a high proportion of resources is spend on projects that offer little to no return to the firm. This is due to the fact that firms often lack the correct metrics or strategy to assign the right amount of resources to the right NPD project (Cooper & Edgett, 2003). To overcome this and to assign the correct amount of resources to the correct NPD projects firms should make strategic decisions whereas these resources should be spent. Firms should assign their resources available for NPD to projects in fields which are attractive to the firm and where there is room for growth in line with the overall firm strategy (Cooper & Edgett, 2003). The earlier mentioned formal portfolio management process proposed by Cooper & Edgett, (2003) should apart from the distribution of human resources also ensure the distribution of the right amount of other resources to projects. So NPD projects should be ranked on their importance including the specification of how much resources they should receive (Cooper & Edgett, 2003). To know how much resources are required and can be distributed firms should implement metrics systems to enable efficient distribution of resources. Furthermore the formal portfolio management process should enable firms to monitor and kill projects if necessary based on the correct metrics (Cooper & Edgett, 2003).

Opposing it is argued that NPD projects should include a so called power promotor, a team member which is often from higher management and promotes the interest of the project to gather the required resources (Ernst, 2002). It can be argued that this could lead to a waste of resources if this power promotor is for instance assigned to a NDP project that would offer little to no returns to the firm. Cooper & Edgett, (2003) found for instance that projects with higher management involvement have higher failure rates because they start to tread projects as their own project, which leads to a reluctance to kill projects in anxiety for face loss. Furthermore, senior management performance is often measured wrongly causing them to invest resources into bad projects just to get their targets. As small firms often lack resources (Nicholas & Ledwith, 2006), wrong spending of these scarce resource could have severe consequences. Therefore instead of making the distributing of resources dependent on power promoters, we suggest that firms should distribute their resources to projects that can offer the most returns to a firm as proposed by Cooper & Edgett (2003).

To rank firms on their ability to dedicate resources to the correct NPD projects we suggest the following scale. Level 1 firms lack the resources to conduct NPD projects at all, these firms for example don't have financial strength to undertake NPD projects. Level 2 firms have the resource to undertake NPD projects but have no mechanism to assign the correct amount of resources to the correct projects. These firms might for instance invest in NPD projects in saturated markets which are not in line with the firm's strategic goals. Furthermore, there is lack of a mechanism to successfully assign the right amount of resources to the correct project. Level 3 firms have the resources and can assign the correct amount of resources to the project that are in line with the firm's strategy. These firms for instance invest their resources into NPD projects in high growth markets in line with the firm's strategic goals.

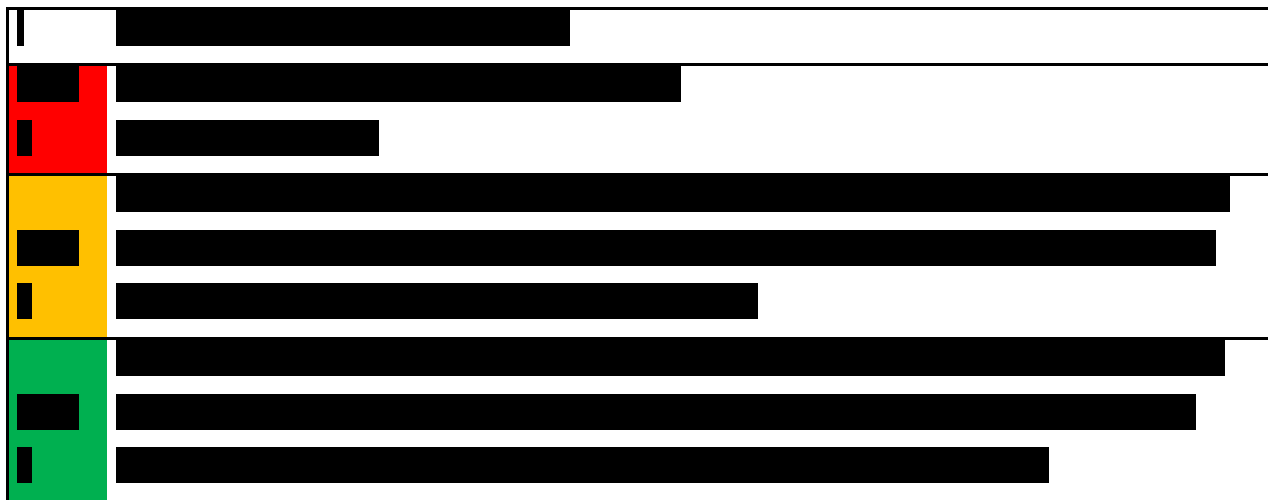


Figure 18: Company resources.

3.7.3 Strategic orientation.

The “strategic impetus, orientation, and focus of corporate strategy” is referred to as the strategic orientation (Evanschitzky et al., 2012, p.37). The input for a strategy within the development of new products can originate from customers, competitors or either technology (Gatignon & Xuereb, 1997; Narver & Slater, 1990). It is argued that the applicability of these orientations is dependent on the characteristics of the market for which these products are developed. “A firm wanting to develop an innovation superior to the competition must have a strong technological orientation” (Gatignon & Xuereb, 1997, p.32). Firms with a strong technological orientation are characterized by strong R&D (Cooper, 1994). “Competitive orientation is recommended in high growth markets to enable firms to emphasize innovation costs, thereby developing innovations with lower costs” (Gatignon & Xuereb, 1997, p.32). “

Firms should be consumer oriented and technology oriented in markets where demand is relatively uncertain ''(Gatignon & Xuereb, 1997, p.32). Competitive orientation is recommended to market innovations when demand is not too uncertain and in growing markets but should be de-emphasized in highly uncertain markets and in declining markets''(Gatignon & Xuereb, 1997, p.32).

In order to assign the correct NPD strategy to the correct market firms thus should be able to translate the market information derived via the market orientation process (Evanschitzky et al., 2012; Henard & Szymanski, 2001; Narver & Slater, 1990) into a solid NPD strategy. To value whether a firm is capable of this we propose the following scale. Level 1 firms don't use market orientation input into the development on their NPD strategy and thus risk the usage of the NPD strategy in the wrong market. Level 2 firms use market orientation input in the development of NPD strategies but lack the capability to match the correct strategy with the correct market. Level 3 firms use market orientation input and can match the correct NPD strategy with the correct market.

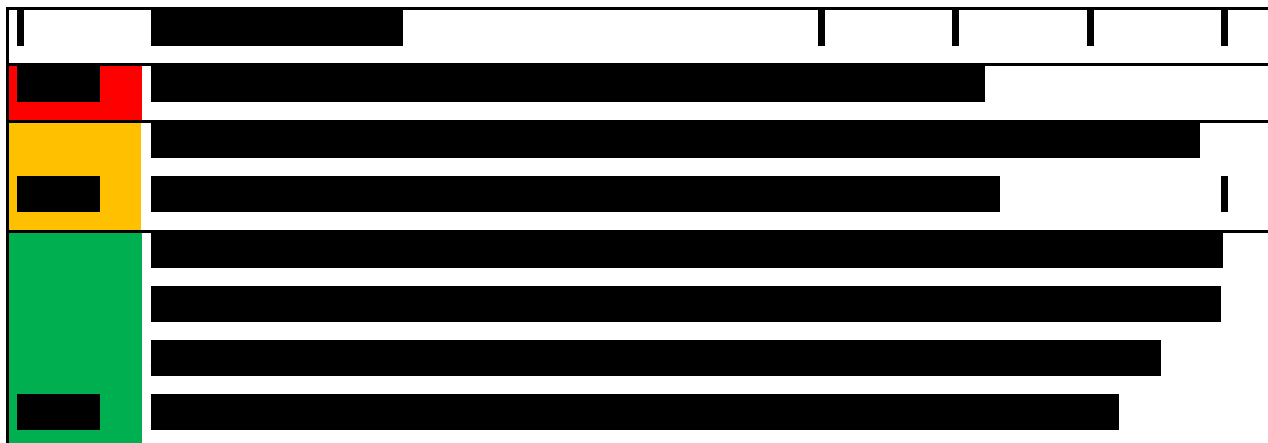


Figure 19: Strategic orientation.

3.7.4 Technological synergy

Technological synergy is considered as the ''congruency between the existing technological skills of the firm and the technological skills needed to execute a new product initiative successfully'' Henard & Szymanski, (2001, p.364). It is found that a fit between the actual and required technological capabilities to produce new products leads to better products that offer more added value and thus increases the NPD success (Calantone, Schmidt, & Song, 1996; Harmancioglu, Droge, & Calantone, 2009; Ozer, 2004; Song & Parry, 1997). Therefore it is

argued that firms should stick with exploiting the technological knowledge they have and avoid unknown technological domains (R J Calantone et al., 1996; Crawford, 1980). On the other hand firms that only exploit current knowledge are prone to produce only incremental innovation (Jansen et al., 2009). Only focusing on exploiting current knowledge to produce incremental innovation will eventually lead to increasing costs of exploring new knowledge which is required in radical innovation. Therefore firms should maintain a balance between exploiting current knowledge and exploring new knowledge which eventually also can be exploited to create radical innovation (Lavie et al., 2010; Levinthal and March, 1993; March, 1991).

So, for firms to maintain synergy between the possessed and required technological skills in the present and in the future, we propose the following scale to rank firms. Level 1 firms have a misfit between the possessed and required skills to successfully produce new product and are not investing in gathering these skills. Level 2 firms currently have a fit between the required and possessed skills to successfully produce new products, but don't invest in future capabilities which will eventually result in lacking technological synergy. Level 3 firms currently have a fit between the required and possessed skills to successfully produce new products, and invest in future capabilities to retain this synergy.

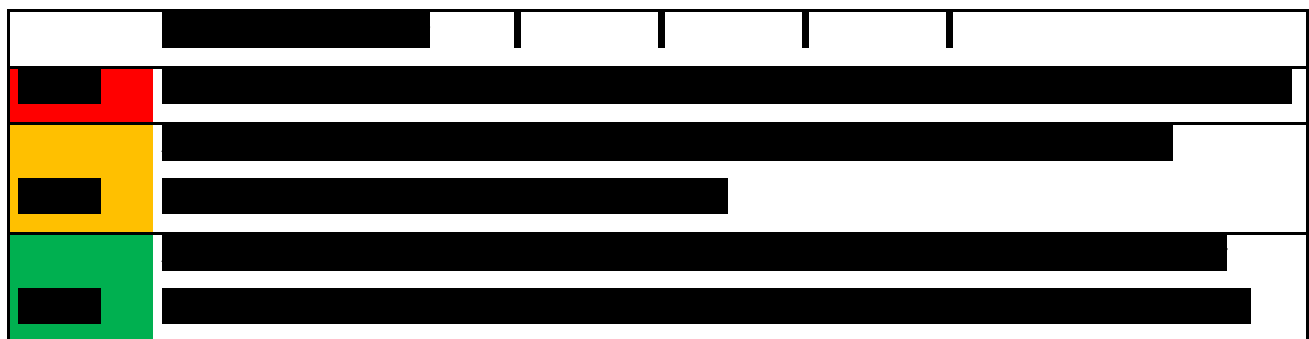


Figure 20: Technological synergy.

3.7.5 Marketing synergy

Marketing synergy is considered as the “congruency between the existing marketing skills of the firm and the marketing skills needed to execute a new product initiative successfully” (Henard & Szymanski, 2001, p.364). A fit between the actual and required marketing skills enables firms to perform better market orientation, introduce new products more successfully and to create more product and competitive advantages. This marketing proficiency leads to higher NPD success (Calantone et al., 1996; Ozer, 2004; Song & Parry, 1997). In line with technological synergy it is

argued that firms should pick NPD projects in which they possess marketing knowledge and there thus is a synergy between actual and required marketing capabilities (Calantone et al., 1996; Crawford, 1980). Again in line with technological synergy, based on March, (1991) theory it can be argued that only focusing on exploiting current marketing capabilities without developing new capabilities could eventually lead to lacking synergy between the possessed and required marketing skills for future marketing activities.

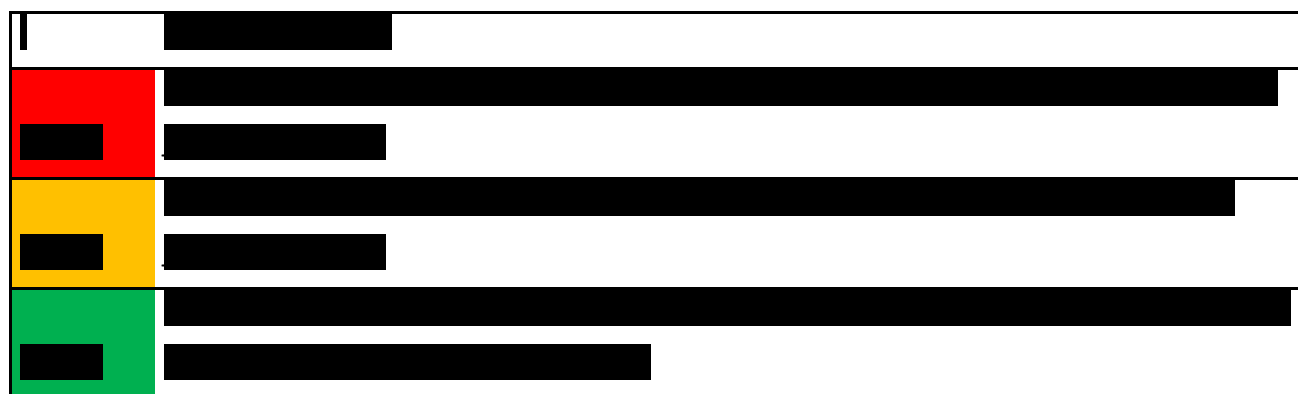


Figure 21: Marketing synergy.

3.8.1 Market attractiveness factors

market. Developing and introducing a new product into a market without demand could be considered as resource destruction (Mishra, Kim, & Lee, 1996). Markets that are considered to have potential are characterized by large size, high growth, demand for the to be introduced product and high profit margins (Kahn & Product Development & Management Association., 2012).

Although a favorable market potential is found to be positively related with NPD success, it should be seen in a perspective. Market potential is just one aspect of the markets attractiveness (Kahn & Product Development & Management Association., 2012), in which environmental uncertainty, competitive response intensity and the likelihood of competitive response (Evanschitzky et al., 2012; Henard & Szymanski, 2001) are also related to NPD success. A market that for instance has potential due to its large and growing size could become less attractive if the environmental uncertainty in this market is very high. Therefore, at the beginning of each NPD project marketing should apart from conducting a preliminary market assessments to value the market potential for the product, also conduct a competitor analysis to value the strength of the competition (Cooper, 1996a). The competitor analysis should at least include the following factors that are found to be related to NPD success. Environmental uncertainty that values the “degree of uncertainty due to the general operating environment faced by the firm (e.g., regulatory environment, technology uncertainty” (Evanschitzky et al., 2012, p.37). The competitive response intensity which values the “degree, intensity, or level of competitive response to a new product” Henard & Szymanski, (2001, p.364). And the likelihood of competitive response “to a new product introduction” Henard & Szymanski, (2001, p.364).

Although the outcomes of preliminary market assessment and competitor might indicate that a market is attractive for a new product, the position of the firm in this market should also be considered in order to decide whether to spend resources on NPD in this market (Cooper & Edgett, 2003). As shown in figure 22 the horizontal axes scales the firms business position or the business units strength on a certain market, whereas the vertical axes scales the attractiveness of a market (Cooper & Edgett, 2003). Firms that for instance have assessed the attractiveness of several markets should pick the project or projects in the market in which they excel. Markets with high attractiveness but in which firms have a poor position should be subjected to more

research, whereas market with low attractiveness and low and a poor business position should be avoided (Cooper & Edgett, 2003).

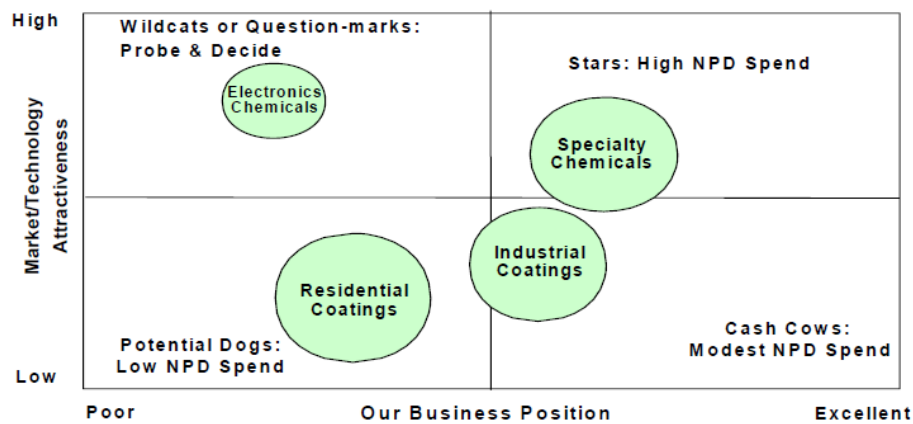


Figure 22: Strategic planning map
Source: (Cooper & Edgett, 2003, p.10)

So, to value how good firms can value a markets attractiveness we propose the following scale.

Level 1 firms don't conduct any preliminary screening or competitive analysis to value a markets attractiveness which causes them to invest in NPD without knowing if there is demand at all.

Level 2 firms conduct preliminary screenings and competitive analysis to value a markets attractiveness but don't consider the firm's own position in the process to decide in which market they should invest. Level 3 firms conduct preliminary screenings and competitive analysis to value a markets attractiveness combined with the firm's own position in this market.



Figure 23: Market attractiveness

3.9 Organizational characteristics

3.9.1 Organizational design and climate

“The extent to which the day-to-day decisions are governed with organization/group’s shared values and norms” is referred to as the organizational climate (Evanschitzky et al., 2012, p.37). A positive climate towards innovation is argued to enhance the innovation and NPD success within firms (Ahmed, 1998; Cooper, Edgett, & Kleinschmidt, 2004; Cormican & O’Sullivan, 2004). A positive climate towards innovation for instance positively influences how managers and employees respond and handle information from market orientation (Wei & Morgan, 2004). Cooper et al., (2004) even argue that a firm’s climate and culture towards innovation is one the strongest discriminators in separating the best and worst performers in NPD (Cooper et al., 2004).

To create a climate that is in support of innovation firms should enable and support employee’s to be creative and dedicate time and resources to their new unofficial projects.

Reward new ideas and people that work on them without punishing them in case of failure. Avoid risk averseness in undertaking new projects. Gather new ideas within the firm, foster open communication, make sure that everyone understands the NPD process, and most important openly communicate the support for innovation (Cooper et al., 2004). Factors such ‘reward structure’ and ‘job design’ are in the literature referred to as a firm’s organizational design and is found to be positively related with NPD success (Evanschitzky et al., 2012, p.37). We argue that the both cannot be seen separate as it is for instance indicated that rewards influence the climate towards innovation within a firm (Cooper et al., 2004). Due to the fact that SME’s often lack the time and resources (Nicholas & Ledwith, 2006) it can be argued that it will be hard to create an organizational design that creates support innovation within a firm. Therefore, SME’s lacking these resources should come up with custom solutions to enable and support employees to work on these projects.

To value whether a firm’s organizational design is supportive in fostering an innovative climate we propose the following scale. Level 1 firms don’t support innovation and punish employee’s for undertaking any form of creative activities. According to Cooper et al., (2004) this can be considered as a bad practice. Level 2 firms openly support innovation and rewards but employees are not enabled to conduct creative activities due to for example a lack of time. level 3 firms

support innovation and enable employees to conduct creative activities. Furthermore, these firm for instance gather ideas throughout the firm.

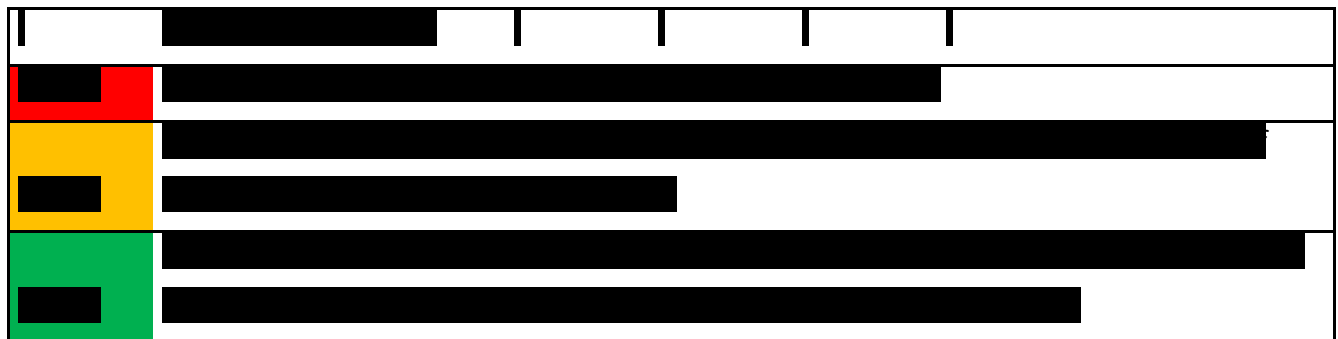


Figure 24: Organizational climate.

3.9.2 External relations

External relations are the “coordination and cooperation between firms and other organizations” (Evanschitzky et al., 2012, p.37). External relations with other firms or organization are found to be positively related to NPD success (Evanschitzky et al., 2012; Montoyaweiss & Calantone, 1994). Barczak et al., (2009) for instance indicate that the cooperation with other firms is a best practice when comparing the performance between firms that do and don’t cooperate. The rationale behind this is that external relations with other firms and organizations enables firms to combine resources and access each other’s resources in order to create a competitive advantage over firms which are not able to do this (Emden, Calantone, & Droge, 2006; Ozer, 2004; Sánchez & Pérez, 2003). Examples of beneficial outcomes of external relations are cost reduction via cooperation, idea input for NPD, new market access, faster NPD processes and risk reduction in NPD. (Hillebrand & Biemans, 2004; Mascarenhas, Baveja, & Jamil, 1998; Sánchez & Pérez, 2003).

At the other hand there are research outcomes that indicate that external relations might have adverse influence on NPD for instance via, the reduction of innovation within firms, slowing down the NPD process and increase the costs of NPD (Kathleen M. Eisenhardt & Tabrizi, 1995; Koufteros, Vonderembse, & Jayaram, 2005; Littler, Leverick, & Bruce, 1995; Mueller, Rosenbusch, & Bausch, 2013). Additionally we have found indications in the literature that the effectiveness of having external relations on NPD is for instance moderated by the internal cooperation within firms (Hillebrand & Biemans, 2004; Koufteros et al., 2005), and the degree of cooperation (Sánchez & Pérez, 2003). To conclude “existing research remains fragmented and

empirical findings to date show conflicting results” (Johnsen, 2009, p.187). Therefore, we argue that additional research regarding external relations will be required to value how firms perform regarding cooperation.

3.9.3 Degree of formalization.

The degree of formalization refers to the “Extent to which explicit rules and procedures govern decision-making in the organization/project” (Evanschitzky et al., 2012, p.37). As mentioned earlier the required degree of formalization depends on the external environment which influences the required type of innovation, either exploitative or explorative (Benner, & Tushman, 2003; Duane Ireland & Webb, 2007; Henard & Szymanski, 2001; Jansen et al., 2006; Lavie et al., 2010). Therefore, regarding the degree of formalization we refer to the earlier discussed “structured approach”.

3.10 Best practice model

In the previous chapters we discussed the success factors as found by Evanschitzky et al., (2012) and operationalized them into scales ranging from level 1 up till 3. The next step is to synthesize each separate factor into our best practice model that enables “managers to measure their performance in terms of product innovation management against best practice.” (Cormican & O’Sullivan, 2004, p.819). In the final model (figure 25) we included all factors which have been operationalized with a scale in the previous chapter. The factor external relations has been omitted due to a large amount of conflicting research findings. Additionally, company resources and R&D resources, cross functional communication & integration, organizational design and climate have all been paired due to their overlap in literature and operationalization. The factors market potential, environmental uncertainty, competitive response intensity and the likelihood of competitive response have all been merged into market attractiveness since we argue that they cannot be seen separate from each other.

To recap, the model works by identifying the actual practice with one of the practice on the scorecard. Firms that for instance have no checks if product offer an advantage over competitive products before it enters development are in the literature seen as bad practices (Cooper et al., 2004c). Therefore, firms that have no checks on product advantage are according the scorecard model identified as level 1 practices which can be considered as bad practice. To improve the

factor product advantage firms can implement measures to identify themselves with level 3. For instance, by introducing sufficient checks on product advantage before a product enters the development phase.

Due to the fact, the model requires less to no hard data the model can be used by either people internal and external to a firm. This feature should make the model suitable for usage as a consultancy tool at which the input for the model can be gathered by for instance questioning managers responsible for NPD within a firm. A major drawback of this model can be self-reporting biases connected to the self-reporting techniques. When for instance questioning whether marketing has the capabilities and skills to perform its tasks, the answer to this question will be influenced by the perception of the person who is being questioned. Furthermore, a question can also be answered more favorable to create more favorable outcomes for the questioned (Podsakoff, 1986). If the person responsible for marketing is questioned, he will be more likely to report that the marketing within the firm is skilled to protect his or her own status within the firm. We will try to prevent this by questioning directors or owners of firms when possible. It can be argued that they should be more inclined to give honest answers since they participate to the research to learn more about their NPD performance.

Model is not displayed due to confidentiality.

4. Field test within SME's

To test the validity and usability of our model we conducted four field tests within firms from different industries that employ between [REDACTED]. These firms are respectively active in the [REDACTED]. From these firms 3 directors or owners participated whereas in one firm an [REDACTED] participated. The duration of the tests including the interview and evaluation lasted between 45 minutes and 2 hours respectively.

As a start, we conducted an interview by using the questions as described in appendix 3. These questions were formulated to gain the knowledge required to value a firm as an outsider. After the interview, we rated the firm by using a Dutch translation of the model (appendix 1) whereas the firm representative could rate itself via the same model in which the levels were being mixed (appendix 2). Participants were asked to mark one of the levels to indicate with which of the levels they identify their firm. By mixing the level scores we tried to prevent that participant would rate themselves more favorable as suggested by (Podsakoff, 1986). Although we mixed the levels it seems participant still rated themselves higher within the model than we did based on the information they gave us during the interview. On average participants rated themselves 0.17 point higher (on a 3-point scale) than we did based on the information they previously provided during the interview. After the participants rated themselves they were given an evaluation model (appendix 4) in which we filled in how they rated themselves according to the model. Within this evaluation model they were given the opportunity to give feedback on the following points. Whether they agreed on which level they valued themselves according to the model, the average agreement on this score is 91%. Whether they agree with the division and levels within in each factor, and whether they agree with the importance with this level at all. The average agreement on this is 90% over all the firms. Finally, they could give feedback whether they see the highest rated level, level 3, achievable within their firm. On average, there is 96% agreement on the achievability of level 3 factors.

To review our results, we will now discuss the results and feedback of each success factor individually. A transcript of each of the feedback forms is to be found in appendix 6. A summary

of these feedback forms is to be found in figure 26. A note to our research outcomes is that one firm representative filled in the model wrong. Instead of marking the practices which he could identify his firm with he selected the levels that he wanted to reach between 2017 and 2020. Therefore, we omitted these results from the level score. Hereafter this firm will be referred to as firm x. Appendix 5 displays a graphic elaboration of the levels he wants to reach between 2017 and 2020 compared with his current score based on our rating.

	Factor	Average level score as valued by researcher based on interview data. (N=3)	Average level score as valued by firm representative. (N=3)	Average score difference between researchers and firm representative valuation. (N=3)	% Firm representatives that agrees with their own valuation level (N=3)	% Of firm representatives that agrees with the division / levels and importance of a factor. (N=4)	% Of firm representatives that thinks that level 3 of this factor is achievable. (N=4)
Product	Product advantage	2,67	3,00	-0,33	100%	100%	100%
	Product technological sophistication	2,67	2,67	0,00	100%	100%	100%
Strategy	Dedicated human resources	2,67	3,00	-0,33	100%	100%	100%
	Company & R&D resources	2,67	2,67	0,00	100%	75%	75%
	Strategic orientation	3,00	3,00	0,00	100%	100%	100%
	Technological synergy	2,67	3,00	-0,33	100%	100%	100%
	Marketing synergy	2,67	3,00	-0,33	100%	100%	100%
	Market orientation	2,67	3,00	-0,33	67%	75%	100%
Process	Predevelopment task proficiency	2,67	3,00	-0,33	67%	75%	100%
	Cross-functional communication & integration	2,33	1,67	0,67	67%	50%	50%
	Launch proficiency	2,33	2,33	0,00	100%	100%	100%
	Marketing task proficiency	2,00	2,67	-0,67	100%	100%	100%
	Senior management support	3,00	3,00	0,00	100%	100%	100%
	Structured approach	2,00	2,67	-0,67	67%	75%	100%
	Customer input	2,33	2,33	0,00	67%	75%	100%
	Reduced cycle time	2,67	3,00	-0,33	100%	100%	100%
Market	Market attractiveness	2,33	2,33	0,00	100%	100%	100%
Organization	Organizational design & climate	3,00	3,00	0,00	100%	100%	100%
Total		2,57	2,74	-0,17	91%	90%	96%

Figure 26: Test results.

4.1 Product advantage

All firm participants did agree to the importance of product checks before a product enters development and the different levels that had been awarded to this factor. Furthermore, all firms found the implementation of a certain check achievable within their firm.

Additionally, there was one firm who valued itself as level 3 in product advantage, so meaning no products can enter development before their advantage are known. Whereas we valued them at level 2 meaning that products without advantages can still enter development. We valued them as level 2 because during the interview they indicated that they sometimes produce products for clients without advantages because these clients want it like that. Although these products don't have any advantage over competitive offerings we can argue that this should not impact the rating of a products success in case of market pull. Market pull would be those situations where "where the idea came from the marketplace, and the main impetus for the project was marketplace demand" (Cooper & Kleinschmidt, 1995, p.331). If there is a demand for a product and the customer is willing to pay for it, even if the product is not offering an advantage, firms should not be ranked lower. Therefore, it can be argued that the current factor might not always be suitable for market pull situations and needs adjustment.

4.2 Product technological sophistication

According the research outcomes there is unanimous agreement with the model, valuation and achievability of level 3 within this factor. Nevertheless, one firm representative indicated that its products are technological sophisticated but felt they are not being interpreted like this by the market. Therefore, he valued his firm on level 2 on this factor. Within our model, we assumed that a difference between actual sophistication and the perception of sophistication would exist where products are being sold on the wrong market. Opposing to our assumption, the products that were specifically developed for this market were nevertheless interpreted as unsophisticated by the market. This could indicate that we should remove the assumption that for products to be perceived as sophisticated they should be sold on the right market.

4.3 Dedicated human resources

According the research outcomes there is unanimous agreement with the model, valuation and achievability of level 3 within this factor. One firm did value itself as level 3 but during the interview indicated that they often hassled to dedicate time to their product development projects. Therefore, we valued this firm to level 2, the level that holds that employees don't always have time to focus on projects. Again, time is one of the resources that SME's might lack in comparison to large firms (Nicholas & Ledwith, 2006). On the other hand, they did assign their time to work on projects according their strategic value to the firm. This could indicate that the

participant had trouble to identify itself with the correct level. To overcome this, future models could for instance assign points to certain statements instead of working with predefined levels which consist of certain statements. Doing this could make it more easy to identify with certain statements and could make the valuation of firms more specific.

4.4 Company and R&D resources

A firm representative, who identified itself as a level 2 firm, did not agree with the division, levels and achievability of 3 level within his firm. He argued that R&D costs are related to the firm's revenues and that strategic goals are not always reachable due to the absence of resources like funding or equipment. As argued by (Nicholas & Ledwith, 2006) SME's might lack the resources that larger firms do have, in this case to reach the strategic goals of the firm. This factor might thus need adjustment within future tests.

4.5 Strategic orientation

All firms acknowledged the importance of strategic orientation and agreed with the levels that where identified and found level 3 to be achievable within their firm. [REDACTED] scored level 3. The representative [REDACTED] explained that his firm created products for a market in which they are unknown and have little to no information about the market which causes them to be unable to create correct strategy.

4.6 Technological & marketing synergy.

All firms acknowledged the importance of technological and marketing synergy within their firm and agreed with the levels that where identified and found level 3 to be achievable within their firm. Again, one firm did rate itself on level 3 on both factors whereas during the interview they indicated that they were not able to invest enough in future technological capabilities or marketing capabilities. Based on this information we valued that this firm was not able to invest enough in marketing and R&D capabilities. The origin of the [REDACTED] might

[REDACTED]
[REDACTED] As argued by Podsakoff, (1986) participant might be inclined to give more favorable answers, or in this case self-valuation, to protect their status.

4.7 Market orientation

They argue that their products are ahead of the market and although market information is flowing into the firm it is not their primary source of information for product development. They reason that their customers could have never provided input for their products because they did not know they needed their products before they created them and therefore use little market information. This statement contradicts with R.G Cooper (1983, p.5) who argued that “Whether a technology push or market pull project, market information should be used, not only in the evaluation decisions, but most importantly, as an input to the product design, engineering, and product development activities”. At the other hand it does reinforce the reasoning of Baker & Sinkula (1999) who argue that firms should not be solely dependent on market information in order to prevent to produce only incremental innovations. And indeed, the strength of this firm is to produce radical innovations. As further suggested by Baker & Sinkula (1999) the firm critically interprets and stores market information to learn from this at later moments.

Additionally, the firm representative indicated that they don't want communication between departments during the development of new products since they argue this could slow down the development process. According our model firms that don't have communication between departments during the development of new products are inclined produce product that are solely based on customers or competitors. Based on the information this firm has provided us they produce products that are the opposite of either being based on competitors or customers. Based on this firms case we can argue that our assumption about interfunctional communication during the development of new products should be reviewed within future researches.

4.8 Predevelopment task proficiency

The same firm did also not agree with having a process before the development of new products that is based on the input of market information, they argued that they work with existing knowledge from the market and sometimes based on feeling. This again seems to be line with the statement of Baker & Sinkula (1999) that firms should not be solely based on market information

but to interpreted this information critically and learn from it at later points. Again this could indicate that this factor could need further investigation within future researches.

4.9 Cross functional communication and integration

Regarding the communication and integration firms did differ in opinion. The [REDACTED] indicated that they did not want communication during product development processes since they argue this would slow down the process. If within this firm management comes up with an idea which is given to R&D to work on and after the development is done marketing is being informed about the new product. They argue that when marketing would interfere earlier within the process this would slow down the process. This contradicts our assumption about communication within firms. As Ahmed, (1998) argued the communication between the different departments or disciplines within a firm would enhance innovation. Whereas this firm that is known for its innovative products is creating these products without using communication between the different departments or disciplines during their product development processes at all. Furthermore it also contradicts the results of Gemser & Leenders (2011) who argue that communication sharing between departments or disciplines increases NPD success.

Another firm indicated that they always wanted to have communication between the different departments and not to adjust the intensity or integration based on the risk of the project. Additionally, the smallest firm with within the research, [REDACTED], indicated that the firm was too small to set up communication mechanisms between disciplines or departments. Although 2 firms rated themselves as level 2, the level in which different departments or people from different disciplines always have communication during product development projects, we rated them as level 3. The reason for this was that they did not work with teams at all due to their size, rating them lower would then only be based on their organizational size. So, for future usage of this model it could be required to adjust our levels as given to the factor cross functional communication and integration. The factor could for instance be brought down whether is communication during the development of new products based on the results of Gemser & Leenders (2011) who argue that both cross functional communication and integration do increase the success rate of NPD projects.

4.10 Launch proficiency

All firm acknowledged the importance of having proficient skills to launch new products within their firm and agreed with the levels that were identified and found level 3 to be achievable within their firm. Level 3 consist of having proficient skills to launch a new product within a firm and to base the launching strategy on market information.

4.11 Marketing task proficiency

All firm acknowledged the importance of having sufficient skills within the firm to conduct the marketing tasks required within their firm and agreed with the levels that were identified and found level 3 to be achievable within their firm. Level 3 exist of having sufficient resources and skilled employees to conduct for instance marketing research. Surprisingly only 2 firms did rate themselves as level 3 and whereas one of these verdicts was given by the person responsible for marketing itself. The person responsible for marketing could as argued by Podsakoff (1986) been have been giving more favorable answers. [REDACTED]

[REDACTED]

4.12 Senior management support

All firm unanimously acknowledged the importance of having capable senior management support within their product development and agreed with the levels that were identified and found level 3 to be achievable within their firm. Although due to the size of these firms they did not have senior management layers but indicated that support mainly comes from director or owners of a firm.

4.13 Structured approach

One firm did not agree with having a structured approach within product development, their rationale behind this was that they want to prevent the product development to become too bureaucratic causing it to slow down. Although during the interview they indicated they had no process at all they valued themselves at level 3 which entails having a process of which the formality is being adjusted to the required type of innovation, either radical or incremental. We could argue that picking level 3 instead level 1 could be considered as a vote of disagreement against our scale and ranking of this factor. As level 1 represents firms that have no process at all

to guide NPD process, not even an informal process. As all other firms did agree to this factor is hard to judge whether we are correct in our scale or whether it need adjustment in future research.

4.14 Customer input

Apart from one, all firms agreed that using customer input within the development of new product is important and agreed with the levels that were identified and found level 3 to be achievable within their firm. Again, the very same firm that did not agree with using market orientation within their product development due to their reasoning they produce products that their customers could have never could have come up with did not agree with using customer input. As argued by Bonner (2010) and incorporated within our models level 3, products that are not new to the market or firm and are not highly embedded at the customer need less customer interaction or input. So, although we indicated that firms can score level 3 under certain circumstances without using less to no customer input, this firm did still disagree with the importance of customer input and rated itself level 1. So, rating of these levels might be unclear to firm representatives. To overcome this within future tests of the model we should more explicitly express that the impact of not using customer input is dependent on the need of customer input within the development of products.

4.15 Reduced cycle time

All firm unanimously agreed on the importance and achievability of having clearly defined product specifications for the to be developed product before the start of the development product paired with a long-term planning within product development. One firm indicated that before the start of the development of a product the specifications of the to be developed product were sometimes unclear and due to the experimental nature of the development process (chemical engineering) they sometimes had to do things twice. They indicated that certain products they produce were invented by accident during trials to produce a product of which the specification were not clearly defined. So, although having clearly defined specifications of the to be developed products might prevail in doing things twice and reduce the development time (Cooper & Edgett, 2003; Cooper & Kleinschmidt, 1995; Lynn et al., 1999), it might also cause to reduce exploration of new products and ideas. Exploration would be those activities that are associated with terms like ‘‘ search, variation, risk taking, experimentation, play, flexibility, discovery, innovation ’’ March (1991, p.71). So, it could be argued that for future test of the model this

factor might be adjusted to also keep in mind whether the goal of an NPD project is to produce incremental or radical innovation.

4.16 Market attractiveness

All firm unanimously acknowledged the importance assessing the attractiveness of a market before developing product for this market and agreed with the levels that were identified and found level 3 to be achievable within their firm.

4.17 Organizational design & climate

All firm unanimously acknowledged the importance of having an organizational design and climate that is in support of innovation and agreed with the levels that were identified and found level 3 to be achievable within their firm. Although all firms did identify themselves to be in support of innovation by their employee's and to enable their employees to innovate, just two of the three firm had a system to gather ideas throughout the company. Meanwhile they all rated themselves at the highest level, so again this reinforces that for future development of the model we could for instance assign points to certain statements instead of working with pre-assembled levels which consist of certain statements. Doing this could make it more easy to identify with certain statements and could make the valuation of firms more specific.

5. Conclusion

To recap, our aim was to test if it is possible to rate the factors that influence the success new product development within firms without using hard data. Based on the research outcomes we can argue that to a certain degree we can rate firms on the factors that influence the success of new product development. Firstly, the factors that we included into the model and the levels we created for them were on average for 90% agreed with according the firm's representatives. Although our starting point was to overcome the critics on the model of Nicholas & Ledwith (2006), holding that SME's often have a lack of resources, a faster decision cycle and different organizational structure due to their size and thus are different than large firms, we did not completely succeed in that.

During our tests and review we found there were certain factors that still fail to meet the criteria of a model that is suitable within SME's. Firstly, during one of the feedback sessions it was

argued that it is hard for SME's to fund R&D project that are in line with their strategic goals due to an absence of the resources required and thus the highest level within our model is not achievable. Furthermore, due to a lack of time within SME's it might also be hard for them to dedicate enough time to NPD projects and thus making the highest level hard to reach. Additionally, it was argued that due to an absence of clearly defined departments or disciplines within firms the highest level regarding the factor cross-functional communication and integration is also not achievable within SME's.

Apart from the previous factors that were argued not to be suitable for SME's we also found that there were also some general errors or drawbacks in our model that would need future adjustment. In our model, we assumed that products that offer no advantage over competitive offer should be withheld from entering development. For products that are made on demand for customers the factor product might in fact be of less importance since the products are being produced on behalf of the customer. This could mean that this factor is of less or no importance for firms that produce products on demand.

Furthermore, we found although products are being sophisticated and being sold on the correct market they might still be interpreted as unsophisticated. For future testing or usage or testing of our model we should thus adjust or remove the link between perceived sophistication and the market on which products are being sold.

Additionally [REDACTED]. They refrained from using market input or customer input within the development of their products based on the reasoning that the market or customers could have never come up with these products. As argued by Callahan & Lasry, (2004) the importance of usage of customer input within the development of new products decreases drastically when a product is radically new to a market. So, for future development of our model we should put more emphasis on incorporating the relation between the newness of a product and the required degree of customer input. Furthermore, opposing to our model, the same firm did not want any form of communication between departments or disciplines within the development of new products to enable quick development of new

products. Again, our assumptions about communication during the development of new products might need additional attention within future development of our model.

Regarding the usability of the model as a consultancy tool there seems to be little discrepancy between the valuation of the firms based on the scores of the representatives and our scores based on the information they provided us. On a 3-level scale, there seems to be an average difference of 0.17 points. To make the model more accurate we could adjust our valuation method. Since our model is based on a 3-level score with predefined features or statements within each score, participant often were forced to choose between two levels or sometimes 3 level that all contained a feature that represented their firm. To create more accurate and specific scores for each firm we should have worked with non-predefined levels instead and award certain points to each statement or element within a success factor.

6. Limitations & future research

Our model has been tested within four firms of which only three test outcomes were usable due to the fact one model had been filled in wrong. This creates an overall $N=3$, making it hard to create solid judgements about the usability and validity of the model. As described by (Sandelowski, 1995, p.182) when “generating items for an instrument, at least 25 descriptions of an experience will likely be required”. Following this reasoning testing such an instrument, in this case our model, would also need at least 25 cases. So, to further validation and or development of our model we can argue it should be tested in at least 25 firms.

Furthermore, in one firm we tested our model based on the information [REDACTED]
[REDACTED] Based on the research outcomes within this firm and arguments within the literature, that holds that people are inclined to give more favorable answers (Podsakoff, 1986). We can argue that within future test of the model the respondent from the participating firm should be able to give honest answers instead of answers that are focused on protecting his or her own position within a firm. To make the model more accurate, future development of the model could be focused on testing certain statements regarding a factor that together form a certain score instead of working with predefined levels. This could also make it more easy for participants to pick the statements which they identify most

with instead of having to choose between multiple levels which all contain statements which they identify with.

Throughout the research we have been building upon the findings of Evanschitzky et al., (2012) which enabled us to discuss factors that have been found to be relevant in NPD success. But as mentioned at the beginning of this thesis, success factors become more widespread among managers and seem to lose their positive relation with NPD success (Evanschitzky et al., 2012). Therefore, the relevance of the model could decay. Usage of this model in the future should be accompanied with updates from future literature. Furthermore, although we have been building our research upon a large amount of literature. It can be argued that the literature is a bit inductive since many research outcomes have been based on comparing firm results at which the practices of successful firms have been indicated to be best practices (Cooper, 1994; Cooper, 1996b; Cooper et al., 2004a; Cooper, Edgett, & Kleinschmidt, 2004b). It can be argued that there are more deep lying motives for these firm's success or failures that are not being observed since we as humans are bounded by our rationality in observing these factors (Arthur, 1994).

Additionally, since there was little known about best practices in SME's we had to make a lot of assumptions of how the factors that influence NPD behave in SME's instead of larger firms. We argue that future research regarding NPD in SME's would be valuable to create better understanding of mechanisms like communication during the development of new products, input of market and customer information during the development of new products.

Finally, we suggest that additional research regarding the influence of external relations on NPD success would be beneficial to indicate when and how this relation is either positive or negative.

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8. Appendices

Appendix 1. Dutch model

Not shown due to confidentiality.

Appendix 2. Dutch model with mixed valuations
Not shown due to confidentiality.

Appendix 3. Dutch questionnaire.

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Appendix 4. Dutch Evaluation model

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Appendix 5. Firm x score

Not shown due to confidentiality.

Appendix 6. Digitalized feedback forms.
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Appendix 7. Differences between large and SME firms

Large organizations	Small and medium-sized organizations
<i>Structure</i>	
Hierarchical with several layers of management	Flat with very few layers of management
Clear and extensive functional division of activities. High degree of specialization	Division of activities limited and unclear. Low degree of specialization
Rigid structure and information flows	Flexible structure and information flows
Top management a long distance away from the point of delivery	Top management close to the point of delivery
Top management's visibility limited	Top management highly visible
Multi-sited and possibly multinational	Single-sited
Many interest groups	Very few interest groups
Normally slow response to environmental changes	Normally rapid response to environmental changes
Low incidence of innovativeness	High incidence of innovativeness
Cultural diversity	Unified culture
<i>Procedures</i>	
Activities and operations governed by formal rules and procedures. High degree of standardization and formalization	Activities and operations not governed by formal rules and procedures. Low degree of standardization and formalization
System-dominated	People-dominated
Rigid and unadaptable processes	Flexible and adaptable processes
Incidence of fact-based decision making more prevalent	Incidence of "gut feeling" decisions more prevalent
Fragmented decision makers	Few decision makers
<i>Behaviour</i>	
Mostly bureaucratic	Mostly organic
Strong departmental/functional mind-set	Absence of departmental/functional mind-set. Corporate mind-set
Cultural inertia	Fluid culture
Meritocratic	Patronage
Rigid corporate culture dominating operations and behaviours	Operations and behaviour of employees influenced by owners'/managers' ethos and outlook
<i>Processes</i>	
Extended decision-making chain	Short decision-making chain
Complex planning and control system	Simple planning and control system
Strategic process generally deliberate and formal	Strategic process incremental and heuristic
Formal evaluation, control and reporting procedures	Informal evaluation, control and reporting procedures
Control-oriented	Result-oriented

Source: (Ghobadian & Galleary, 1997, p.128)

People

Personal authority mainly low
Individual creativity stifled
Dominated by professionals and technocrats
Range of management styles: directive, participative, paternal, etc.
Individuals normally cannot see the results of their endeavours
Ample human capital, financial resources and know-how
Training and staff development is more likely to be planned and large scale
Specified training budget
High incidence of unionization
High degree of resistance to change
Potentially many internal change catalysts

Contact

Wide span of activities
Extensive external contacts
Greater scope for an extended customer base

Large customer base

Personal authority mainly high
Individual creativity encouraged
Dominated by pioneers and entrepreneurs
Range of management styles: directive, paternal
Individuals normally can see the results of their endeavours
Modest human capital, financial resources and know-how
Training and staff development is more likely to be *ad hoc* and small scale
No specified training budget
Low incidence of unionization
Negligible resistance to change
Very few internal change catalysts

Span of activities narrow
Limited external contacts
Normally dependent on a small customer base

Limited customer base

Source: (Ghobadian & Galleary, 1997, p.129)