

MASTER

Drawing up a business context specific product innovation strategy for regulated R&D companies and applying it at Liandon

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**Drawing up a business context
specific product innovation strategy
for regulated R&D companies and
applying it at Liandon**

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in partial fulfilment of the requirements for the degree of

**Master of Science
in Innovation Management**

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Preface

“Innovation is not the product of logical thought, although the result is tied to logical structure.”

Albert Einstein

This is the final product required to end the master programme Innovation Management at the Eindhoven University of Technology. It involves a graduation project conducted at Liandon B.V. to help them with solving their new product development (NPD) related problems.

My interest was raised in the field of NPD during the course Management of Product Development lectured by professor Langerak. Due to the topic its importance and the fact that it's a topic that many talk about, but little thoroughly understand, NPD was chosen as the subject for my graduation project. Einstein's quote pinpoints to another intriguing characteristic of the process of coming up with a new product by stating that structuring the innovation process is not a guarantee for success. Structuring the innovation process merely enables successful innovations to be developed.

The case study at Liandon was chosen because of its appealing business context and related NPD problems. Setting up decent NPD in a former utility company was found to be a serious challenge thereby meeting my graduation project wishes.

The concepts of the development funnel, portfolio management and the Stage-Gate process were initially researched since they were thought to be the solution for Liandon's NPD problems. However, the underlying NPD problem of an entirely missing (and required) product innovation strategy became evident when the problem diagnosis was conducted. To solve their NPD problems, the initially researched theoretical concepts would not be sufficient anymore and the literature study therefore insufficient. The consequences of this find were broadening the research scope and thereby lengthening the graduation project duration. Clever or not, this graduation project brought with it many lessons in the field of NPD and how to cope with my personal traits, both essential before actually graduating.

The master thesis that now lies before you is a product that has not been an individual effort. I would therefore like to thank various people for supporting and inspiring me during both the graduation project as well as the master programme itself.

I would like to thank professor Langerak and doctor Schepers and all other IE & IS ITEM support staff involved for their energy, comment, time, and help they provided to aid me in reaching this very milestone.

Thanks go to both Hans Korsman and Roelof Potters at Liandon, and all other employees that supported me in my graduation activities.

Special thanks go to my fellow students Nicky Aerts, Tom van Leijsen, Thomas Wijtvliet and Willem Verstraten, with whom I spend most of my master programme at the TU/e, for their friendship and support during our 'common effort' in Eindhoven. To conclude, I would very much like to thank my wife, father and Father for their all-enduring support and confidence in my capabilities and ability to finish this project successfully.

Friso Schuring
Zetten, March 2012

Management summary

Introduction

Liandon is an R&D company in a regulated specific business context and part of the Alliander holding. With multiple business units as its ordering customers, it has the primary responsibility to develop the business units' desired products. Moreover, it indicates having two New Product Development (NPD) related problems it wants solved. These two problems relate to (1) a lacking NPD process structuring the development of individual products and (2) a missing overview of the project portfolio and their interdependence. Cooper's (2005) product innovation strategy, incorporating portfolio management and the Stage-Gate process, forms the most important new product performance-enhancing factor and is considered the right tool to meet Liandon's NPD problems.

Where companies like Unilever and Philips can tailor Cooper's (2005) generic product innovation strategy to meet their specific companies, the in a regulated domain operating Liandon cannot. The main cause for the inability at regulated companies to tailor the generic product innovation strategy is the lack of stimuli they receive to operate or innovate efficiently (Tieben and Poort, 2008). Literature widely acknowledges that monopolistic regulated companies generally are less efficient and innovative than companies in a competitive environment (Tieben and Poort, 2008). This lack of stimuli has resulted in the shortage of commercial processes that translate changing market needs to new products that need to be developed. In the domain where Cooper's (2005) product innovation strategy is applicable, commercial processes are presumed available. However, when a regulated company does not possess these commercial processes, it is unable to bridge the gap between a generic product innovation strategy and a company specific version. The generic product innovation strategy therefore has to be tailored for Liandon to make it applicable.

The resulting research question will try to find a specific product innovation strategy for all R&D companies in the specific business context and will then aim at its application at Liandon:

(1) *What does the product innovation strategy for an R&D company in the specific business context look like, and (2) how can it be applied at Liandon to solve its NPD problems?*

A literature study first of all researched literature on the product innovation strategy and its best practices. Secondly, the literature study proposed the business context specific product innovation strategy and the differences with the generic product innovation strategy. Specific business context requirements are met by the specific product innovation strategy and are now elaborated on.

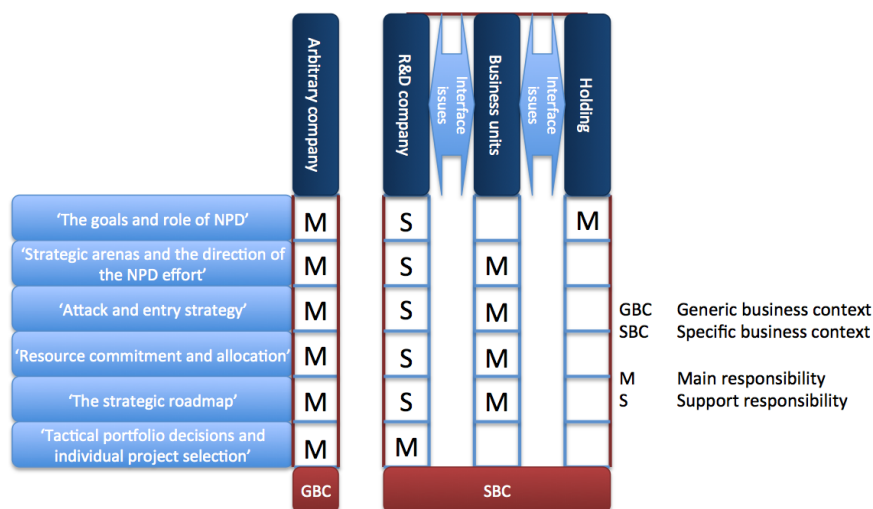


Figure I Division of the product innovation strategy components in the specific business context

Where arbitrary companies in the generic business context conduct all Cooper's (2005) product innovation strategy components, R&D companies in the specific business context are only to conduct

the bottom one on holding level. The other five components are to be determined by the business units and the holding and are not the R&D company's main responsibility. This division of roles logically follows from their current activities. However, that the other five components are not the R&D company's main responsibility does not prevent it from determining the components on company level. Fully aligned and in dialogue with the business units and the holding's management, the first five components are to be strategically determined on an R&D company level. By defining, for example, their own NPD goals in line with the holding's, the risk of suboptimization is partly countered by considering the entire holding in giving substance to the R&D company's NPD activities. Additional NPD meetings and continued dialogue with the business units and holding has to prevent suboptimization entirely from occurring. This alignment goes hand in hand with an aspired strong market orientation that is currently missing in the regulated specific business context. Lastly, it's the holding and business units management's responsibility to arrange NPD budget for the R&D company. The R&D company can merely appeal to this responsibility in dialogue and discussion to help obtain it.

The most important differences related to the specific product innovation strategy's components are that resource commitment and allocation, the strategic roadmap and part of tactical portfolio management are blended to form a new component. This new component is set up since it utilizes the by Cooper (2005) described best practices in a rather different way. The responsibilities depicted in figure I are translated to each individual product innovation strategy component and have altered them to meet the specific business context.

Overall, the first research question part can be answered with: as a detailed version of Cooper's (2005) product innovation strategy, but with a strong emphasis on aligning the product innovation strategy's components with the holding and business units' NPD goals and arenas.

A descriptive case study at Liandon diagnosed Liandon's current NPD effort by using the prior defined specific product innovation strategy and its best practices. The case study at Liandon utilized in-depth interviews and company data to come to a diagnosis on Liandon's NPD effort. This problem diagnosis can confirm the by Liandon indicated two NPD problems and moreover states that Liandon lacks all specific product innovation strategy components. A single major innovator has multiple mental roadmaps at tacit knowledge but is not made explicit through formal processes. The overall conclusion on the problem diagnosis therefore sounds: implement both Liandon's main responsibility of tactical portfolio management and also the other components for which it has a supportive responsibility.

Succeeding the diagnosis, a Liandon specific change plan (according to Van Aken et al. (2007)) has been drawn up to make sure Liandon conducts all necessary activities to successfully implement the specific product innovation strategy. The change plan's most important actions are to:

- (1) Convince Liandon's Management Team of the importance of decent NPD and the urgency to communicate it with colleagues within Alliander and the business units at Liander.
- (2) Form an NPD workgroup that will guide the implementation process and most importantly, detail the specific product innovation strategy.
- (3) Implement a sound NPD culture, climate and leadership.
- (4) Conduct a pilot implementation within Liandon.
- (5) Actually implement the specific product innovation strategy.
- (6) Organize frequent NPD information meetings with both colleagues at the business units of Alliander and Liander and with NPD employees of Liandon to be in continued dialogue and prevent suboptimization issues.

All preceding findings altogether result in the conclusion that Liandon will only be able to conduct adequate NPD when Liandon, Alliander and Liander share a common NPD view and jointly conduct a product innovation strategy on holding level. Liandon can take the initiative by implementing her part of the product innovation strategy.

General limitations are mainly concerned with the research methodology and literature used. The case study is for example as strong as the weakest spot in the in-depth interviews and company data.

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Abbreviations

APQC	American Productivity & Quality Center
BPS	Business-problem solving
DP	Desired product
GBC	Generic business context
NPD	New product development
PDP	Product development project
PIS	Product innovation strategy
PMC	Product-market-combination
R&D	(The department of) Research & Development
SBC	Specific business context
SPIS	Specific product innovation strategy
TPC	Technology-product-combination
TDP	Technology development project

1 Introduction

1.1 Innovation, NPD and their importance

In a response to changing market needs, companies need to innovate to remain competitive and profitable. Innovations in the form of new products can boost sales and guarantee a company's future existence. Sadly, new product development (from now on called NPD) is not an easy activity and a lot of companies do not conduct it in the right way. Cooper et al.'s (2004a) research amongst more than a hundred companies, states:

- 79.5% of new product projects from best performing companies are commercially successful, which is more than twice the score of the worst performers (37.6%). The company average is 60.2%
- 42.4% of profits come from new products at the best performing companies, where the worst performers only receive 9.1% of their profits from new products. The company average is 28.4%

In sum, NPD performance (and thereby new product performance) amongst companies overall differs greatly. Little (2005) furthermore adds that increasing the ability to conduct NPD is the most important lever to increase profitability and growth at the present time.

1.2 A desired business context specific product innovation strategy

This second paragraph will explain the necessity of a business context specific product innovation strategy by discussing NPD best practices, Cooper's (2005) product innovation strategy, and a specific business context in which Cooper's (2005) product innovation strategy needs to be specified. To support companies in their attempt to improve their NPD effort, Cooper et al. (2004a, 2004b, 2004c) together with the APQC¹ have conducted a thorough research on performance and best practices in NPD. Companies with problems in organizing NPD or ambition to improve their NPD effort can use the research results of these authors to compare their own NPD effort to. As a result, important missing or badly implemented NPD components or activities can then be identified and redressed so to enhance new product performance.

All best practices in NPD are aimed at strengthening a company's so-called new product performance. Since the term 'new product performance' can be viewed in multiple ways, what it (among others) entails is now described by presenting Cooper et al.'s (2004a) performance metrics (all relating to a new product):

- Profitability
- Generated revenue versus the forecasted revenue
- Related customer satisfaction
- Generated profitability versus the forecasted profits
- Market share
- Performance to schedule
- Time to market
- Performance to budget
- Development costs versus its generated revenue
- Time to profit
- Percentage of customer that repeat their purchase

Consequently, new product performance is in this thesis viewed as a dimension with the previously mentioned measures.

¹ The American Productivity & Quality Center, a 'leading proponent of knowledge management, benchmarking, and best practice business research' (<https://twitter.com/#!/APQC>).

1.2.1 Introducing the product innovation strategy

Companies not sure on where to begin with improving their NPD effort are met by the by Cooper (2005) proposed product innovation strategy (in which the NPD best practices are incorporated and that can be abbreviated with 'PIS'). Companies can use this product innovation strategy as a guide in establishing their NPD effort methodologically and anchored in scientific research (see figure 1).

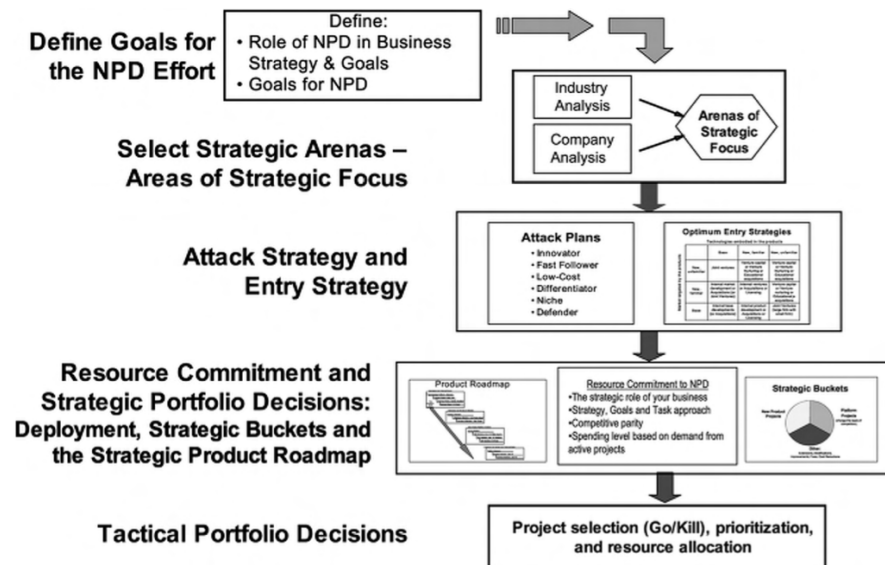


Figure 1 The major steps for developing a product innovation strategy by Cooper (2005)

Figure 1 portrays a flow through multiple activities that together make up the product innovation strategy. It starts at

- Determining a company's NPD goals, and
- Translates them into strategic arenas (markets, products, technologies),
- Determines how to attack and enter these arenas,
- Commits and allocates resources to and among the arenas, and
- Concludes with tactical portfolio decisions on the individual projects within the arenas.

Hence, the product innovation strategy (with its underlying best practices) can be used by companies to compare their current NPD activities. Also, when a company copes with NPD problems it wants to solve, important missing or badly implemented NPD components/activities can be detected and resolved by wielding the product innovation strategy and its best practices.

To emphasize its importance, Cooper (2005) mentions the product innovation strategy as one of the four main new product performance-enhancing factors. The other three factors are (1) portfolio management, (2) an idea-to-launch process (as for example the Stage-Gate® process) and (3) a good NPD climate, culture and leadership. Both portfolio management and the Stage-Gate process are incorporated in the product innovation strategy thereby making it absolutely indispensable in conducting NPD (see paragraph 2.1 for more information on the four main new product performance-enhancing factors).

1.2.2 Introducing the specific business context

A note on Cooper's (2005) product innovation strategy is that it's rather generic and needs to be tailored before a company can actually apply it. One of many specific business contexts where the product innovation strategy needs to be tailored to is depicted in figure 2.

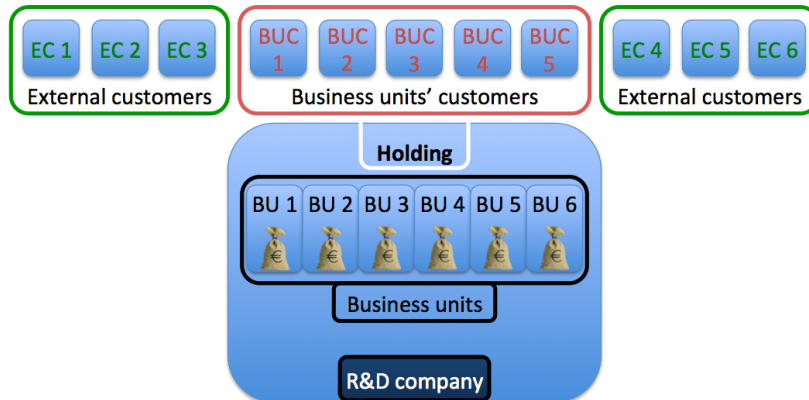


Figure 2 Representation of the specific business context

This specific business context is common amongst the larger corporations that have divided their organization in multiple business units and an R&D company² such as Thales, Unilever, Philips, Suzlon and many more. This specific business context will now be elaborated on before the consequences of this context on the execution of the product innovation strategy will be discussed.

Figure 2 shows a business context in which a holding is considered that contains an R&D company and multiple business units. The business units:

- Can be considered the R&D company's internal clients.
- Hold NPD budget (where the R&D company has none but needs to receive it from the business units and the holding's management).
- Together form the R&D company's primary (ordering) customer (thereby dictating the R&D company's product development portfolio).
- Together determine the holding's NPD strategy.

Furthermore, the business units have multiple (external) customers (BUC1 - 5) that are indirect customers of the R&D company. Lastly, the external customers that are illustrated are customers of the R&D company but not of the business units (EC1 - 6).

In sum, this specific business context is mainly characterized by the fact that it concerns:

- A holding with multiple business units next to which an R&D company develops the ordered products of these business units.
- An R&D company without an NPD budget that needs to receive/obtain it from the business units and the holding's management.

² Not called a business unit on purpose due to the fact that a business unit makes profit and R&D does not.

1.2.3 The product innovation strategy's limitations at regulated companies in the specific business context

The results of conducting the product innovation strategy on the holding in the specific business context are discussed by using figure 3.

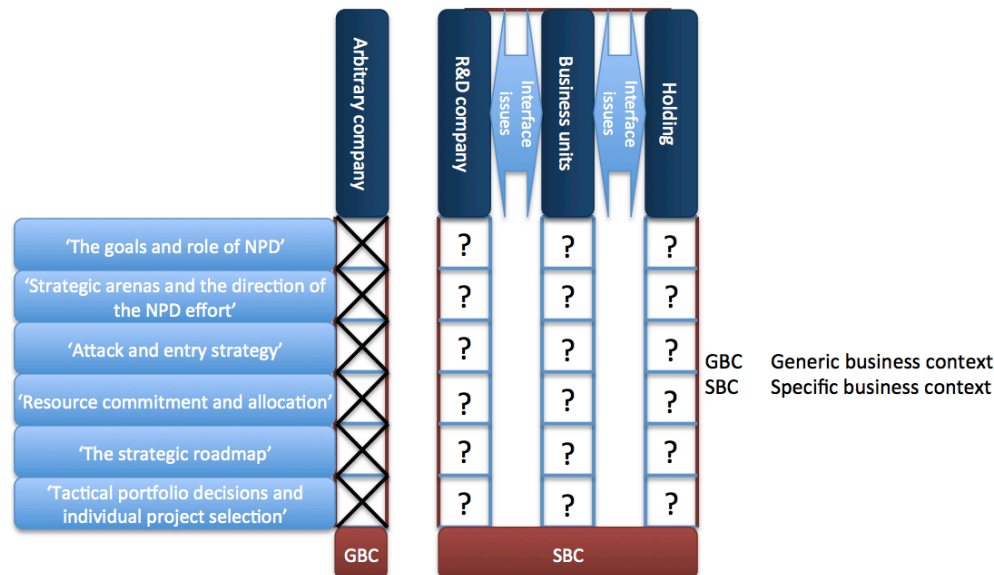


Figure 3 The allocation of the PIS' component responsibility in the generic business context and the specific business context

Firstly, from figure 3 can be observed that (according to Cooper (2005)) an arbitrary company would need to conduct every single product innovation strategy component in a generic business context. However, (when applied to the holding in this specific business context) which product innovation strategy components need to be carried out by whom and how is yet to be determined. For example, is the R&D company to determine an attack and entry strategy for a product which is to be developed, or is it a responsibility of the holding?

Secondly, as figure 3 also depicts, potential interface issues might need to be addressed that can be caused by suboptimization in this specific business context. Suboptimization is in this context referring to the fact that when product innovation strategy components are executed at different business units of the same holding, they are likely to optimize activities on a business unit level rather than on a corporate level. Possible results of ensuing poorly synchronized product innovation strategy components can be that activities of the R&D company are not aligned with the corporate NPD goals. In sum, how to meet this potential suboptimization issue forms a second question to be answered.

In sum, the product innovation strategy is rather generic and needs to be tailored before it can be applied in the specific business context to meet these two challenges.

However, where companies like Philips and Unilever know how to tailor the product innovation strategy, companies in a (by the government) regulated business context do not. This is not due to incorrectness of Cooper's (2005) product innovation strategy, but has to do with its applicability outside its scope. Regulated companies are not inside the scope of Cooper's (2005) product innovation strategy and it therefore needs to be adapted to regulated companies in the specific business context.

The expression 'specific business context' can from now on be considered a *regulated* holding in the specific business context of figure 2.

The main cause for the inability at regulated companies to tailor the generic product innovation strategy is the lack of stimuli they receive to operate or innovate efficiently (Tieben and Poort, 2008).

Literature widely acknowledges that monopolistic regulated companies generally are less efficient and innovative than companies in a competitive environment (Tieben and Poort, 2008). This lack of stimuli has resulted in the shortage of commercial processes that translate changing market needs to new products that need to be developed. Where the future existence of companies in a highly competitive environment is depending on their ability to respond to changing market needs, regulated companies will continue to exist due to their monopoly and markets their dependence on the company's products. Hence, regulated companies are likely to lack commercial processes that are considered vital and available at the competitive commercial companies. In the domain where Cooper's (2005) product innovation strategy is applicable, commercial processes are presumed available. However, when a regulated company does not possess these commercial processes, it is unable to bridge the gap between a generic product innovation strategy and a company specific version.

For example, Langerak et al. (2007) present in their research that *'the influence of market orientation on organizational performance is completely channelled through proficiency in NPD'* (p. 296). Market orientation can be defined as an organisational culture consisting of three behavioural components, namely (1) customer orientation, (2) competitor orientation and (3) interfunctional coordination (Narver and Slater, 1990). When solely focussing on improving NPD in the by Langerak et al. (2007) presented relationship and forgetting a poor market orientation, the organizational performance will remain rather low. Shoham (2006) additionally presents research in the non-profit sector and found stronger effects of market orientation on performance than in the for-profit sector. Therefore, (1) it is of major importance for regulated companies to become highly market oriented, and (2) a poor market orientation impedes tailoring the product innovation strategy.

In sum, Cooper's (2005) product innovation strategy will need to be adapted to (regulated companies in) the specific business context with a low market orientation. 'Which components are in what way to be conducted by whom' and 'how to meet the potential interface issues' are questions that need to be answered by a business context specific product innovation strategy.

1.2.4 The required business context specific product innovation strategy

A 'specific product innovation strategy' (SPIS) detailing Cooper's (2005) product innovation strategy for companies in the specific business context can meet a company's inability to do so themselves. Companies in the specific business context can use it to implement a rigorous NPD strategy that can meet their NPD problems. This specific product innovation strategy that is to be set up, forms the first product that is to be delivered by this thesis and will answer the first research question part:

What does the product innovation strategy for a company in the specific business context look like?

1.3 The Liandon case

A second product of this thesis has its cause in the company Liandon that currently faces the specific business context of figure 2 and mentions NPD problems it wants solved. This R&D company is part of the regulated Alliander holding (see figure 4), has multiple Liander business units as internal ordering clients, has no private NPD budget and mentions NPD related problems suggesting a badly implemented product innovation strategy³. It also experiences a low market orientation due to its business context in which this is not punished by competitors or by the market.

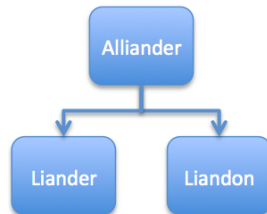


Figure 4 The Alliander holding consisting mainly of both Liander and Liandon

Liandon's mentioned NPD problems are now elaborated on before looking at what is required to solve them.

1.3.1 Liandon's NPD problems

Senior management perceives a dual problem looking at the innovation effort that takes place at Liandon that (they perceive) negatively influences new product performance. The *first* problem that is mentioned is that a formal NPD process is missing. More specific, an integral NPD process approach and predefined evaluation moments and criteria are absent. Due to this missing structure, development projects are not managed well, will miss strategic alignment, and will be decided on merely by 'gut feeling' (Planview, 2010).

The background of the *second* problem is that Liandon does not have private NPD resources available for innovation projects. It therefore continuously needs to look for project funding at Liander's budget holders or other stakeholders. This practice results in the fact that steering on the innovation project portfolio becomes a difficult task. 'Who pays also determines' is a Dutch saying that applies here, and therefore, project interrelatedness will not come naturally.

Consequently, the underlying interrelatedness of individual innovation projects is hard to comprehend (or just missing) and the project portfolio is therefore harder to communicate to stakeholders. This clear coherent project portfolio is important in communicating Liandon's added value and receiving goodwill and funding from Liander. A comprehensive overview of all innovation projects and their individual added value in the bigger picture could help communicate and finance the innovation effort at Liandon.

When these two NPD problems are compared to the by Cooper (2005) proposed four new product performance-enhancing factors, they most likely correspond to the factors idea-to-launch system (like the Stage-Gate process) and portfolio management. A problem diagnosis should verify if these two important new product performance-enhancing factors are indeed badly implemented. Furthermore, it should check all other product innovation strategy components for their condition. The foregoing is based on Van Aken et al. (2007) who state that a problem diagnosis may show that the problem initially indicated is only a symptom of an underlying problem and that it cannot be solved without solving the underlying one. Regardless of the output of a problem diagnosis, Liandon simply wants (all) their NPD problems solved in its specific business context so to achieve higher new product

³ Appendix I further enlarges on the company's business context and history which is left out of the introduction in terms of brevity.

performance.

1.3.2 The product innovation strategy's limitations in the Liandon case

Recalling paragraph 1.2.3, Cooper's (2005) product innovation strategy is too generic to make the strategy a practicable aid in solving Liandon's NPD problems. A specific product innovation strategy will be the first product of this thesis aiding Liandon in solving its NPD problems. However, how the specific product innovation strategy needs to be implemented at Liandon is subject for additional research. An NPD problem diagnosis (to diagnose Liandon's NPD state) and a change plan (that prescribes how to apply or implement the specific product innovation strategy at Liandon) are therefore additionally required to aid Liandon in solving its NPD problems.

1.4 Research question and relevance

Summarizing the two previous paragraphs, a business context specific product innovation strategy and a Liandon specific change plan are to be drawn up as aspirated results.

To confront Liandon and all comparable companies' NPD problems as well as possible, the specific product innovation strategy will be drawn up specifically for R&D companies. Consequently, the relating main responsibilities within the holding ('who needs to do what') will be determined per holding element, after which the activities per specific product innovation strategy component will be determined on R&D company level.

The research question guiding this study to find the aspirated results is formulated as follows:

(1) What does the product innovation strategy for an R&D company in the specific business context look like, and (2) how can it be applied at Liandon to solve its NPD problems?

The answer to this research question is relevant for Liandon since it proposes a business context specific product innovation strategy that helps it solve its NPD problems. It also describes a change plan with the activities required to implement the specific product innovation strategy. Moreover, other R&D companies in the same business context can utilize the specific product innovation strategy to set up proper NPD and solve their NPD problems.

The results of this study are relevant for scientific purposes in that they add to the literature of Cooper (2005) by proposing a business context specific product innovation strategy making Cooper's (2005) literature more specific and applicable.

Whether the – in this thesis – proposed specific product innovation strategy can really be generalized to all (regulated) R&D companies in the specific business context is subject to successive research and is not the main aim of this thesis.

1.5 Research methodology

This last paragraph will now clarify the research methodology and structure of the thesis together describing how this thesis is organized to answer the research question. In line with the dual research question, this thesis will consist of two major parts providing answers to both parts of the research question. The first part of this thesis is a literature study where the second part is an empirical study at Liandon.

To answer the first part of the research question, a literature study will first of all research literature on the product innovation strategy and its best practices. Secondly, the literature study will propose the business context specific product innovation strategy and how it distinguishes itself.

To answer the second part of the research question, a descriptive case study at Liandon will diagnose Liandon's current NPD effort by using the specific product innovation strategy and its best practices.

This problem diagnosis will confirm/refute the by Liandon indicated two NPD problems by determining its current NPD state in terms of the specific product innovation strategy's components. Succeeding the diagnosis, a Liandon specific change plan makes sure that Liandon conducts all necessary activities to successfully implement the specific product innovation strategy.

The case study at Liandon is categorized as descriptive due to (1) its registration of facts without searching for their explanation and (2) by describing Liandon's current situation instead of primary focusing on how it should be (Shadish et al., 2002). The case study in the second part of this thesis will further elaborate on the case study specific research methodology according to the regulative cycle by Van Strien (1997).

The resulting structure of the thesis is in line with the preceding described two major parts and is depicted in figure 5.

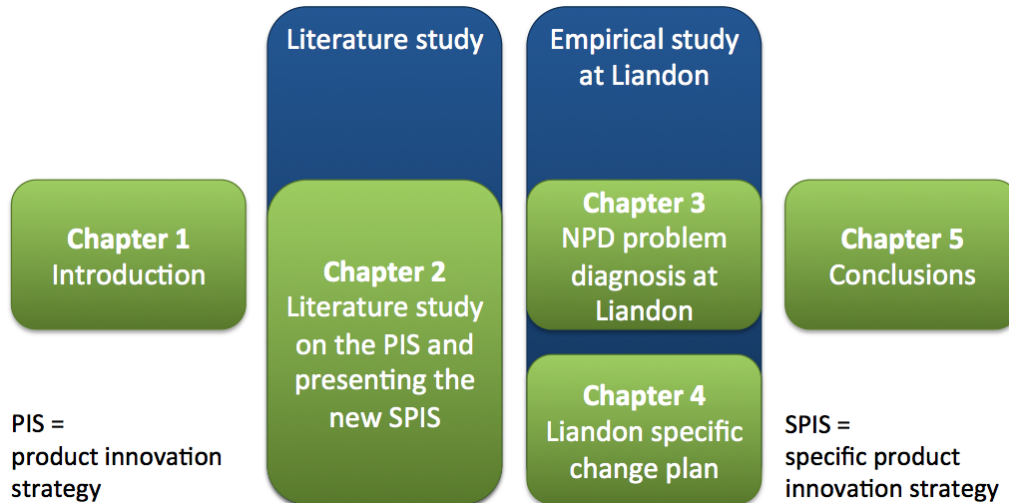


Figure 5 Thesis structure

2 Literature study on the PIS and presenting the SPIS

This chapter will form an answer to the first part of the research question (*‘What does the product innovation strategy for an R&D company in the specific business context look like’*) by presenting both Cooper’s (2005) (generic) product innovation strategy and the specific product innovation strategy simultaneously. The reason for this approach is to immediately highlight the differences between literature of Cooper and the newly proposed specific product innovation strategy. When this approach is found too confusing, it is to be advised to first read every paragraph without reading the subparagraphs on the strategies’ differences.

But before discussing these subjects, Cooper’s (2005) Innovation Diamond is introduced first to emphasize the importance of the product innovation strategy in NPD.

2.1 The industry’s best practices in NPD summarized in Cooper’s Innovation Diamond

Literature was sought on the most important new product performance enhancing factors and literature by Cooper (2005) was found to provide a useful introduction. Cooper’s (2005) so-called Innovation Diamond presents ‘four points of new product performance’ that emerged as common denominators across the best performing businesses in NPD. It yields a comprehensive view on what is most important in NPD. The four points of performance originate in best practices found in a major APQC study (Cooper et al., 2004a, 2004b, 2004c) amongst more than a hundred firms and from case studies at ExxonMobil Chemical, Mega Bloks, Proctor & Gamble (read also Cooper & Mills (2005)) and EXFO Engineering.

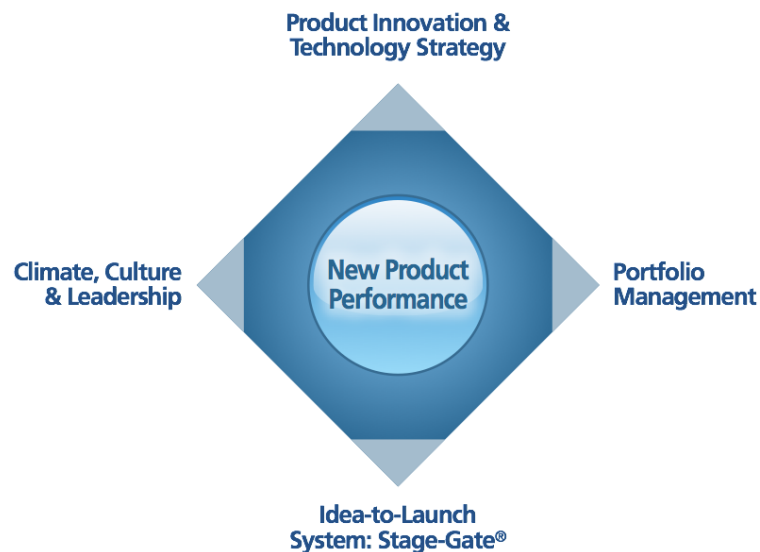


Figure 6 The Innovation Diamond by Cooper (2005)

The four points of new product performance mentioned by Cooper (2005) comprise:

A Product Innovation & Technology Strategy

A solid product innovation and technology strategy has to originate from the business strategy and guides the business’s NPD direction, resource distribution and project selection. This area is one key for success at Proctor & Gamble and ExxonMobil Chemical.

A ‘product innovation and technology strategy’ and ‘product innovation strategy’ are both used by Cooper (2005) to denote the very same thing. This thesis will utilize ‘product innovation strategy’ since technology is always developed in service of a company’s products (it can even be a company’s product), and the technology strategy is therefore already incorporated implicitly.

Portfolio Management

Top performers organize portfolio management, which commits sufficient resources to the right projects. This area is the number one best practice at EXFO Engineering and also a common denominator for success at Proctor & Gamble, Mega Bloks and ExxonMobil Chemical.

An Idea-to-Launch System: Stage-Gate[®]

Also called an 'NPD process', top performing companies have a robust idea-to-launch process (for example a Stage-Gate process) that guides novel products to the market. Emphasis within this process is placed on quality of execution, upfront homework, voice-of-the-customer input and gates with teeth that kill a project when needed.

This area was crucial to all four mentioned companies and to nearly all best performers researched by the APQC study.

Climate, Culture & Leadership

Top performers' senior management brings into being a positive climate, a culture for innovation and entrepreneurship, promotes valuable cross-functional (NPD) teams and joins the NPD decision-making process. The three areas that are fundamental to NPD success are (1) how project teams are organized, (2) how culture and climate support product innovation, and lastly (3) senior management's attitude and commitment. Mega Bloks stands out in this area.

These four main practices set apart the best performers from the rest (Cooper et al., 2004a, 2004b, 2004c) and are mentioned by Cooper (2005) as the key(s) to become a winner in the NPD effort. Hence, solely implementing a product innovation strategy that incorporates portfolio management and the Stage-Gate process covers three of the four points of performance and is therefore the most important new product performance driver. However, an NPD climate, culture and leadership may not be forgotten when implementing the product innovation strategy and has to be implemented simultaneously so to cover all four points of new product performance.

2.2 Cooper's PIS and the SPIS introduced

This paragraph will introduce both Cooper's (2005) product innovation strategy components as well as how they return in the specific product innovation strategy and who needs to do what. Subparagraph 2.2.1 will introduce the product innovation strategy and the requirements of the specific product innovation strategy. Next, subparagraph 2.2.2 will then present how to meet these requirements on a general level. Subparagraph 2.2.3 translates the in subparagraph 2.2.2 presented solutions to the specific product innovation strategy design.

2.2.1 PIS components and SPIS requirements

Cooper (1998, 2005) identifies six key components in a product innovation strategy that differentiate the best performing companies in NPD:

- 1) The goals and role of NPD;
- 2) Strategic arenas and the direction of the NPD effort;
- 3) Attack and entry strategy;
- 4) Resource commitment and allocation⁴;
- 5) The strategic roadmap;
- 6) Tactical portfolio decisions and individual project selection.

Figure 7 presents a framework with the flow through these six components that starts at determining NPD goals and moves through to the tactical project selection decisions.

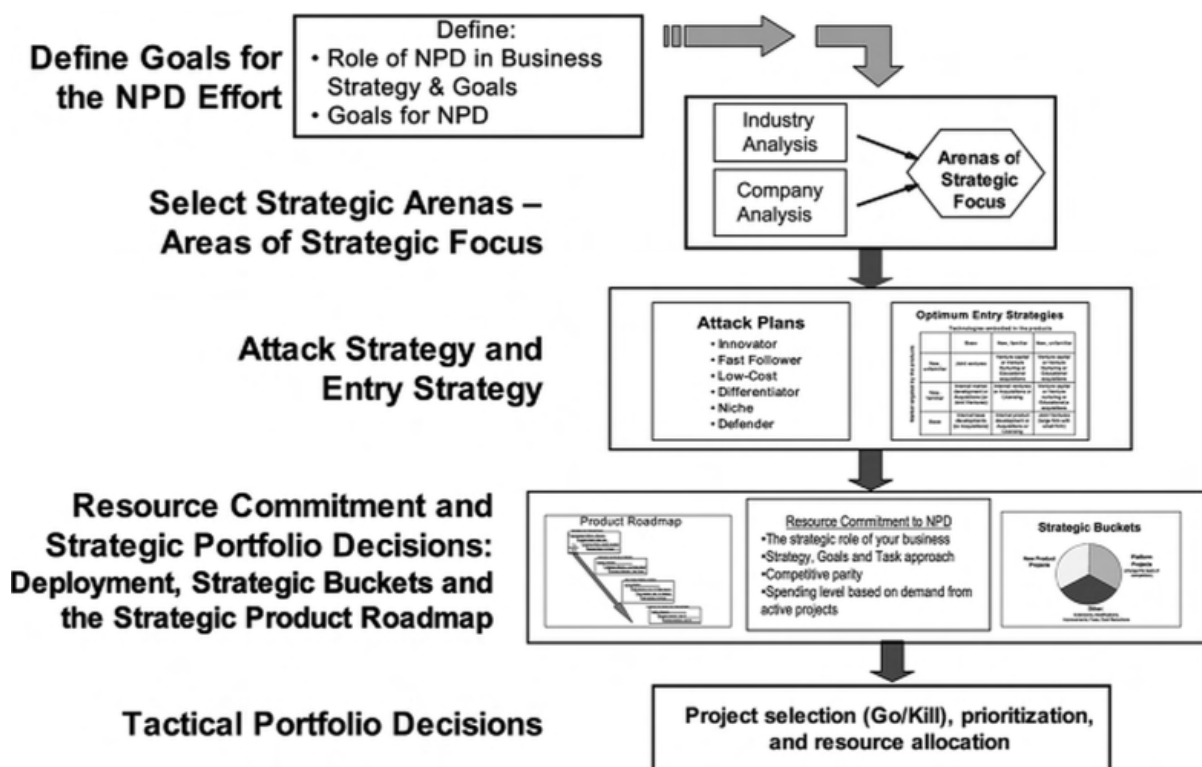


Figure 7 The flow through the major steps for developing a product innovation strategy by Cooper (2005)

Before introducing the specific product innovation strategy and its components, the requirements are summed up that were used to devise it. The specific product innovation strategy will have to specify:

- Which component needs to be conducted by whom and how?
- How to meet the potential interface issues as a result of suboptimization?
- How to meet the specific business context's low market orientation?
- How to meet the R&D company's lacking NPD budget?

⁴ Note that the fourth step in figure 7 represents both component 4 and 5.

These four business context issues are not new to the world, but sadly are not discussed by current best practice literature. Together, these requirements will now help come up with a strategy that helps in enhancing new product performance at R&D companies that want to set up sound NPD in the specific business context.

2.2.2 How to meet the SPIS requirements on a general level

As a sequel to figure 3, figure 8 presents the answer to meet four specific product innovation strategy design requirements. These four requirements will now be discussed utilizing figure 8.

Which component needs to be conducted by whom and how?

Figure 8 depicts a proposed division of roles for the specific product innovation strategy. What's most important is that each party is conducting a product innovation strategy component that suits its current responsibilities within the holding. The succeeding division of components amongst the holding's parties is thought up with this principle in mind.

The (management of the) holding, responsible for the direction and strategy of the holding, also needs to determine the holding's NPD goals and the role that NPD will have in achieving their overall business goals.

The various business units, together determining the products that are to be developed, should therefore need to determine:

- (1) The strategic arenas (products, markets and technologies) that show the highest potential in achieving the holding's overall NPD goals.
- (2) Attack and entry strategies on how to attack and enter the product related markets.
- (3) Resource commitment and allocation on how much and where to spend NPD budget amongst arenas.
- (4) The strategic roadmap on the development schedule for the coming years.

The R&D company, that develops the by the business units ordered products, is to conduct tactical portfolio decisions and individual project selection.

Now this self-evident initial allocation has been made, figure 8 shows these main responsibilities by an 'M' in the relating responsibility boxes.

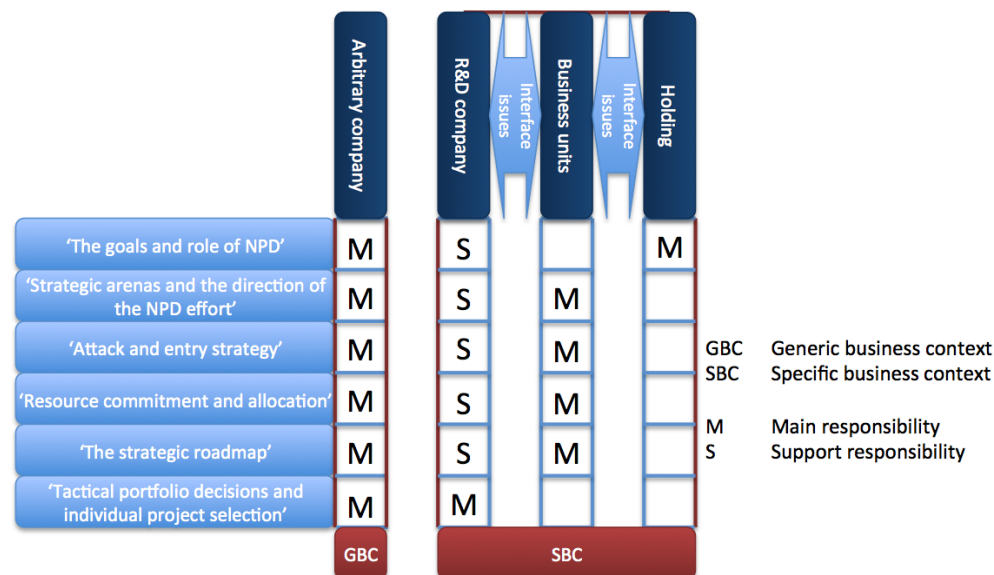


Figure 8 Proposed division of PIS components in the SBC

Note that the R&D company is *mainly* responsible for conducting the tactical portfolio decisions and individual project selection of the holding's NPD effort. However, this does not restrain the R&D company from determining the other components on a company instead of on a holding level. The R&D companies are therefore also advised to determine the other five product innovation strategy

components on an R&D company level. This activity is proposed to prevent the R&D companies from simply developing the dictated products without considering the greater goal of the products.

How to meet the potential interface issues as a result of suboptimization?

By defining their own NPD goals in line with the holding’s, the risk of suboptimization is partly countered by considering the entire holding in giving substance to the R&D company’s NPD activities. Figure 8 therefore illustrates the R&D company having a support responsibility (‘S’) for the first five product innovation strategy components that entails their specification on R&D company level. To entirely counter suboptimization, additional NPD meetings should be organized bringing the three parties together to line up all NPD activities conducted within the holding.

How to meet the specific business context’s low market orientation?

The low market orientation related to the specific business context is to be countered by laying a strong emphasis per component on building a higher customer orientation. This can go hand in hand with solving suboptimization issues due to internal clients being the R&D company’s main market.

How to meet the R&D company’s lacking NPD budget?

In addition, the specific business context’s related lacking NPD budget is met by the simple fact that it is the business units and holding’s management their responsibility to arrange NPD budget for the R&D company. The R&D company is thereby dependent on the other parties within the holding in taking their responsibilities. However, it is to be advised that the R&D company proactively approaches the business units to organize the NPD budget. The resulting practical consequences on receiving/obtaining NPD budget will be discussed in paragraph 2.6.3 and 2.6.4.

How the just-mentioned four requirements are met is to be translated into the specific product innovation strategy design and is discussed in the next subparagraph.

2.2.3 How PIS components return in the SPIS

Figure 9 presents both Cooper’s (2005) product innovation strategy and the business context specific product innovation strategy so to represent their differences and similarities.

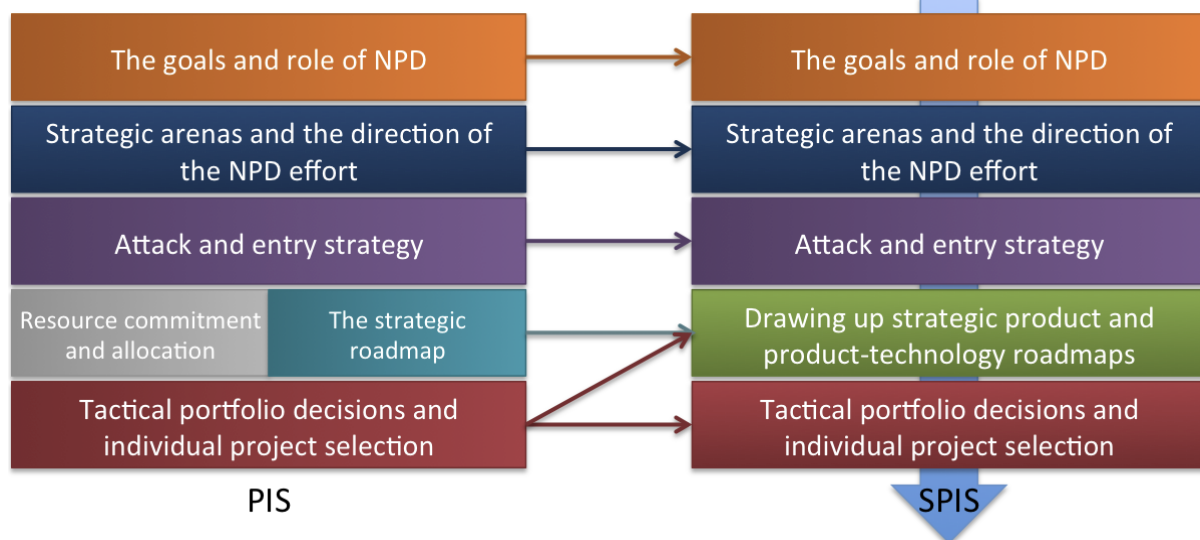


Figure 9 Cooper’s (2005) product innovation strategy and the business context specific product innovation strategy

Overall, differences between both strategies are not that large. As figure 9 illustrates, four components are applied in (almost) the same way. Only two components (together with a part of tactical portfolio decisions) are reformed into a single new component to better meet the specific business context. The underlying difference comes down to best practices used in an unconventional way.

The actual differences between both strategies come to light in elaborating the underlying best practices as described in paragraph 2.3 until 2.7.

However, an important question that needs to be answered before discussing the components individually is how the specific products innovation strategy is drawn up from the generic one. The specific product innovation strategy is the product of both Cooper's product innovation strategy and the (translation of the) provided answers on the design requirements into altered best practices.

The succeeding subparagraphs will further elaborate on the literature behind the six key components of Cooper's (2005) product innovation strategy and which best practices they contain. Paragraph 2.3 will deal with the first component on the goals and role of NPD. Paragraph 2.4 will describe how to translate these NPD goals into strategic arenas and thereby direct the NPD effort. Paragraph 2.5 will briefly discuss the attack and entry strategy that needs to be determined per arena. Paragraph 2.6 deals with resource commitment and allocation, the strategic roadmap and part of tactical portfolio decisions to introduce all material used by the fourth specific product innovation strategy component. Paragraph 2.7 will continue the in paragraph 2.6 presented part of tactical portfolio decisions by elaborating on the Stage-Gate process' principles.

Overall can be stated that best practices are elaborated on rather briefly; more information can be found in the appendices. Moreover, every paragraph is concluded with the differences between the specific product innovation strategy and Cooper's (2005) product innovation strategy to ease the reader in comprehending their differences.

2.3 The goals and role of NPD

The first crucial step in setting up a product innovation strategy is the formulation of goals for NPD and a clear linkage (and added value) with the overall business goals (Cooper & Edgett, 2010). Only 38.1% of the average businesses determine their NPD goals competently where best performers score 51.7% (Cooper et al., 2004b). Through the formulation of additional objectives, goals can be made more tangible. A goal for a utility company can be for example "to be the best in green gas injection technology in the Netherlands", where an objective can make this more tangible by stating "in 2020, 30% of annual sales will come from green gas injection products". Another best practice is the clear communication of the role of the NPD goals in achieving overall business goals (Cooper & Edgett, 2010). When their added value is unknown or common NPD goals are not communicated or absent, a lack of focus will result in middle-of-the-road business results.

A more practical prescription of the type of NPD goals to be included in a product innovation strategy is that they:

- Need to be measurable to wield as performance benchmarks.
- Should bind all resulting activities to the overall business strategy.
- Should provide employees with a clear direction and cause.
- Form criteria for project selection and funding decisions (Cooper, 2005).

A further elaboration on how to come up with goals that meet these requirements is described in literature by Cooper (2005).

Differences between Cooper's (2005) literature on the PIS and its application in the SPIS

The point of interest with this component is in the fact that R&D companies in the specific business context need to formulate their NPD goals in close dialogue with the holding and the business units to guarantee perfect alignment. This alignment and focus on the NPD goals of the holding and its business units is important to prevent suboptimization in the tactical portfolio decisions the R&D company needs to conduct. The importance of perfect alignment with the holding's NPD goals is emphasized by Cooper's (2005) suggestion that the NPD goals should form criteria for project selection and funding decisions. When the R&D company's NPD goals would not be perfectly aligned with the holding's, fallacious criteria would be used in the R&D company's project selection decisions. Note that this specific product innovation strategy component is to a large extent exactly

the same, but additionally details this component to make it applicable for the specific business context.

PIS activities	SPIS activities
The formulation of goals for NPD and a clear linkage with the overall business strategy.	Idem.
A clear communication of the role of the NPD goals in achieving overall business goals.	Idem.
	Align the NPD goals with the other parties' NPD goals within the same holding.

Table 1 NPD goals related differences between both strategies

2.4 Strategic arenas and the direction of the NPD effort

A second step when NPD goals have been determined is to further specify arenas where the focus of the development effort will be on, as well as areas that are 'out of bounds' (Day, 1975). This step answers the question "*on what business, product, market, or technology areas should your business focus its new product efforts?*" (Cooper, 2005, p. 67).

Requirements on the selection of strategic arenas are that they:

- Guide resource commitment and resource deployment,
- Guide the pursuit for new product ideas and aid in idea screening and project selection,
- Are crucial in long-term planning, especially in resource and skill acquisition.

Three important practical steps in determining the strategic arenas (Cooper, 2005):

- 1) Conducting a strategic analysis that assesses the company and the marketplace.
This step identifies markets, technologies and products so to come to potential strategic arenas. Key activities are (1) assessing a company's industry and market, (2) assessing the impact of disruptive technologies (that can disturb current markets and can render either a threat or opportunity to the company's business) and (3) identifying the company's core competencies (read appendix XIII for a brief description of the core competencies concept).
- 2) The identification of opportunities through the development of a comprehensive list of potential arenas (with the product to be developed as its unit).
The first question in determining the list is how many dimensions are incorporated. Cooper (2005) states that a strategic arena can be determined in terms of:
 - Who? The market or market segment that is to be served by the arena.
 - What? The customer need that is to be met by the arena.
 - How? The technology the arena requires.
These three questions form the starting point for assigning the arenas and produce three dimensions. Corey (1978) proposes a product-market matrix to draw up a picture of products meeting markets (PMCs), or more specific, the needs of a specific market. Hence, such a picture consists of two dimensions covering the combined 'what' and 'how' in the former dimension and the 'who' in the latter dimension.
- 3) Assessment to trim the potential arenas list.
Cooper (2005) asserts the right arenas are chosen based on a single "must-meet" criterion and two "should-meet" criteria:
The must-meet criterion entails if the arena does fit with the overall strategy of the business. The should-meet criteria is two-fold:

(1) Arena attractiveness

Consists of market attractiveness and technological opportunities. The former is about market potential (e.g. size and growth), where the latter describes the degree of product and technology opportunities in the arena.

(2) Business strength

Consists of the abilities to leverage the company's technological, marketing and sales competencies and the product advantage potential.

Both should-meet criteria can form the axes of a graph (like the one in figure 10) so to map all potential arenas against the criteria and illustrate the arena distribution. Rating questions will help managers plot the arenas relative to one another. By preference, a company will try to choose an arena portfolio that is a combination of arenas with⁵:

- High market attractiveness and high business strength (thus low risk) which are the 'good bets';
- A mix of more attractive but (high-risk) low business strength arenas and less attractive but (low-risk) high business strength arenas (Cooper, 2005).

What will be the ideal combination of arenas for a company is left to its senior management.

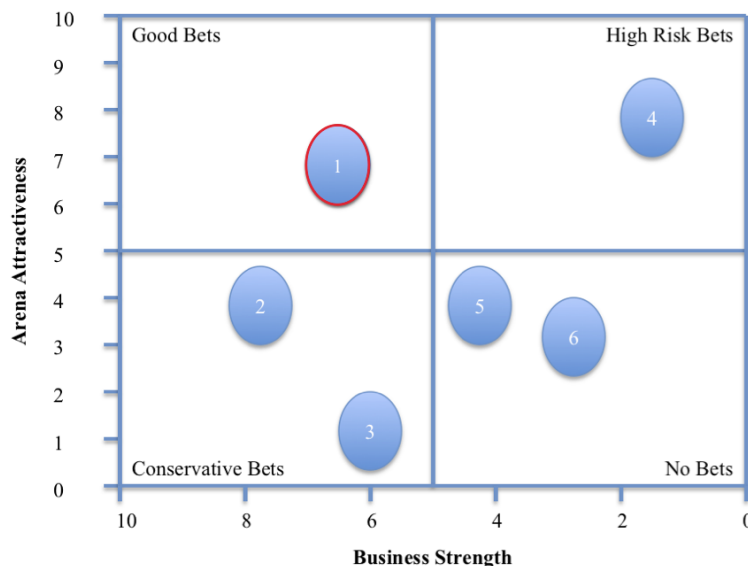


Figure 10 A strategic map with the arenas plotted on two dimensions (Cooper, 2005)

Differences between Cooper's (2005) literature on the PIS and its application in the SPIS

As depicted in figure 8, the business units bear the main responsibility for carrying out the in this paragraph discussed product innovation strategy components within the holding. Since the focus of this research is on how the R&D company needs to conduct the product innovation strategy in its specific business context, how business units need to carry out the components will not be discussed. The R&D company perspective is therefore now again continued.

To meet the specific business context, both business units and the business units' customers need to be considered the most important target markets during step 1 of determining the strategic arenas. These (internal) markets have high significance due to the close relation between the R&D company and its dictating business units and need to be weighted more heavily than other identified (external) markets. This is not a big difference but rather an important emphasis that is maybe implicitly stated in NPD literature, but not that obvious to regulated companies currently conducting a bad NPD effort.

⁵ Day (1986) describes the BCG matrix, which is an example of such a graphical representation.

In line with the first step, a point of emphasis is that the products that meet the internal markets in the product-market matrices need to be marked with an identifier to highlight the dissimilarity. Moreover, next to product-market matrices, also technology-product matrices are advised to draw up. The resulting technology-product combinations (TPCs) can help with determining the most effective technologies to be developed and are to be utilized in the next step of the specific product innovation strategy.

The third step adds a factor to the first should-meet criterion ‘arena attractiveness’, namely ‘market importance’ (internal markets are ranked highest). Moreover, like figure 10 already illustrates, internal market products are set apart again by providing them (for example) with a red rim. Lastly, the amount of strategic arenas selected at the end is intentionally kept high since the R&D company does not know in advance which ones will be financed and which ones will not be financed. Besides the ‘no bets’, no arenas are excluded a priori.

Hence, the R&D company’s strategic arenas are to be determined and additionally need to be discussed with the business units to both prevent potential suboptimization within the holding and assure that the right arenas are targeted by the business units. This dialogue between the R&D company and the business units double checks the by business units chosen arenas, and utilizes available knowledge of the R&D company with identifying and selecting arenas.

PIS activities	SPIS activities
1. Conducting a strategic analysis that assesses the company and the marketplace.	Idem, but with business units and their customers considered and weighed as the most important target markets.
2. Identification of opportunities through the development of a comprehensive list of potential arenas.	Idem, with products meeting internal markets marked to highlight their dissimilarity. Also technology-product matrices with TPCs are to be drawn up.
3. Assessment to trim the potential arenas list.	Idem, with ‘market importance’ added to the criterion ‘arena attractiveness’, internal market products highlighted with a red rim in the strategic map and the amount of selected arenas not reduced.

Table 2 Strategic arena related differences between both strategies

2.5 Attack and entry strategy

The third step in the product innovation strategy - now multiple arenas have been chosen as a company’s focus - is deciding on the new product attack strategy (Cooper, 2005). A company has to choose its strategic attitude between “*innovator, fast follower, defender, low-cost provider, differentiator, customer-friendly, niche player or low budget conservative*” (Cooper, 2005, p. 86). How a company wants to enter an arena is the important consideration that comes next. Enter possibilities are either solely, through licensing, through acquisition, with alliance partners or in a joint venture. A further elaboration on all different strategic attitudes and entry strategies is omitted in terms of brevity and is assumed common knowledge.

Differences between Cooper’s (2005) literature on the PIS and its application in the SPIS

According to Cooper’s (2005) product innovation strategy, the attack and entry strategy per arena should be determined when the arenas are selected. However, since the products from business units are developed, these business units determine whether to be the first to the market with a certain product (‘innovator’) or maybe a ‘fast-follower’. The same applies to the entry strategy and is depicted in figure 8. The R&D company should additionally propose supporting the business units in determining how to attack and enter the strategic arenas determined in a common effort.

PIS activities	SPIS activities
Determine the attack and entry strategy per selected arena.	Cannot be determined by the R&D company. The R&D company is advised to support the business units in determining them.

Table 3 Attack and entry strategy related differences between both strategies

2.6 Resource commitment and allocation, the strategic roadmap and tactical portfolio decisions

This paragraph will elaborate on the three entitled product innovation strategy components by introducing the literature behind the concepts followed by the differences with their application in the specific product innovation strategy. Paragraph 2.6.1 will elaborate on resource commitment and paragraph 2.6.2 on portfolio management that addresses the other two related product innovation strategy components. To be specific, the strategic roadmap is a strategic portfolio management method and tactical portfolio decisions are described under the heading of tactical portfolio management. Paragraph 2.6.3 will then introduce the differences of best practices applied in the component ‘drawing up strategic product and product-technology roadmaps’ with the affiliated product innovation strategy components. Due to the fact that the specific product innovation strategy component does not become clear through solely elaborating on its differences with the product innovation strategy components, paragraph 2.6.4 will spell out its six proposed activities.

2.6.1 Resource commitment

Best performers in resource commitment distinguish themselves from the rest by:

- How intelligent and quick they commit and assign development resources;
- Focus and dedication on not too many projects;
- The availability of sufficient resources (Cooper et al., 2004b).

But how to decide what level of investment is sufficient? Cooper (2005) proposes four approaches:

1. Strategic business role approach.
Investment levels will be determined by funding each business unit or company based on its NPD opportunities and potential. For example, a business unit or company with little potential in NPD is also given relatively little resources. This approach is especially useful for businesses that are part of a larger corporation.
2. Strategy, goals and task approach.
This approach seeks to make sure that the amount of invested resources reflects the required activities that need to be undertaken to realize business strategy and goals. Subsequently, a resource capacity analysis can form an assessment of actual supply and demand and highlights current investment gaps in NPD spending.
3. Competitive parity approach.
Competition simply dictates what a company spends on NPD based on the assumption that an average competitor’s NPD spending is close to optimal.
4. Demand and opportunity approach.
This approach is bottom-up in that it does not strategically determine spending amounts, but utilizes developments projects’ demand as input. The approach therefore places a great amount of trust in the assessment and screening process of proposed NPD projects.

No single approach mentioned here is a panacea for the investment level issue. Cooper (2005) recommends using multiple approaches and above all, an informed decision.

2.6.2 Portfolio management

Cooper (2008b, p. 9) states that “*there are two ways to win at new products: doing projects right and doing the right projects*”. This paragraph about portfolio management will deal with the second challenge covering ‘doing the right projects’ which precedes ‘doing projects right’.

Portfolio management introduction

Portfolio management is about the crucial question how to invest resources and (R&D) capabilities most effectively. This resource allocation is important as these resources are meant to be spent to attain business’s NPD goals. Portfolio management determines the specific projects that receive resources today and thus determine the products launched and received by the market tomorrow.

Therefore, the optimal investment mix between projects differing in risk and return, maintenance and growth and short-term and long-term timespans is a balance worth analysing and controlling (Cooper, 2001; Cooper & Edgett, 2008). More practically, Cooper et al. (1998a) state (1) senior executives in top performing companies regard new product portfolio management to be of vital importance and (2) companies giving prominence to a formal portfolio management process outperform the rest.

Best practices of portfolio management will now be summarized to make the concept wieldable and carry out the preliminary work for a company benchmark.

Portfolio management best practices

As one of the four points of performance in the Innovation Diamond by Cooper (2005), portfolio management best practices really are important to review. Best performing companies can be distinguished from the rest in that they hold the following seven best practices (Cooper et al., 2004b):

1. Formal and organized portfolio management is in place.
2. The entire project portfolio is aligned with the business's strategy and goals;
3. The distribution of resources in the portfolio reflects the business's strategy;
4. The project portfolio contains high-value new product projects;
5. Ranking and prioritization of projects is well established;
6. The project portfolio is well balanced in terms of long/short-term, high/low-risk, and across markets and technologies;
7. The amount of new projects undertaken and the resources available is well balanced.

Moreover, research by Cooper et al. (2004b) spell out that a large portion of companies do not have these seven best practices in place. They are therefore advised to be checked on their presence.

In sum, carrying out sound portfolio management is a challenging task that cannot be underestimated. Companies really need to assess their portfolio management so to make sure it really practices the previously mentioned seven best practices.

An important subdivision in portfolio management needs to be made before heading on to what companies actually do to achieve the seven points mentioned above.

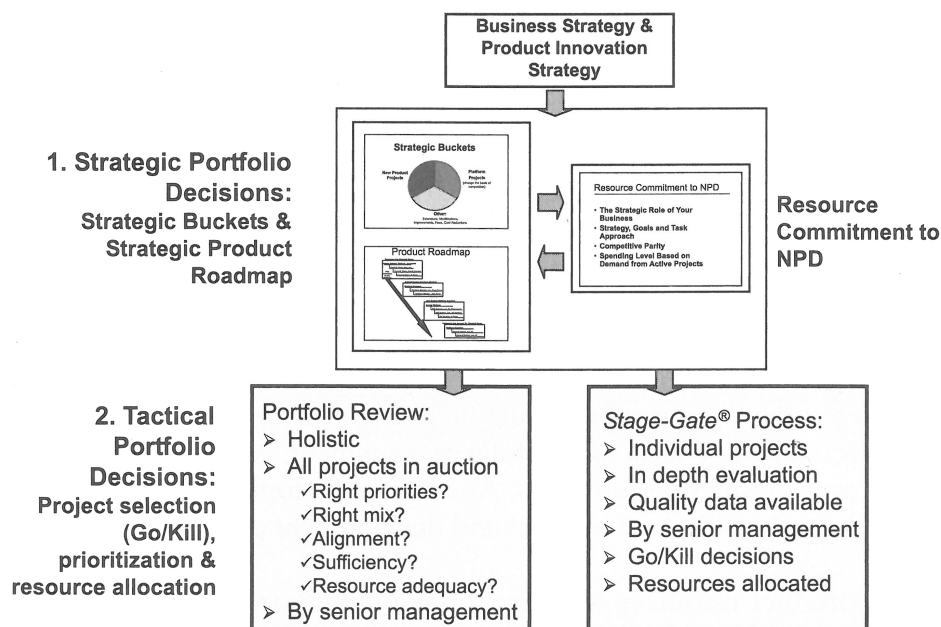


Figure 11 Moving from the product innovation strategy to strategic and tactical portfolio decisions (Cooper, 2005)

Figure 11 zeroes in on components four, five and six of the product innovation strategy. Resource commitment together with resource allocation (which utilizes strategic buckets and roadmaps) takes place at the strategic portfolio decisions level. The tactical portfolio decisions are split up in a portfolio review and the Stage-Gate® process that allocate resources between projects in the same

portfolios. The actual differences between strategic and tactical portfolio management decisions are now dealt with.

Strategic portfolio management

Strategic portfolio management deals with where the resources are spent and how these resources are split across different kinds of projects, technologies, markets and product classes (altogether called arenas in paragraph 2.4). Strategic buckets and strategic roadmaps are effective methods that can be exercised at this level of portfolio management (Cooper, 2003).

The strategic bucket method is a very good technique to really implement business strategy into the project portfolio by spending resources on predefined themes (also called ‘buckets’). In short, senior management needs to undertake the following to set up sound strategic buckets (Cooper, 2005):

- Start at the business strategy and choose strategic dimensions for the buckets.
- Determine how resources will be allocated among the buckets.
- Plot current projects (both active and on-hold) into the newly formed buckets.
- Prioritize the projects within each bucket (when this has not been done already) with either financial methods or the scoring model (see appendix II for an example and paragraph 2.6.2 on portfolio management methods).
- Review each bucket on either shortage or surplus of projects related to its allocated budget.

The result of applying strategic buckets will be multiple portfolios where each strategic bucket represents a particular portfolio theme. Important in prioritizing projects within the buckets is that different criteria are used for different types of projects. A low-risk/incremental project will otherwise always win from a high-risk/radical project since the risk of a radical project is hard to quantify and lowers the overall project score significantly.

See appendix II for an example of strategic buckets with ‘product type’ chosen as bucket dimension.

A second strategic portfolio management method is the strategic roadmap. Where strategic buckets are aimed at strategically aligned resource spending, the strategic roadmap takes care of a strategically aligned schedule of development projects. It ensures that the scheduled development project portfolio really contributes to the business strategy and goals (Cooper et al., 2002a) and can be used in combination or instead of the strategic buckets method. Two main strategic roadmaps can be distinguished, namely the product roadmap and the technology roadmap. The product roadmap establishes a map with the company’s selected strategic arenas related products along a time axis so to map out the planned development effort. The technology roadmap is obtained from the product roadmap and displays the technological competencies and technologies required to develop the products from the product roadmap. Both product and technology developments can even be combined in a product-technology roadmap providing an overview of all necessary developments (Cooper, 2005).

Appendix II gives an example of a product roadmap. Information on the projects in a roadmap is fairly general like ‘green gas injection systems’ or ‘superconductive net’. Note that for each mapped product in appendix II, the development projects that are required to acquire them individually are also mentioned.

The two types of roadmaps can therefore be used to draw a product and technology map linking NPD goals to successive product development programs. The strategic roadmap hereby becomes an attack plan to attain the desired products. The roadmaps also identify product or technology development gaps that need senior management’s attention so to complete the development schedule.

Tactical portfolio management

Tactical portfolio management succeeds strategic portfolio management and is aimed at what specific individual projects should be done, what their relative priorities are, and how many resources should be spent on each project (Cooper, 2003). As figure 11 already suggests, Cooper (2003) splits tactical portfolio management into two elements that need to work together to come up with the ‘right projects’:

1. The Stage-Gate® process
An idea-to-launch process with stages and gates guiding individual projects from idea generation to market launch (elaborated on in paragraph 2.7).
2. The portfolio review
A periodic project portfolio review by senior management where all project are reviewed and receive a go or kill decision.

Cooper (2005) calls the difference between the Stage-Gate process and the portfolio review the contrast between the *fingers* and the *fist*. The Stage-Gate process deals solely with the *fingers* since it makes go or kill decisions based on individual projects. Every project assessed is judged on its individual quality where the portfolio review deals with the entire *fist*. The portfolio review is thus a comprehensive view of all current projects and is therefore something essentially different than the Stage-Gate process. Furthermore, the Stage-Gate process is conducted in real-time and is a thorough, in-depth analysis of a single project, where the portfolio review is always conducted afterwards and is less detailed per project. How both elements can be integrated is drawn up in appendix IX.

Tactical portfolio management methods to achieve portfolio management goals

Both the Stage-Gate process and the portfolio review can utilize tactical portfolio management methods to help attain overall portfolio management goals. These main goals of portfolio management (Cooper et al., 1998b; Cooper & Edgett, 2001; Cooper, 2005) are now mentioned accompanied by methods (and industry's best practices,) that help in attaining them:

1. Maximizing the value of the portfolio

Maximizing the value of the portfolio has to do with allocating resources aimed at maximizing the value of the portfolio in terms of some development goal (profitability for example). The ranking of the projects follows from first computing values for the projects and then ordering them from the highest score to the lowest score. When resources are limited, they are spent from top to bottom until the resources are all allocated. Methods for maximizing the portfolio value are the net present value (NPV), expected commercial value (ECV⁶) and the scoring model (Cooper, 2001; Cooper & Edgett, 2001, Cooper et al., 1998b).

2. Achieving balance in the portfolio

Achieving balance in the portfolio concerns balance on the following terms:

- Long-term projects versus short-term projects
- High-risk versus lower-risk projects
- Projects in differing markets
- Projects in differing technologies or technology types
- Projects in differing project types

The portfolio can be balanced through the use of visual aids like a risk-reward bubble diagram (showing the allocation of resources as bubbles), pie charts, or any other figure depicting how projects score compared amongst each other. An important note is that these balancing aids do not fit as deciders which projects to choose, since they only show the current state and should be used for the sheer presentation of information (Cooper & Edgett, 2001).

3. Picking the right number of projects

Having the right number of projects in the portfolio is according to the article of Planview (2010) very important, since they found 57% of companies in their survey having too many projects for their resources available. Too many projects in the NPD pipeline means projects with serious potential

⁶ Examples of this and other portfolio management methods can be found in appendix II.

receiving insufficient resources. Cooper & Edgett (2001) describe a ‘pipeline gridlock’, which means projects end up in a queue and thus take too long to reach the market. Activities then have to be omitted since resources are unavailable to work according to plan. Therefore, a remedy to prevent these situations from occurring is balancing the required resources for the active projects with the available resources. Besides NPV, ECV (which rank project until out of resources) and the bubble diagram, the final check for potential ‘pipeline gridlock’ is a resource capacity analysis (Cooper et al., 2002a). Such an analysis determines both the resource demand per department as well as the resource capacity per department. The analysis will provide (1) useful information on the (possible) resource gap between supply and demand and (2) information on the ideal resource commitment to realize NPD goals (Cooper, 2005).

4. Ensuring portfolio sufficiency versus development goals

This fourth portfolio management goal is aimed at examining whether the overall project portfolio meets the required performance of the formulated NPD goals. Check, for example, if all projects taken together jointly result in the overall stated goal that 40% of annual sales comes from new products (Cooper, 2005). No specific method is prescribed because of the straightforwardness of examining this practice.

A further comparison between the portfolio management methods can be found in appendix III.

2.6.3 Differences between Cooper’s (2005) literature on the PIS and its application in the SPIS

Where the specific product innovation strategy NPD goals and strategic arenas are formed by the best practices from Cooper’s (2005) corresponding strategy components (figure 9), the ‘drawing up strategic product and product-technology roadmaps’ component is formed by blending three components into one. This figurative way of speaking is in line with the fact that the application of the components’ content differs to a large extent from that of the three product innovation strategy related counterparts.

Due to the fact that the specific product innovation strategy component does not become clear through solely elaborating on its differences with the product innovation strategy’s components, paragraph 2.6.4 will in addition spell out its six proposed activities.

Recall that again the business units bear the main responsibility in conducting the related product innovation strategy components. The R&D company determines them in line and dialogue with the business units.

The first difference has to do with the fact that the R&D company in the specific business context is not responsible for determining the corporate resource commitment approach. But the results of too little committed resources for certain products the R&D company needs to develop endanger successful development. Hence, the R&D company will benefit from the business units’ well-determined amounts of committed resources.

What the R&D company can actually do relating to this product innovation strategy component is contact the business units so to arrange resource commitment in the *strategy, goals and task* approach. This comes down to funding all activities that are required to obtain a desired end result. Hence, when the end result is aligned with that of a business unit and its intermediary steps are made clear, it will logically approve (and fund) the required activities to obtain it. Consequently, when the R&D company supports the business units in making specific the development projects that have to be conducted for the prior determined desired products, it helps with determining the right amount of resources to commit.

The remainder of this specific product innovation strategy component acts according to this *strategy, goals and task approach*. Due to the power of roadmaps in plainly communicating a goal and the necessary activities to acquire it, roadmaps are employed in line with the *strategy, goals and task approach*’s mind-set. The roadmaps can then help free resources for their related development content and prevent suboptimization by supporting the business units in determining the amount of resources

to commit. Since Cooper (2005) recommends using multiple approaches, the *strategic business role approach* is to be viewed and communicated as an even more preferred resource commitment approach.

The second difference between the specific product innovation strategy and Cooper’s (2005) product innovation strategy is that Cooper (2005) remains rather vague on when to do exactly what, where the specific product innovation strategy proposes six activities that guide R&D companies in their effort of setting up decent NPD. Moreover, the strategic buckets method cannot be used due to the fact that R&D companies do not know in advance which development projects or products will actually be funded (which is the third difference).

Fourth, roadmaps are applied differently. The product-technology roadmap is used in combination with the product roadmap to communicate the development projects to business units, ‘sell’ the products that can be developed by the R&D company and schedule the NPD effort of the near future.

Lastly, tactical portfolio management methods are utilized prior to development instead of during.

PIS activities	SPIS activities
1. Strategically commit resources	The R&D company is not responsible for committing resources but needs to proactively support the business units in doing so.
2. Conduct strategic portfolio management with a strategic bucket and/or roadmap.	Cooper (2005) remains rather vague in how to practice the discussed concepts where the SPIS proposes six activities that guide the R&D company in how to conduct the strategic roadmaps in the SBC.
	Strategic buckets cannot be used.
	Roadmaps are applied differently.
3. Conduct tactical portfolio management methods in the Stage-Gate process or portfolio review.	Tactical portfolio management methods are utilized prior to product development instead of during.

Table 4 § 2.6 related differences between both strategies

2.6.4 Drawing up strategic product and product-technology roadmaps

This subparagraph will now expand on the six steps of the specific product innovation strategy component ‘drawing up strategic product and product-technology roadmaps’ which utilizes the literature on portfolio management (both strategic as well as part of the tactical).

A strategic product roadmap as mentioned by Cooper and Edgett (2001) (and elaborated on in paragraph 2.6.2) strategically maps all selected business opportunities in development sequence. Companies deciding their own NPD planning can wield this tool to schedule the desired products and required technologies consecutive to one another. However, R&D companies in the specific business context do not know in advance for which strategic arenas they will receive development resources. To face this uncertainty, paragraph 2.4.3 already mentioned selecting a large amount of business opportunities that increases the possibility that for many of them resources can be organized. Which products will eventually form the strategic product roadmap depends on which products can be financed.

A proposed first activity that needs to be carried out is mapping all strategic arenas’ related desired products in a strategic product roadmap⁷. The central roadmap in figure 12 is an example of the result of this activity and shows desired products 1 until 6 (DP1-DP6). Since it is still unclear which desired products’ development will be funded, no development sequence is determined yet.

⁷ ‘Desired products’ instead of solely products because these products are desired by the R&D company to be developed for the business units and external customers.

A second activity is identifying and mapping the required technology and product development projects (TDP and PDPs) per desired product in a so-called product-technology roadmap. These product-technology roadmaps are to be used as communication tools to help finance their development content and prevent suboptimization.

Cooper (2005) states that determined arenas help make required (development) projects apparent (see paragraph 2.6.2). Furthermore, the technology-product matrix and the TPCs can assist in the identification of the possible required technologies per product. Figure 12 shows an example of this activity on DP1 and DP6. Product 6 (DP6) requires a rather long-term development trajectory where desired product 1 (DP1) requires much less development time. Note that it is also possible that more than one desired product requires a common technology development project (TDP1), which practically results in the development of TDP1 being very efficient. Furthermore, DP1 requires next to TDP1, two product development projects (PDP1 and PDP2) to obtain DP1. PDP2 overlaps PDP1 so to depict that development of PDP2 can commence before PDP1 is finalized where PDP1 must wait before TDP1 is completed.

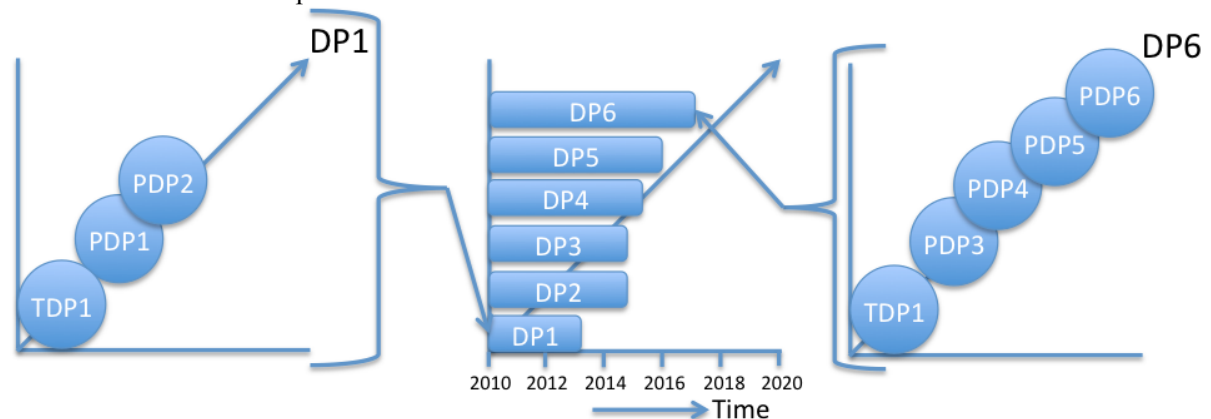


Figure 12 A strategic product roadmap in the centre with two product-technology roadmaps next to it.

When the product-technology roadmap is to be used as a tool to receive funds for their development projects, its projects have to be explicit and specific. A third activity therefore entails making the identified development projects much more tangible by drawing up their business cases (see appendix VIII for content of a business case). At this point, the lack of NPD budget returns in the fact that there is no budget available to finance this initial formulation of business cases. Since this activity is indispensable in succeeding activities, budget has to be organized for the R&D company's development effort to take off. With innovative projects and efforts, costs always precede benefits and therefore there has to be a small budget to help present an R&D company's NPD potential. Senior management will need to organize this 'business case budget' by for example (1) organizing that every innovation project generates a small amount of profit, or (2) again recalling the strategically(/business units') aligned arenas and asking the budget from either the business units or holding's management.

When the business cases are drawn up, both a targeted desired product and its enabling development projects are unambiguous and ready for the next activity.

The fourth activity in this specific product innovation strategy component is 'selling' the product-technology roadmaps to clients. The multiple product-technology roadmaps are communicated with the clients who require/desire the relating products to be developed. In line with the *strategy, goals and task* resource commitment approach, the development projects inside a product-technology roadmap are to be financed by receiving resources for developing the desired product. That is to say, the multiple development projects are not to be financed individually, but the overall product-technology roadmap's desired product is.

Hence, the desired products are to be financed by identifying and making the underlying development projects(' market/competitor/technical assessments, risks, et cetera) explicit with clear business cases. In anticipation of paragraph 2.7, involving the client in the individual development project decision-

making process also helps selling the development trajectories. The client can then continuously monitor the product development's progress and has a strong vote in its interim project deliverables.

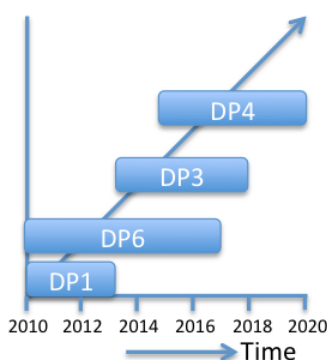
Moreover, when multiple clients and external customers are targeted with a single desired product, (1) they can share the development related (financial) risks, (2) the development costs per participant are much lower, and (3) the likelihood of not finding development resources decreases. A downside that has to be kept in mind is that decision-making on individual development project level becomes very complex with multiple clients involved. Equally important, business units may want to cooperatively finance the development of a product where external clients may not want this due to desired exclusive ownership of the product.

The fifth activity utilizes tactical portfolio management methods to determine which desired products (that can be financed) will form the 'best' development project portfolio. 'Best' in this business context is defined by a good balance between:

- Development projects in differing markets and technologies,
- High/low risk and long/short term development projects, and
- If all development projects together acquire the R&D company's NPD goals (note that the NPD goals have previously been determined in line with the holding's).

Portfolio management methods that can be utilized to help examine the first two balances are the risk-reward bubble diagram and pie charts. The latter enumerated point is a mere check of the projects' joint NPD performance that is required by the stated NPD goals and does not need a specific method. The final selection of the strategic arena portfolio to be developed can be made when this fifth activity has been dealt with and together with the preceding four activities ensures a thorough selection process. An assumption on which this very activity is based is that there are more than sufficient desired products that can be developed. When this is not the case, this activity can simply be omitted and the desired products that did obtain resources are to be developed.

A sixth activity will map the desired products from which the development projects can be financed so to form the final strategic product roadmap. Not all funded and selected desired products' development projects can be developed concurrently and need to be scheduled in time (and in consultation with their clients). At this very point, the strategic product roadmap regains the scheduling function it was initially assigned. Figure 13 exhibits an example of the result of this activity. Note that since DP1 and DP6 require the same technology to be developed, they can be developed in parallel. Of course, practical development capacity determines how many products can be developed next to one another.



In short, this specific product innovation strategy component wields product-technology roadmaps as tools to obtain development resources for products their required development projects.

Figure 13 A final strategic product roadmap with a scheduling function.

2.7 Tactical portfolio decisions and individual project selection

Now the product innovation strategy has been described up to the management of the project portfolio, this paragraph will deal with 'doing projects right' and the management of the project activities. Paragraph 2.6.2 on portfolio management has clarified the position of the Stage-Gate process as an important element in tactical portfolio management. Furthermore, paragraph 2.1 already

introduced the idea-to-launch system, and the Stage-Gate process as one of them, as one of the four main ‘points of performance’.

Stage-Gate® process principles

The Stage-Gate process as introduced by Cooper in the late 1980s acknowledges the fact that the innovation of products is a process. And similar to other processes, innovation can be managed. Stage-Gate systems simply use process-management techniques for managing the innovation of products (Cooper, 1990). In this process, an idea is brought from idea to launch using multiple steps, also called stages. In between these stages there are gates that prevent bad projects from continuing down the process towards the actual (expensive) launch. This possible discontinuation serves the underlying thought of evading spending resources on non-lucrative products even when there already has been a significant investment (Von Stamm, 2008).

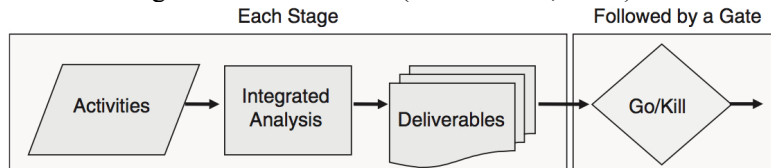


Figure 14 Stage-Gate® principle (Cooper, 2008a)

More specifically, each stage consists of (1) activities in which the actual information gathering is done, (2) an integrated analysis of the results of the information gathering, and lastly (3) the deliverables which are the input for the gate (Cooper, 2008a).

A rather typical Stage-Gate model made for major NPDs is shown in figure 15. Not every product does need five stages to bring it successfully to product launch. Less innovative – incremental – new products can have fewer stages (that simply bundle multiple stages into a single one) since the risk of failure is lower and thus, less structure is needed to guide and assess the product.

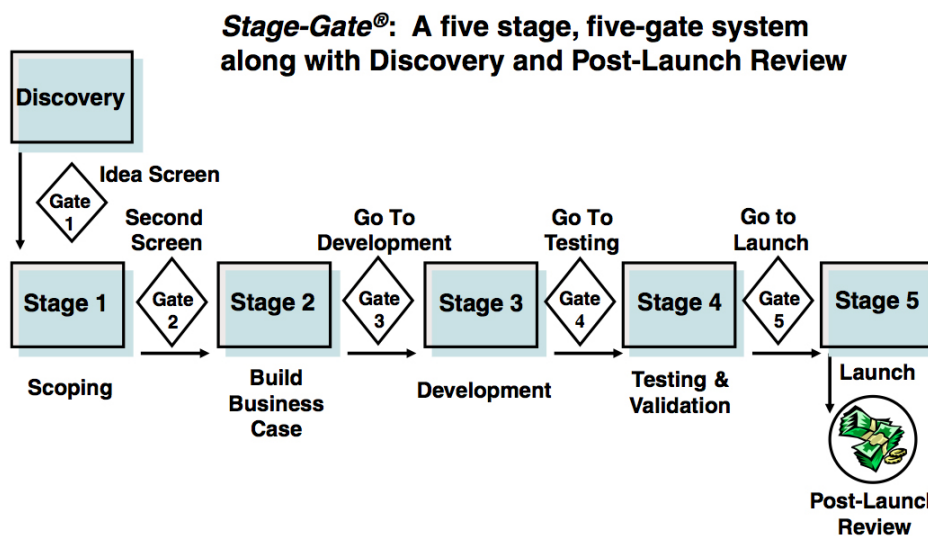


Figure 15 The Stage-Gate® model by Cooper (2008a) for radical NPDs

These two terms – stages and gates – are now explained more thoroughly:

The stages

As can be seen in figure 15, all stages depict a certain phase in the NPD process and hence, have their particular activities to successfully pass the upcoming gate. Furthermore (Cooper, 2008a):

- Each stage costs more than the preceding one; therefore all information being gathered is used to lessen main project uncertainties and risks thereby keeping the costs as low as possible.
- Employees from different departments deal with each stage in parallel. This way, product development speed will be higher and greater consistency and integrity can be achieved.

- Each stage is department-independent; it entails R&D, marketing, engineering and so forth. No single department ‘owns’ a stage.

Appendix VIII further presents a description per stage and general content of the stages and gates according to Cooper (2000).

A post-launch review is included at the end of the Stage-Gate process to evaluate the development projects. Project leaders and teams, gatekeepers, other stakeholders and the overall company review the Stage-Gate process and will incorporate acquired knowledge and skills in succeeding projects and process adaptations. Moreover:

- (1) The corporate product innovation strategy may be altered over time when multiple projects point at similar issues that need addressing.
- (2) The added value to the organization’s capabilities can be evaluated for future learning.

The gates

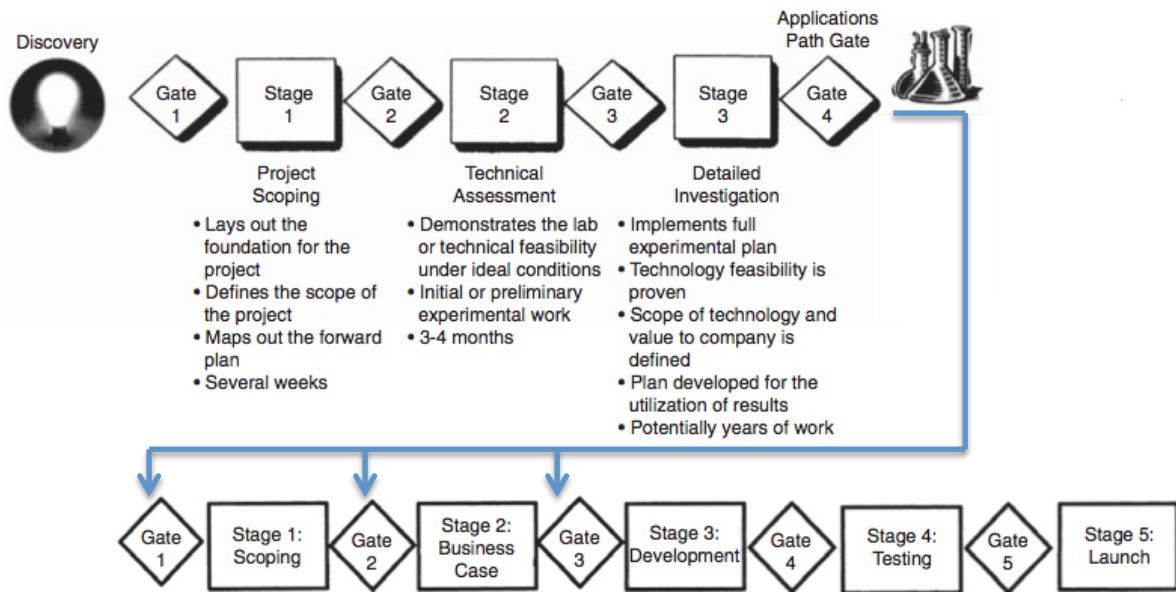
Figure 15 also shows gates succeeding each stage. These gates serve as a checkpoint where quality is determined, go or kill decisions are made and prioritization of the successful projects takes place. Each gate is composed of three returning parts: *deliverables*, *criteria* and *outputs*. *Deliverables* are the outcome from the activities performed in the preceding stage and are determined at the preceding gate. *Criteria* comprise must-meet and should-meet criteria. The first are questions aimed at quickly sorting out strategy fitting projects, the latter are meant to prioritize the remaining projects using a point count system. *Outputs* refer to a decision (go/kill/hold/recycle) accompanied with an action plan that prescribes the timeframe in which the succeeding stage is carried out, the resources that will be dedicated to the project, a list of the deliverables and finally a date for the next gate (Cooper, 1990; Cooper, 2008a).

A point of attention concerning the Stage-Gate process is its limitations, which must be taken into account while considering its potential.

The well-known tension between structuring a process and creativity can be relieved by organizing the fuzzy front end (discovery/idea generation phase) fundamentally different from the succeeding phases of the Stage-Gate process (Koen et al., 2002). That is to say, the fuzzy front end is the most important phase related to creativity and the need thereof. The fuzzy front end as organized by Koen et al. (2002) in their NCD (new concept development) model can facilitate creativity and the generation of novel ideas. While innovators thus need as little structure as possible, the succeeding phases (where the idea is scoped and further developed) consist of other people and tasks and do need structure to bring a product successfully to market (Cooper, 2005).

Technology development

The last topic to conclude the Stage-Gate process with is the development of technologies using a modified Stage-Gate process. If technology development projects are put through a normal Stage-Gate process, most or even all projects will be killed due to their differing nature. Besides technology development, disruptive technologies and radical innovations should be evaluated differently than the standard new product developments. A long-term perspective and less financial criteria can help in evaluating these projects. Among others, scorecards (with different criteria) are used to rank and prioritize the technology projects, while strategic buckets ensure that committed resources are employed for these higher-risk projects (Cooper, 2006).



The Standard 5-Stage, 5-Gate Stage-Gate® New Product Process

Figure 16 The Stage-Gate®-TD framework for technology developments (Cooper, 2006)

Figure 16 shows the Stage-Gate-TD – where TD stands for technology development – process with three additional stages prior to the familiar Stage-Gate process. The three stages are briefly explained in figure 16 and are succeeded by the applications path gate. In this concluding gate, senior management needs to decide what to do with the new technology. When it enables or defines multiple new products, these product projects can enter (at either gate 1, 2 or 3 depending on their level of elaboration, risk and size) and follow the regular Stage-Gate process. Another difference from the standard Stage-Gate process is the required process’s strong technology relatedness in gatekeepers’ backgrounds. In sum, (financial) numbers are destined to be incorrect due to the innovativeness of new technologies and uncertainty which products they may enable. Gatekeepers therefore need to review the project in a different perspective and use less financial methods. Best practices in this process can be found on page 29.

Further information on disproving misconceptions of the Stage-Gate process and how to deal with points on which the process generally fails can be found in appendix IV and V and are omitted in terms of brevity. Best practices are now introduced to make the process wieldable.

Stage-Gate® process best practices

The idea-to-launch framework’s related best practices of the industry’s top-performing companies are reported by Cooper (2005) in eight main points of interest. These best practices are explained in more detail in appendix VI and are kept rather brief in this paragraph in terms of conciseness.

1. Integrate a best practice formal idea-to-launch framework.
2. Quality of execution of critical tasks.
Vital tasks in the process need to be qualitatively well executed and may not ever be bypassed.
3. Competitive advantage through superior new products.
Products need to be (1) *superior in quality* and (2) *in meeting customer needs compared to competitors’ products*.
4. Built-in voice-of-the-customer.
This best practice is based on the perspective that a customer should be involved as soon as possible to continuously gauge and check their problems, interests and (latent) needs. Incorporating the voice of the customer at every single stage of the Stage-Gate process is thus essential.

5. Early product definition.
The sooner the product is defined on paper with a sound value proposition and various assessments, the less risky the development project will be due to unclearness.
6. Solid upfront homework.
Solid upfront homework needs to be conducted to reduce uncertainty and vagueness as much as possible to prevent new and undesirable cost items.
7. Solid decision gates.
Solid decision gates that kill bad projects early are required to discontinue the bad projects from draining valuable resources that otherwise could have been invested in more profitable projects (Cooper, 2009).
8. Put metrics in place.
Both the management of individual projects as well as the management of the entire project portfolio need metrics to gauge progress and performance.

These eight main best practices with all their described subparts really contribute to the effective implementation or revision of an idea-to-launch framework.

Technology development best practices

Next to new product development best practices, new technology development also has some best practices to build into the Stage-Gate-TD process. Cooper (2005) states the following:

(1) *Target the niche market segment* that strongly benefits from the new technology's performance capabilities. (2) *Undertake fieldwork* to let the project team understand the potential product applications, market segments and customer needs to meet desired application and product characteristics. (3) *Examine similar applications and existing solutions* to the problem the new technology will fix. How much better is the new solution and which customer segment will really adopt the new solution? (4) After proper homework during the detailed investigation (stage 3), the project team should be able to *define at least three resulting objects* to use as input for the market and strategic (business and financial) analysis.

Differences between Cooper's (2005) literature on the PIS and its application in the SPIS

Recall that this component in combination with the tactical portfolio management methods utilized in the previous component (paragraph 2.6.4) is the main responsibility of the R&D company in conducting NPD on holding level.

The most important difference between the specific product innovation strategy component and the literature by Cooper (2005) is that business units are provided an overview of the development projects they finance using a development phase map. A (differing) portfolio review is used as a tool to inform business units with development progression. Where companies normally practice the portfolio review mainly as a tool to review their entire project portfolio's balance (and subsequently rank and commit resources to the projects), it is now used towards business units to depict development progression. Figure 17 illustrates this by portraying an example of the development projects underlying desired product 1 and 6 for, say, business unit x. The portfolio review utilizes a funnel-like development phase map to plot the development projects on. Every business unit can be attended by a portfolio review specifically aimed at its specific development project portfolio.

Incorporating the business units in the Stage-Gate(-TD) process is already mentioned as a best practice and is therefore not a difference between the two strategies. However, it is without question important for a regulated R&D company to take along and therefore still mentioned.

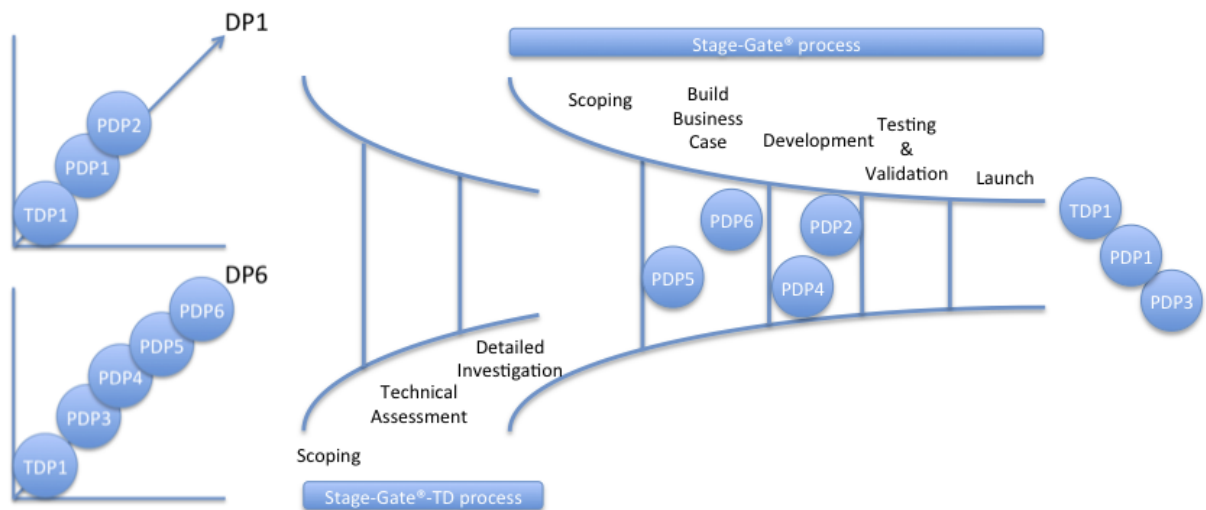


Figure 17 A development phase map illustration depicting the Stage-Gate(-TD) process and its content.

PIS activities	SPIS activities
Conduct tactical portfolio management with a Stage-Gate(-TD) process and portfolio review that utilize portfolio management methods.	The difference with the PIS activities is that a (differing) portfolio review is used to show individual business units development progression instead of using the portfolio review merely for internal use.

Table 5 Tactical portfolio management related differences between both strategies

2.8 Conclusions

This last paragraph will now present conclusions on the content of this chapter and thereby also on the first part of this master thesis. Recall the first part of the research question:

What does the product innovation strategy for an R&D company in the specific business context look like?

The answer to this question can be stated: as a detailed version of Cooper's (2005) product innovation strategy, but with a strong emphasis on aligning the product innovation strategy's components with the holding and business units' NPD goals and arenas.

The ambiguity concerning what party needs to conduct which component and how to meet the potential interface issues due to suboptimization is met and elucidated using figure 18.

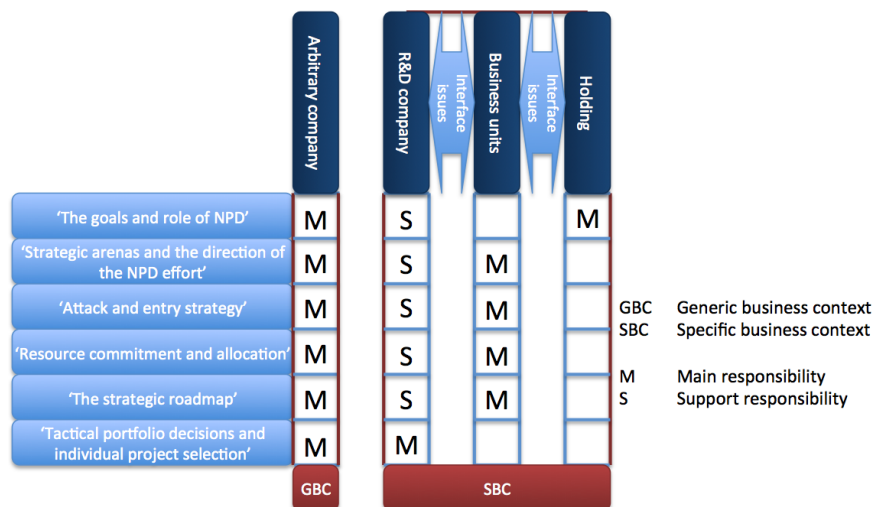


Figure 18 Division of PIS components in the SBC

Where arbitrary companies in the generic business context conduct all Cooper's (2005) product innovation strategy components, R&D companies in the specific business context are only to conduct the bottom one on holding level. The other five components are to be determined by the business units and the holding and are not the R&D company's main responsibility. This division of roles logically follows from their current activities. However, that the other five components are not the R&D company's main responsibility does not prevent it from determining the components on company level. Fully aligned and in dialogue with the business units and the holding' management, the first five components are to be strategically determined on an R&D company level. By defining, for example, their own NPD goals in line with the holding's, the risk of suboptimization is partly countered by considering the entire holding in giving substance to the R&D company's NPD activities. Additional NPD meetings and continued dialogue with the business units and holding has to prevent suboptimization entirely from occurring. This alignment goes hand in hand with an aspirated strong market orientation that is currently missing in the regulated specific business context. Lastly, it's the holding and business units management's responsibility to arrange NPD budget for the R&D company. The R&D company can merely appeal to this responsibility in dialogue and discussion to help obtain it.

The most important differences related to the specific product innovation strategy's components are that resource commitment and allocation, the strategic roadmap and part of tactical portfolio management are blended to form a new component. This new component is set up since it utilizes the by Cooper (2005) described best practices in a rather different way. The responsibilities depicted in figure 18 are translated to each individual product innovation strategy component and have altered them to meet the specific business context.

3 NPD problem diagnosis at Liandon

This chapter together with chapter 4 forms the second part of this master thesis and provides an answer to the second part of the research question: *how can the specific product innovation strategy be applied at Liandon to solve its NPD problems?* Where chapter 4 will elaborate on the Liandon specific change plan that aids Liandon in implementing the specific product innovation strategy, this chapter will first diagnose its NPD problems and status. This chapter will therefore firstly introduce the case study methodology consisting of both theory on the case study and the regulative cycle by Van Strien (1997). Secondly, an empirical problem analysis is conducted to analyse the condition of Liandon's NPD effort. Thirdly, the problem diagnosis will diagnose Liandon's entire NPD effort to both verify/refute the initially reported NPD problems and check all other specific product innovation strategy components for their status.

3.1 Case study methodology

This paragraph both presents theory on the business problem solving regulative cycle by Van Strien (1997) and the case study methodology.

3.1.1 The regulative cycle

Van Aken et al.'s (2007) present a methodology required to tackle the 'problem mess' (which are the NPD problems) at Liandon in a legitimate way. The problem-solving project at Liandon is by Van Aken et al. (2007) called a business-problem solving (BPS) project. These BPS projects are started to improve the performance of a company on one or more criteria. Eventually, the project should impact the profit of a company, but generally the true goals of a BPS project are related to the effectiveness and/or efficiency of operational business processes. Van Aken et al. (2007) follow the regulative cycle as elaborated by Van Strien (1997) to help solve business' problems. Mietus (1994) supplies a clear description of the problem characteristics and the aims of the regulative cycle so that Liandon's NPD problem can now be checked whether it indeed can be tackled with the regulative cycle.

- *A clear client organization has a problem and is involved during the entire cycle.*
Liandon clearly has an (NPD) problem and is involved during the entire cycle.
- *The researcher is involved with the problem situation.*
The student was indeed involved with the problem situation through organizing interviews, attending meetings and physically working amongst and with people confronted with the problem situation.
- *The problem situation and the researcher are influenced by each other.*
Indeed, the student was influenced by the problem situation and the student has its effects by altering the problem situation perception of employees thereby influencing their actions and the problem situation.
- *The developed plan of action is usually only fitting the specific situation.*
The in chapter 4 Liandon specific change plan is indeed only applicable for Liandon since it is designed based on the results of the NPD problem diagnosis that is company specific.
- *The regulative cycle aims at "intervening into practice by making a plan in which the focus is on solving an individual problem in particular circumstances." (p. 50)*
The problem to be solved is completely context specific and corresponds thus.
- *The regulative cycle does not aim at general statements or developing theories.*
Again matching the Liandon case, it is indeed not aimed at developing theory.

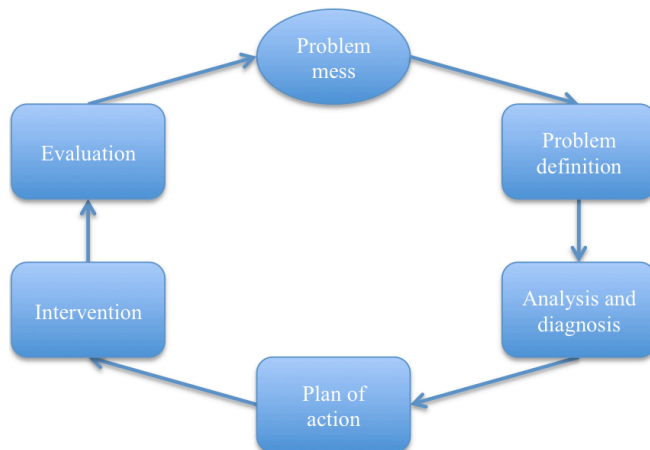


Figure 19 Regulative cycle by Van Strien (1997)

Since the problem-solving project at Liandon thereby meets these characteristics, and furthermore does not meet other methodologies' characteristics, the regulative cycle by Van Strien (1997) will be used to dictate the research phases.

The regulative cycle by Van Strien (1997) in figure 22 starts with Liandon's 'problem mess' (which are the indicated NPD problems). Chapter 1 introduces this 'problem mess', defines the problem and states the research question that focuses the succeeding phases. Theoretical background analysis (the desk research) takes place in chapter 2. The analysis and diagnosis will take place in this chapter and will verify/refute the by senior management indicated NPD problems. During the regulative cycle's plan of action phase, one designs the solution and the associated change plan. The specific product innovation strategy forms this solution and the change plan follows in chapter 4. Due to the limited amount of time available for this master thesis project, the intervention and evaluation steps could not be executed.

3.1.2 Theory on the case study

As already mentioned in the introduction, a descriptive case study at Liandon is to be conducted and is of descriptive nature due to; (1) its registration of facts without searching for their explanation and (2) by describing Liandon's current situation instead of primary focusing on how it should be (Shadish et al., 2002).

Yin (2009) states there are six sources of evidence within the field of case studying that can be used to underpin a problem analysis:

- 1) Documents (letters, agendas, progress reports);
- 2) Archival records (Service records, organizational charts, budgets etc.);
- 3) Interviews (typically open-ended, but also focused or structured surveys are possible);
- 4) Direct observations (formal or casual; useful to have multiple observers);
- 5) Participant observation (assuming a role in the situation and getting an inside view of the events);
- 6) Physical artefacts.

Of these six sources, the first five are employed in the research at Liandon to come to a thorough analysis of the research problem. The succeeding empirical problem analysis is divided into two subparagraphs to summarize these five sources, namely; (1) in-depth interviews (points three, four and five) and (2) company data (points one and two). Van Aken et al. (2007) further supports this very sequence by stating that interviews are held at the beginning of a project to gain insight into the problem mess. The analysed company data can then subsequently confirm or contradict the in-depth interviews. In this research, company data will be ranked more important than opinions from employees and views resulting from interviews (except for the business context analysis). The unavailability of company data on a certain process will consequently lead to the conclusion that the process is not being used.

In-depth interviews

In order to prevent the start of the empirical research with a too narrow focus, in-depth interviews, as described by Yin (2009), were conducted to gain a thorough understanding of the issues at hand. The people in table 6 were interviewed to obtain a broad perspective on Liandon's NPD effort and help answer the research question.

The people from Liander and Alliander were intentionally chosen since the first two hold important NPD effort dictating positions at two business units, and the latter helps determine the NPD strategy of the entire Alliander holding. Hence, the first two hold an NPD budget and determine their specific NPD roadmaps where the latter determines the corporate NPD goals. During these interviews, the specific strategy was used as a framework of reference to regard employees' opinions in the NPD effort frame of mind.

Name	Function	Company
Roelof Potters	Senior manager / Management team member	Liandon
Hans Korsman	Senior manager / Management team member	Liandon
Jan Visser	Senior manager / Management team member	Liandon
Egbert Prins	Project manager / Portfolio holder	Liandon
Jan Breedveld	Project manager / Portfolio holder	Liandon
Marcel de Nes Koedam	Project manager / Portfolio holder	Liandon
Elbert Huijzer	Senior consultant / Portfolio holder	Liandon
Maarten van Riet	Senior consultant / Portfolio holder / Major innovator	Liandon
Irina Melnik	Consultant / Project manager	Liandon
Marloes Rutten	Data Manager / Marketing & Sales support employee	Liandon
Matthijs van der Weg	Manager Business Development at client 'Infostroom'	Liander
Martijn Bongaerts	Manager Innovation at client 'Asset Management'	Liander
Harry van Breen	Innovation manager / Strategy policy advisor at client 'Strategy'	Alliander

Table 6 Interviewees for in-depth interviews at Liandon, Liander and Alliander.

Company data

Company data was consulted next to the in-depth interviews to form a second gauging rod for the current specific product innovation strategy components' status. The company data also either confirms or contradicts the in-depth interview results so to further strengthen the empirical analysis.

3.2 Empirical problem analysis

In this paragraph the analysis will take place divided into in-depth interviews and company data being analysed. Not only tactical portfolio management will be assessed but also Liandon's entire NPD effort in terms of the other specific product innovation strategy components.

3.2.1 In-depth interviews

The in-depth interview outcomes are now presented under the headings of 'best practice related findings' and 'business context related findings'.

Best practice related findings

Overall can be stated that Liandon is not managing and communicating their NPD effort in an integral way using a predefined strategy. This puts forward the possible lack of a predefined plan to integrate NPD strategy into its NPD activities. Stakeholders accordingly have little insight in the content and contribution of Liandon's total NPD effort. This translates in Alliander/Liander not recognizing the capabilities and potential of Liandon due to the lack of transparency and clarity of their NPD program.

NPD strategy that is actually present is positioned as tacit knowledge at the major innovator of Liandon. This person forecasts potentially required technologies, products and markets with his individually determined mental roadmap. Sadly, this important knowledge is not made explicit in company documents and therefore hard to see into and assess. The marketing and sales support department further mentioned that Liandon specific (not Alliander wide) marketing is at its infancy and formal analyses on the industry, markets and competitors still need to be made.

Likewise, so-called portfolio holders are managing more than one project, but are not *strategically* managing the projects they are held responsible for (one exception put aside). Due to the absence of formal tactical portfolio management aiding the portfolio holders, they individually determine what projects to start and do not use tactical portfolio management methods. Project managers, the data manager and senior management additionally added that a formal NPD process is missing to structure project management and execution.

Business context related findings

Next to issues concerning the actual NPD effort, Liandon’s specific business context also became evident. Chapter 1 and appendix I already mention part of the business context by describing the underlying responsibilities and interdependencies in the holding. Figure 20 illustrates the business context and depicts Alliander as the holding, where Liandon is the R&D company. Multiple internal clients of Liandon (which are mainly Liander’s ‘Infostroom’ (IS), Liander’s Asset Management (AM) and Alliander’s Strategy (STR) departments) are Liandon’s ordering clients and each have a private NPD budget where Liandon has none. In practice, these internal clients all individually identify ‘interesting’ products for which they ask Liandon to develop them. Moreover, the desired products are developed with the Dutch saying “uurtje-factuurtje” (something like “bill per hour”) and per project. Liandon’s NPD portfolio is therefore not strategically determined but instead simply dictated, and consequently a scattergun that shows no coherence. Employees at Liandon state that this in turn has a negative influence on the position of Liandon in the Alliander holding. Its added value is hard to communicate which results in distrust and strict development effort funding rules. A coherent NPD project portfolio that helps clearly communicate Liandon’s NPD added value, can most certainly help receive goodwill and funding more easily.

Together, these NPD issues at Liandon form a business context that is rather specific. The generic business context as described by Cooper (2005) and Cooper et al. (2004a, 2004b, 2004c) entails companies that can decide independently what products to develop for which customers/markets and can dedicate resources on projects they see fit. Liandon clearly differs from this business context and requires a product innovation strategy that takes this specific business context into account.

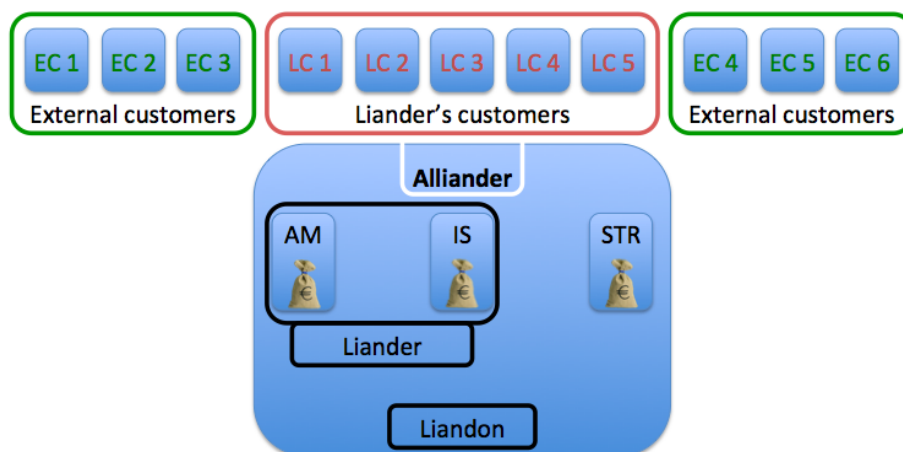


Figure 20 Business context situation of Liandon

3.2.2 Company data

Research on the company data is now introduced in this subparagraph. The problem diagnosis in paragraph 3.3 (in turn) will present both company data and the results of the in-depth interviews per specific product innovation strategy component.

Liandon has formulated a business plan 2012-2016 that starts with providing an analysis of developments in their customers' needs, their markets, legislation, politics, demography and technology. From these analyses follows a business strategy that entails multiple business goals and only one related to innovation/product development: *"To make innovation the business driver of Liandon"* (Liandon B.V., 2011, p. 11). A further benchmark with other parties on (among others) customer satisfaction, high performance procurement, and retention of incoming employees results in a SOAR (strengths, opportunities, aspirations and results) analysis. This analysis differs from the common SWOT analysis in that it does not mention important weaknesses and threats compared to Liandon's competitors.

The business plan continues with how to meet the business strategy with improvement initiatives and their specific key performance indicators (KPIs). The 'rollout of innovations outside Alliander' is mentioned as the initiative to meet the stated innovation goal. However, for this goal, no KPI is mentioned what makes performance/progression measurement impossible.

Lastly, Liandon's current innovation areas of attention are mentioned per lifecycle phase (research, development or implementation) to present its current innovation effort. Further stated strategic project program themes do not mention an agenda on innovation or new product developments and therefore give an unclear view on its innovation strategy.

In sum, Liandon's business plan does bring forward the ambition to make innovation its business driver but does not translate this into tangible NPD goals, programs or projects.

Liandon furthermore wields PRFs (project reporting forms) and Kapstok for individual project management. These two systems will now be explained to clarify their role and conclude Liandon's significant company data analysed.

PRF is a system registering the project initiation details (size, finance, timing, risks, quality, organization, additional information) and monthly alterations to them. See appendix XI for an example that will now be elaborated on. Appendix XI shows an innovation project on superconductivity. Two issues stand out in this project documentation:

1. It was budgeted € 250,000 and eventually did cost € 1,000,000.
Projects such as this consume valuable resources that could have been spent on other projects that do live up to their expectations.
2. Important documentation is absent from May 2009 until February 2010.
Moreover, the documentation that is drawn up from 2010 until 2011 is incomplete and minimalistic. Without proper documentation, 'gut feeling' determines a project's (dis)continuation since no data is available to decide upon. Furthermore, little or none can be learned from project failure and no decent portfolio management will be possible with this kind of data shortage (Cooper, 2008a). A side note is that PRF might be well suited for common projects but innovation projects are often highly uncertain and risky and therefore need scrutiny during their execution.

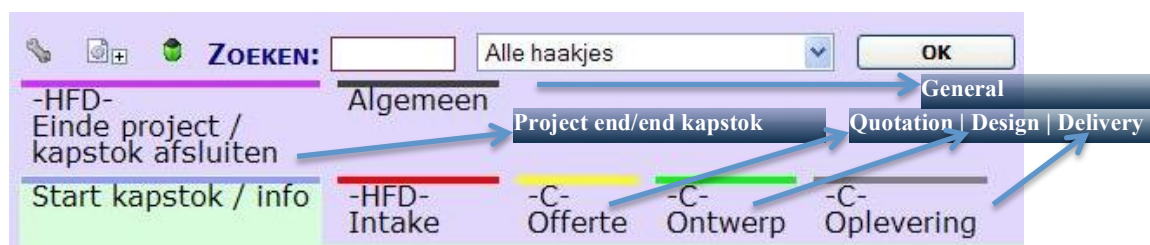


Figure 21 Kapstok project phase categories

Kapstok on the other hand is a system functioning as an overview of the project's progress/lifecycle where project managers can view/monitor the overall progress. The PRF system is incorporated in the 'Ontwerp' (design) phase, which succeeds the quotation phase and precedes the delivery phase. Hence, the phases depicted in figure 21 are standardly used for common projects as well as innovation

projects. Therefore, Kapstok does not distinguish a key difference in project character and regards common projects and innovation projects as homogeneous.

The PRF related Kapstok overview is shown in appendix XII and displays the following shortcomings:

1. Wrong/incomplete phases.
Only the (not-filled-with-data) category ‘General’ is created thereby providing far too little information on this highly uncertain and risky project. This Kapstok overview thus gives no information to a portfolio manager interested in the project’s progress.
2. Incomplete in terms of documentation.
No documents on, for example, the (internal/external) client assignment is incorporated nor on intermediate (dis)continuation decisions.

In sum, PRF and Kapstok are positioned at an operational project management level and do not prescribe (and are therefore unsuited to) the development of new products. A layer on top of PRF and Kapstok could most certainly utilize both systems to register a great deal of specific project information and use this data as input for gate meetings or portfolio reviews.

Hence, company data results do not contradict the in-depth interviews but instead are in keeping with their results.

3.3 Problem diagnosis

The data from the empirical analysis at Liandon will in this paragraph be compared to a company benchmark (formed from the best practices found in paragraph 2.3 until 2.7). Firstly, this will result in a diagnosis on the current NPD effort at Liandon and will confirm/refute Liandon’s NPD issues. The best practices that are used to compare Liandon to, are kept rather general on purpose to diagnose relatively general how its managing its NPD.

Secondly, figure 22 will illustrate the business context specific diagnosis on Liandon’s currently situation in terms of NPD and what it should be doing.

Recall that employees of Liander and Alliander are also interviewed and that something has been said on business units possibly lacking decent NPD. Since this diagnosis is on how Liandon conducts its NPD, no diagnosis or conclusions will be mentioned on business units and their NPD activities.

The benchmark of Liandon’s NPD effort performance will be summarized per specific product innovation strategy component in table 7. Ensuing text will than elaborate on the diagnoses to form an overall diagnosis.

SPIS component	Desired situation formed by best practices (§2.3 - §2.7)	Liandon’s current situation (§3.2)	Diagnoses
The goals and role of NPD	Clear NPD goals (their role) linked with the overall business strategy. Aligned with the other parties’ NPD goals.	A formal business goal is <i>to make innovation the business driver of Liandon</i> . No NPD related goals are subsequently stated.	NPD goals can be diagnosed as entirely absent. An innovation related business goal is not translated into NPD goals that must help achieve it nor are business units their NPD goals used as input.
Strategic arenas and the direction of the NPD effort	1. A conducted strategic analysis assesses the company and the marketplace with business units and their customers considered the most important markets. 2. Opportunities are identified through the development of a comprehensive list of potential arenas. Products meeting	1. The market and technology fields are described together with the impact of disruptive technologies but without assessing them to identify potential so-called ‘strategic arenas’. Additionally, a SOAR analysis is conducted but without comparing Liandon to its competitors.	No clear (potential) arenas are identified to focus NPD on and form a strategy for. Succeeding the absence of the identification of potential strategic arenas, no list forming or assessment thereof can take place. A single innovator may envision Liandon’s arenas but this needs to be made explicit in order to assess it.

	<p>internal markets are highlighted and technology-product matrices are drawn up.</p> <p>3. An assessment of the aforementioned list is conducted with ‘market importance’ as an arena attractiveness criterion. Internal market products are highlighted. The amount of selected arenas being not reduced.</p>	<p>2. and 3. are not found available</p>	
Attack and entry strategy	<p>The forming of attack and entry strategies at the business units is supported by the R&D company.</p>	<p>Liandon has its own thoughts on how to attack arenas but does not share them with other business units.</p>	<p>Liandon will need to start supporting the business units in determining their attack and entry strategies.</p>
Drawing up strategic product and product-technology roadmaps	<p>1 Business units are supported in determining their resource commitment approaches.</p> <p>2 Formal portfolio management is conducted utilizing the six proposed activities.</p> <p>3 Tactical portfolio management methods are utilized to determine the best development portfolio prior to its actual development.</p>	<p>1. Liandon has a passive attitude towards resource commitment and desires receiving budget based on their NPD potential.</p> <p>2. The major innovator at Liandon plans the NPD effort and has a mental roadmap of projects that need to be executed.</p> <p>3. Liandon has no implemented strategic or tactical portfolio management.</p>	<p>1. Liandon’s passive stance towards the commitment of resources is a missing best practice that needs to be conducted.</p> <p>2. Formal portfolio management is entirely absent and needs to be conducted according to the six proposed activities.</p> <p>3. Tactical portfolio management methods are non-existent and need to be implemented to determine the best development portfolio for Liandon.</p>
Tactical portfolio decisions and individual project selection	<p>A formal Stage-Gate® model is in place together with a Stage-Gate-TD process managing technology development projects. A portfolio review is drawn up per business unit and depicts development progression.</p>	<p>Liandon ‘manages’ innovation projects with the PRF and Kapstok systems and has no system or process that acknowledges innovation projects’ differing nature. Technology and product developments both use the PRF and Kapstok systems to manage their progression. No portfolio reviews are conducted.</p>	<p>A formal idea-to-launch process is currently not in business at Liandon and none of its seven best practices can be claimed well implemented. Moreover, technology developments are treated the same as product developments and no post project learning takes place to write down potential (process) improvements. In addition, no project specific portfolio overviews exist nor are portfolio methods in place to make periodic reviews of the portfolio possible.</p>

Table 7 Problem diagnosis by comparing Liandon’s current situation to the desired situation.

A first conclusion on the diagnoses in table 7 is that there is no (specific) product innovation strategy at Liandon. Products are developed but not according to a formal strategy communicated to and known by NPD employees. This absence will most certainly be a forerunner of the absence of other necessary product innovation strategy components.

Figure 22 is now utilized to recall the by chapter 2 presented desired situation, as well as to compare Liandon’s current situation. Overall can be stated that Liandon does not possess the in chapter 2 stated mandatory component of tactical portfolio management and also has not conducted other (supportive) components in a solid way. By Liander ordered development projects are executed without discussing their place in a larger roadmap and how Liandon can aid in obtaining the desired end result. Some employees have certain aspects available as tacit knowledge but strategically determined processes and activities remain unavailable. Hence, from the diagnoses follow that a sound innovation project structure and a coherent project portfolio are indeed missing. Strategic and tactical portfolio management (as prescribed in the specific product innovation strategy) that need to prevent both issues are simply not in place thereby confirming Liandon’s NPD issues. Furthermore, remarks on a

possible relationship between the two indicated NPD problems and the specific business context are no other than that the entire NPD effort is conducted unprofessionally.

In short, Liandon is trying to develop new products and technologies, but does not practice important processes and activities that will help it in doing it thoroughly. Independently from how the other parties within the holding perform, Liandon needs to conduct the specific product innovation strategy appealing to the business units' responsibility.

This observation is significant, but knowing how to implement the solution is equally important. Chapter 4 will continue on the case study at Liandon by proposing a change plan according to Van Aken et al. (2007) that will help implement the specific product innovation strategy so to meet the diagnosed NPD problems.

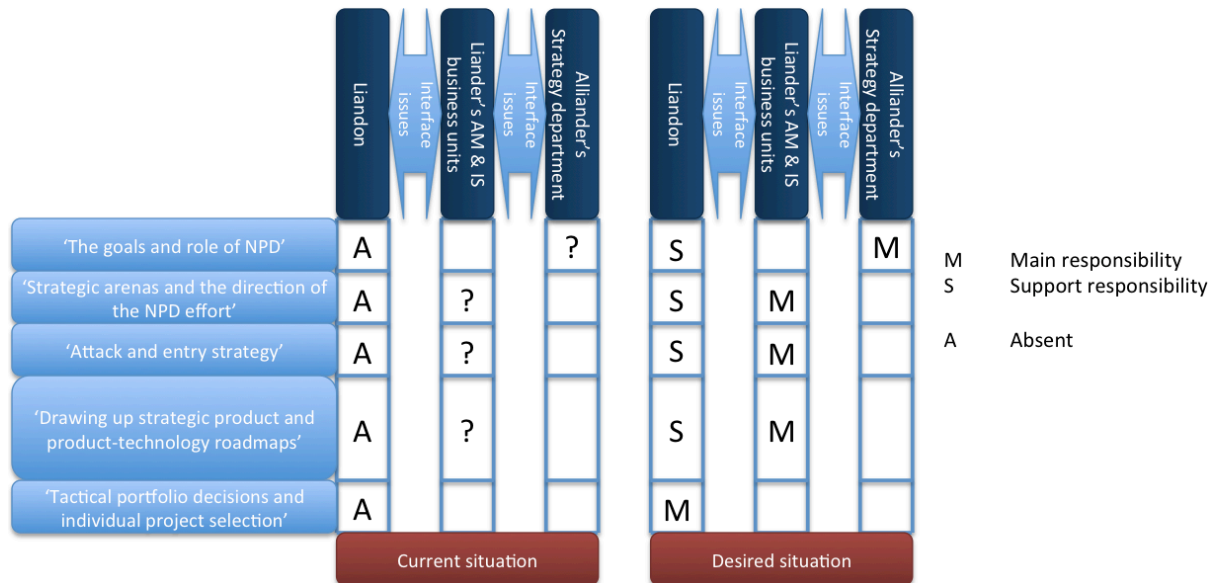


Figure 22 Role division diagnosis at Liandon

4 Liandon specific change plan

Utilizing the results of the problem diagnosis (chapter 3), the Liandon specific change plan will now prescribe how to actually implement the specific product innovation strategy in Liandon's current situation. In line with figure 22, it's important to note and keep in mind that, Liandon's main responsibility is conducting tactical portfolio management. Next to that, it supports the other parties in taking their responsibilities to help solve Liandon's NPD problems and improve both Liandon and the holding's overall NPD performance.

A remark made beforehand is that the proposed change plan is most of all concerned with the required organisational changes instead of how to actually conduct every specific product innovation strategy component. Chapter 2 provides the business context specific product innovation strategy that Liandon will have to review and master before it can be conducted. Appendix XIV does present content related implementation recommendations to provide a grip on this process, but still not discharges Liandon from its responsibility of determining the activities itself. The organizational changes and the content changes are kept separate on purpose to not provide a handbook with every little activity included that would make it possible for Liandon to execute it without fathoming NPD. This approach is preferred to force Liandon to master NPD on the long-term instead of simply implementing a prescribed product innovation strategy and expect that it will solve all problems. Without thorough understanding of NPD, changing business circumstances could easily undermine the effectiveness of the specific product innovation strategy after its implementation according to a very specific handbook.

4.1 A change plan's required content

The first step in setting up a change plan is to determine its required content. Van Aken et al. (2007) elaborate on this subject and state that an important preliminary activity should be a stakeholder analysis. This analysis maps both direct stakeholders (whose work processes, roles or vital interests are directly affected by implementing the specific product innovation strategy), and indirect stakeholders that cooperate with the direct stakeholders and therefore need to know about the change. Next to inventorying all stakeholders, the analysis also needs to investigate which potential sources of resistance these stakeholders hold towards the change. An interview that helps obtain valuable information is a method that at the same time involves a stakeholder in the change process, thereby confronting the possible source of resistance 'lack of trust'. When stakeholders and their potential sources of resistance are mapped, technical ('the solution'), political ('the formal order') and cultural ('participatory') interventions can be prepared to counter all potential resistance and help form a change plan that is feasible to succeed (Tichy, 1983).

When the foregoing preliminary activities are accomplished, the change plan itself can be developed. Van Aken et al. (2007) assert a change plan should hold:

- A specification of the redesigned process with the changed elements made apparent.
- The actions or interventions to be taken to realize the planned changes.
- The people to execute the actions or to involve in these actions.
- A design of the change organization, depicting the temporary work structure.
- A communications plan, specifying the ways and timing of informing stakeholders.

Relating to the change organization, Van Aken et al. (2007) suggest creating a workgroup to detail the solution and to prepare the actual change. Furthermore, if the change affects multiple departments, a steering committee should be arranged made up of the department's managers (ideally no representatives, in order to have a committee with actual decision-making powers).

Lastly, a pilot implementation may prove useful to test the new process in a small-scale well-monitored environment and learn from its results. For example, interventions to tackle resistance against change can be tested and altered when found insufficient in convincing stakeholders.

Together, the preliminary stakeholder analysis, the enumerated change plan components, workgroup, steering committee and the pilot implementation are the, according to Van Aken et al. (2007), required change plan components.

4.2 Stakeholders and their potential resistance to change

The preliminary stakeholder analysis is now conducted prior to the introduction of the Liandon specific change plan to give aim to the actions or interventions to be executed. This analysis is conducted separately from the NPD problem analysis to not blend two in nature differing analyses.

First of all, the vital interests of Liandon's Management Team are affected when the specific product innovation strategy is being implemented. That is, Liandon's new product development is an important interest of its Management Team. They therefore form the first direct stakeholder group involved in the change plan. When a business process would be altered without their support and commitment, its implementation would surely fail. The Management Team's potential sources of resistance are:

- Lack of understanding.
The Management Team will most likely understand there is an NPD problem but possibly does not entirely understand (all consequences of) the proposed new NPD approach.
- Differences in opinion.
Due to the multifunctional nature of the Management Team, some members may disagree with the new NPD approach for technical, economic or personal reasons.

As a result, serious attention on how to meet the challenge of convincing the Management Team is to be aimed before implementing the new NPD approach.

With implementing a new NPD approach, it is obvious that all employees conducting Liandon's development projects are direct stakeholders. Their development processes will change and Liandon's NPD employees are therefore the second stakeholder group that can be discerned. Their potential sources of resistance are:

- Low willingness to change.
Employees fear losing a familiar organizational environment in which they have a relatively large amount of freedom and self-government. NPD activities and the development pace are currently not monitored where the novel NPD approach will monitor these elements what can result in a feeling of losing one's freedom.
- Conflicts of interest.
Organizational changes have a tendency not to be neutral regarding the material or immaterial interests of the multiple stakeholders. Individual employees may fear that the new NPD approach will cost them more than it does to their colleagues or management.

Liandon's major innovators form a third direct stakeholder group. They come up with ideas and help (to some extent) develop new products to meet client/customer latent needs. Their tacit knowledge related to roadmaps on how to achieve NPD goals in 10 years from now will be used differently in the new NPD approach making them an important stakeholder to mind.

Also the fact that the very new product's ideas originate with this stakeholder makes them an important partner to appease. Their potential sources of resistance are:

- Lack of understanding.
The major innovators may not perceive the NPD problem since they do not perceive any trouble with the current NPD approach.
- Lack of trust in either intentions or competences.
The major innovators lack trust in senior management's intentions ('they say they want to improve new product performance, but in reality they want to bind us') or in their competences ('what do they actually know about NPD?').

- Low willingness to change.
Major innovators know what they have now but do not know how the new NPD approach will work out for them. They also fear not performing well in the new NPD approach due to the much more organized way of conducting NPD in which they lack their former decision-making freedom. On top of that, the potential over-specification of the new NPD approach can be experienced as a straightjacket to them what is severely colliding with their creative and open mindset. Lastly, an unprofessional change approach may result in major innovators' low willingness to change.
- Conflicts of interest.
Major innovators may fear that the new NPD approach will cost them more than it does to their colleagues or management.

The fourth stakeholder group is Liandon's ordering customers Infostroom, Asset Management and Strategy. They can be labelled either a direct stakeholder because they fund Liandon's NPD effort, and indirect due to their cooperation with Liandon's NPD employees and major innovators. Their potential sources of resistance are:

- Lack of understanding.
These ordering customers may not understand why Liandon wants to implement an entire NPD approach, since - in their view - Liandon only has to implement tactical portfolio decisions. Hence, they do not perceive 'the problem' and do not want Liandon to decide on its own NPD organization and lose their dictating role.
- Differences in opinion.
In line with 'lack of understanding', the ordering customers may disagree with the NPD approach for the reason that they question whether Liandon actually needs to implement an entire NPD approach.
- Lack of trust in either intentions or competences.
Ordering customers may possibly mistrust Liandon in organizing its NPD effort individually and question Liandon's true intentions. Also Liandon's competences in setting up NPD in a proper way may lack the ordering customers' trust.
- Low willingness to change.
The ordering customers might fear the unknown and want to hold on to the current (by them dictated) way of NPD at Liandon.
- Conflicts of interest.
The fear that the new NPD approach will turn out in their disadvantage while strengthening Liandon's position is a possible fear.

In sum, the four stakeholder groups show multiple sources of resistance that all must be parried by actions in the change plan to result in a successful implementation.

4.3 The change plan design

Resulting from the problem diagnosis (chapter 3), the change plan's required content (paragraph 4.1) and the stakeholder analysis (paragraph 4.2), an actual change plan is now introduced (figure 23) to guide Liandon in implementing the specific product innovation strategy.

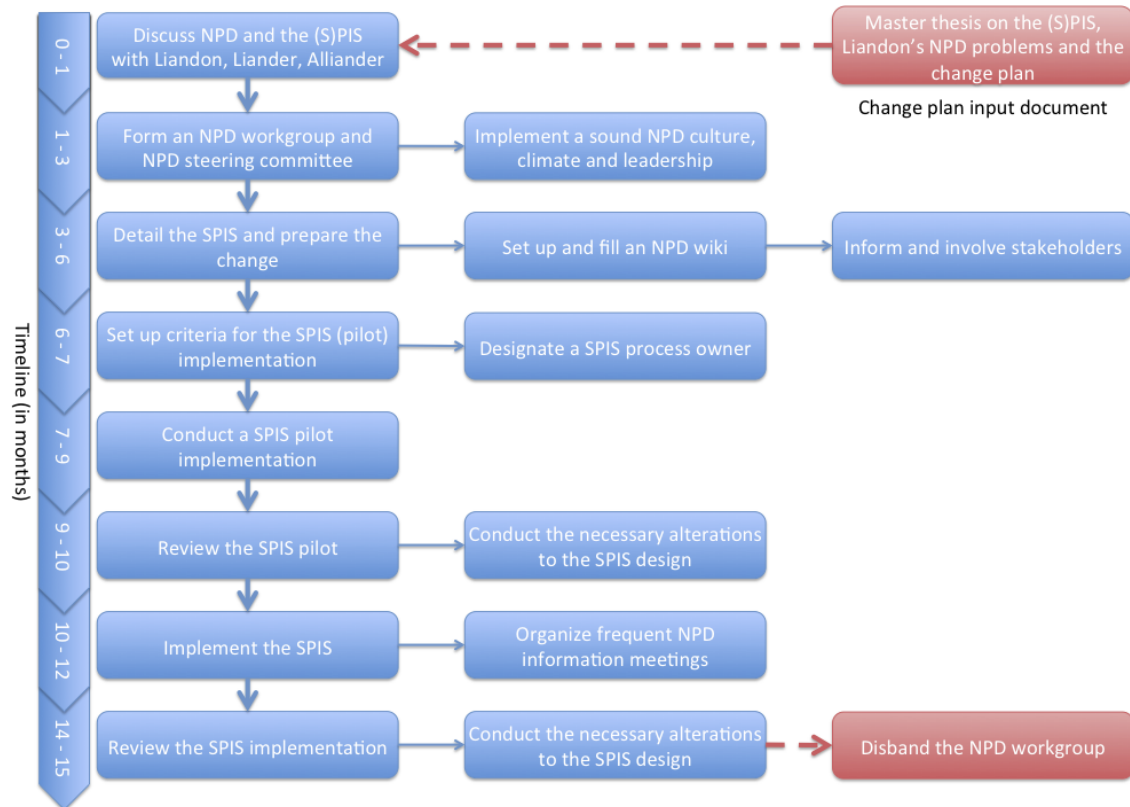


Figure 23 Liandon specific change plan

4.3.1 Change plan remarks and content

The Liandon specific change plan starts with this very master thesis as its input document. With this document at Liandon's disposal, all relevant background information (or references to it) is at hand to commence the change process. The timeline is drawn vertically denoting that activities in the same row are all conducted in the month(s) indicated in the timeline. The change plan is discontinued at the bottom of figure 23 when the implementation of the specific product innovation strategy (SPIS) has been reviewed and necessary alterations to the design have been made. There's a two-month gap between the implementation of the specific product innovation strategy and its review so that sufficient activities are employed to be reviewable. The depicted time durations are determined with both feasibility and the fact that Liandon wants her NPD problems solved quickly in mind. Despite the quite strict scheduled activities, Liandon is advised to hold on to the scheduled durations to keep momentum in the change process.

The by Van Aken et al. (2007) suggested change plan content requirements come back in the change plan design in the following way. The specification of the redesigned process is provided by the specific product innovation strategy in chapter 2. Since Liandon lacks all the SPIS components (chapter 3), all the SPIS components are new and therefore form the elements to be changed. The actions required to realize the planned changes are depicted in figure 23 and are further elaborated on starting in paragraph 4.3.2. The required interventions meeting the stakeholders' various sources of resistance and the people executing them are also introduced in paragraph 4.3.2. Required people are not mentioned by name but rather on function or role due to the current reorganizations at Liandon and the accompanying uncertainties. The change organization design simply becomes clear when

figure 23 and its steps are examined. How and when to inform the stakeholders is also incorporated in the change plan's actions as elaborated on in paragraph 4.3.2. The required workgroup, steering committee and pilot implementation are also used in the change plan thereby resulting in the fact that all Van Aken et al.'s (2007) required change plan components are included.

The link between the in figure 23 proposed change plan components and the components of the specific product innovation strategy is clarified using figure 24.

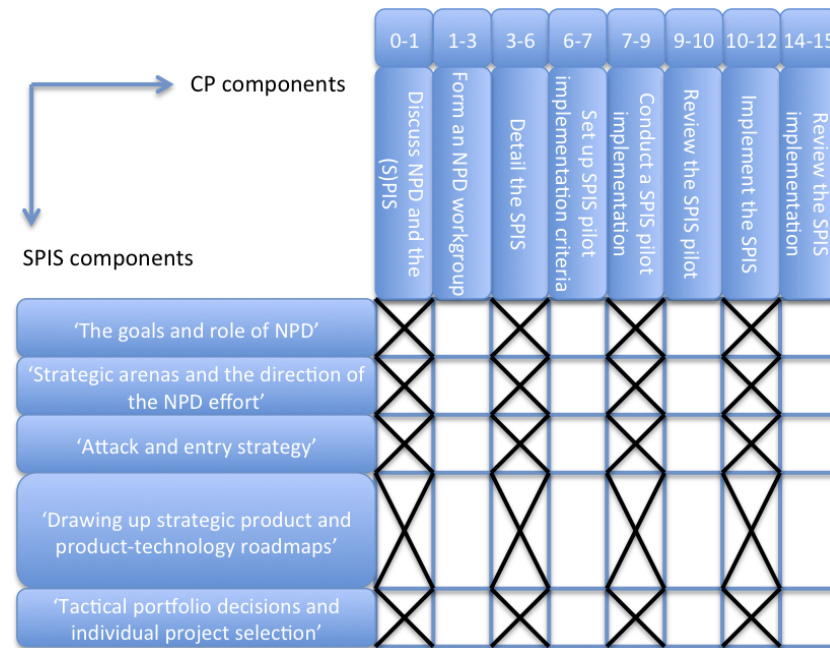


Figure 24 Where (S)PIS components are addressed by change plan components

The in figure 24 presented matrix can be summarized by notifying that the specific product innovation strategy components are to be:

- Submitted to Liandon, Alliander and Liander to inform and discuss their importance and application (during the first month).
- Detailed to prepare their implementation (during the third until sixth month).
- Implemented in an internal pilot implementation (during the seventh until ninth month).
- Fully implemented (during the tenth until twelfth month).

Paragraphs 4.3.2 until 4.3.9 will further describe the details of the related change plan activities.

4.3.2 Change plan timeslot month 0 - 1



The first activity in the change plan is to inform Liandon's complete Management Team on NPD, NPD problems at Liandon and discussing the importance of improving NPD. Additionally, the specific product innovation strategy is presented and discussed with the Management Team. These actions in this specific sequence to be sure that the importance of NPD, the NPD problems at Liandon and the specific product innovation strategy are well understood at Management-Team-level. The entire Management Team is involved as soon as possible to build complete support and commitment for the implementation of the specific product innovation strategy. A first practical result of their commitment has to be an allotted budget for covering the (employee) costs of the change plan. A second action to be executed by the Management Team is to start a dialogue with Alliander's Strategy department and Liander's business units. The content of this dialogue resembles the steps taken towards Liandon's Management Team but now on NPD at holding level and on possible NPD suboptimization issues. The goal of contacting the other parties within the holding is to urge them to

start conducting the necessary innovation strategy components and prevent ‘resistance to change’. Depending on the (un)willingness of the related Alliander and Liander colleagues, additional documents need to be drawn up on the importance of NPD and the product innovation strategy. This initiative and proactive attitude may strengthen Liandon’s position within the holding as a professional company that wants to formalize and professionalize her NPD activities.

All these actions need to be conducted in a single month. Recommended people to conduct this action are graduation project supervisors Hans Korsman and Roelof Potters. Roelof Potters is already part of the Management Team and Hans Korsman possesses the necessary knowledge on NPD. This first activity aimed at a thorough understanding is the first (technical) intervention (Tichy, 1983) that confronts the potential resistances ‘lack of understanding’, ‘differences in opinion’, and ‘low willingness to change’.

4.3.3 Change plan timeslot month 1 - 3

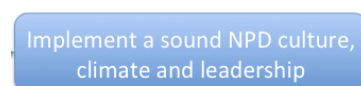


The following by Van Aken et al. (2007) suggested action is to form both an NPD (reorganization) workgroup and an NPD steering committee. Recall that the workgroup is created to detail the specific product innovation strategy (the solution) and prepare its implementation and the steering committee is meant to back the workgroup in legitimizing their decisions. The Management Team forms the steering committee and provides decision-making power so that the multifunctional workgroup is backed in altering processes. The NPD workgroup should represent all stakeholders by involving representatives from them as workgroup members. By incorporating these representatives, these employees help detail the activities they need to conduct in the future and help build support by involving them and the employees they represent. Because of the representatives’ important role, it’s of crucial importance that they are perceived by the employees they represent as the right people to represent them.

This early involvement is an important cultural intervention meeting resistances as ‘differences in opinion’ and ‘conflicts of interest’ by participation from the stakeholders. Two months are scheduled for this activity since it is of utmost importance that the right people can spend time as a workgroup member and maybe need some time to hand over current activities to colleagues. Recommended people to form the NPD workgroup are:

- An (R&)D/NPD representative or the major innovator that fulfils this role.
- A Marketing and Sales representative.
- A Finance representative.
- A portfolio holder.
- A project manager.
- A senior development employee who is able to oversee the development processes.
- An innovation manager of one of the three business units.

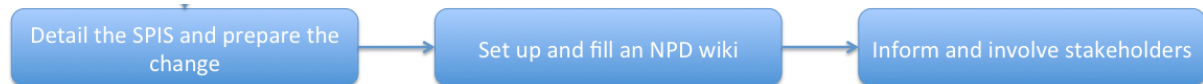
When forming the NPD workgroup, the change plan is to be examined on whether the amount of people recommended is sufficient to carry out the proposed activities in the appointed time. When thought insufficient, the workgroup can be expanded to the amount of people thought necessary.



The first activity for the workgroup and steering committee is concerned with Cooper’s (2005) fourth major new product performance enhancing factor. A sound NPD culture, climate and leadership is the last missing prerequisite next to the product innovation strategy when Liandon wants to improve its new product performance. This activity is carried out this early to prepare the organization for the more professional way of conducting NPD via the specific product innovation strategy. When a company does not have a climate for NPD, multiple processes directing and guiding NPD will be simply ineffective due to an unsuitable company climate. It is therefore important that Liandon is prepared for new NPD processes by realizing this activity. How this activity is to be conducted is

outside the scope of this thesis and therefore left to the Management Team of Liandon. Cooper (2005) provides theory on this subject that can be consulted to help implement a durable NPD culture, climate and leadership. This action will most certainly take longer than the two months prescribed for forming the NPD workgroup and steering committee, but does need to be started simultaneously since it cannot be started too soon.

4.3.4 Change plan timeslot month 3 - 6



When the NPD workgroup is formed, their most important task is to detail the specific product innovation strategy and prepare the change (which is its actual implementation). ‘Detailing’ the specific product innovation strategy relates to determining the Liandon specific practicalities (e.g. who is going to determine the NPD goals and is designated as a Stage-Gate gatekeeper?). Although not all succeeding change plan activities are executed by the NPD workgroup, it does carry the major responsibility of ‘preparing the change’ and thereby their realization and further detailing.

To carry out its responsibilities, the workgroup firstly needs to study the proposed specific product innovation strategy and its activities (chapter 2) so that they attain a thorough understanding of the design (which is a technical intervention). The workgroup secondly can now detail the specific product innovation strategy so to embed it in current practice. Thirdly, the preparations are executed to prepare the actual implementation of the specific product innovation strategy (in months 10 - 12).

The first task is rather apparent where the second task will now be elaborated on per specific product innovation strategy component to direct the workgroup in this activity.

1. Setting up NPD goals

The NPD workgroup will have to detail this first component by:

- Determining who (in the unit ‘function specification’) are to establish the NPD goals.
- Determining whom to involve in establishing the NPD goals (both internal and external).
- Determining the required capacity (in FTE) to carry out this activity.
- Determining the information required to execute this activity.
- Organizing a (set of) NPD meeting(s) with Alliander’s Strategy department and Liander’s business units to align and discuss Liandon’s NPD goals.

2. Strategic arenas and the direction of the NPD effort

Recall the three steps of this component:

- ① An extensive analysis that assesses the marketplace, the industry and the company and identifies markets, products and technologies that show potential in helping to attain the NPD goals. Also potential disruptive technologies are assessed on their impact and the company’s core competences are to be identified.
- ② Identifying business opportunities and subsequently mapping them.
- ③ The actual selection or compilation of the list of strategic arenas for the year 2020.

The NPD workgroup will have to detail this second component by:

- Determining who (in the unit ‘function specification’) are to⁸:
 - ① Conduct the various analyses.
 - ① Determine the impact of potential disruptive technologies.
 - ① Determine the company’s core competencies (see appendix XIII on how to do this).
 - ② Identify arenas by forming PMCs and TPCs.
 - ③ Check arenas their fit with the overall business strategy.
 - ③ Draw up rating questions that can help plot business opportunities relative to one another.
 - ③ Rate and plot business opportunities on business strength vs. arena attractiveness.

⁸ Note that the enumeration signs provide information on the relation with the SPIS component activities.

- ③ Make a selection of business opportunities' products desired to develop and form the list of strategic arenas.
- Employing new employees to fulfil the functional specifications not currently filled.
- Determining the required capacity (in FTE) to carry out these activities.
- Determine the information required to execute these activities.
- Organizing a (set of) NPD meeting(s) with Liander's business units to discuss the arenas.

3. The attack and entry strategy

The NPD workgroup will have to detail this first component by:

- Determining the required capacity (in FTE) to carry out these activities.
- Organizing a (set of) NPD meeting(s) with Liander's business units to discuss how to attack and enter selected arenas.
- Determining who (in the unit 'function specification') are to:
 - ① Join the NPD meetings with Liander's business units to help determine the best attack and enter strategies per strategic arena.

4. Drawing up strategic product and product-technology roadmaps

Recall the six steps of this component:

- ① Mapping all business opportunities' related products in a strategic product roadmap.
- ② Identifying and mapping the required technology and product development projects per desired product in a product-technology roadmap.
- ③ Drawing up the business cases of the development projects.
- ④ 'Selling' the product-technology roadmaps to clients.
- ⑤ Utilizing tactical portfolio management methods to determine which desired products will form the best development project portfolio.
- ⑥ Map the desired products from which the development projects can be financed in the final strategic product roadmap.

The NPD workgroup will have to detail this third component by:

- Determining who (in the unit 'function specification') are to:
 - ① Map all business opportunities in a strategic product roadmap.
 - ② Identify and map the development projects per desired product in a product-technology roadmap.
 - ③ Draw up the development projects' business cases.
 - ④ 'Sell' the product-technology roadmaps to clients.
 - ⑤ Determine which desired products will form the best development project portfolio.
 - ⑥ Map the desired products in the final strategic product roadmap.
- Finding possibilities to fund drawing up business cases.
- Determining the required capacity (in FTE) to carry out these activities.
- Determine the information required to execute these activities.
- Organizing a (set of) NPD meeting(s) with Liander's business units to discuss their resource commitment approach and present (and sell the content of) the product-technology roadmaps.

5. Tactical portfolio decisions and individual project selection

Recall the most important elements of this component:

- ① 'Do projects right' by implementing the Stage-Gate process.
- ② Manage the TDPs by setting up the Stage-Gate-TD process.
- ③ Identifying latent customer needs and fully incorporating the customer in the development projects ('built-in voice-of-the-customer').
- ④ Incorporate the other Stage-Gate best practices.
- ⑤ Present development progression by using the portfolio review.

Before the workgroup will detail this component, it is advised to read paragraph 2.7 and appendices IV until VIII for important information when detailing the Stage-Gate(-TD) process.

The NPD workgroup will have to detail this fifth component by:

- Determining whether only one Stage-Gate and one Stage-Gate-TD process design is sufficient for all possible innovations. Multiple designs may have to be established with varying stage amounts to meet the differing risk levels of incremental or radical innovations.
- Determining the stage descriptions and required activities for both the Stage-Gate and the Stage-Gate-TD process. Appendix VIII can be used as an example for a Stage-Gate process with five stages.
- Determining the required deliverables per gate and designing their templates.
- Determining must-meet and should-meet criteria for all gates.
- Determining how to foster and not inhibit creativity in the discovery stage.
- Specifying the so-called 'rules of engagement' that describe the rules that need to be practiced in gate meetings (see appendix VII for an example).
- Determining performance metrics to gauge Stage-Gate(-TD) performance.
- Determining the tactical portfolio management methods to incorporate.
- Determining how and where to involve clients in the Stage-Gate(-TD) process.
- Scrutinizing the Stage-Gate(-TD) best practices on their presence in the Liandon specific Stage-Gate(-TD) design.
- Determining who (in the unit 'function specification') are to:
 - ① Function as the various gatekeepers in the Stage-Gate process.
 - ② Function as the various gatekeepers in the Stage-Gate-TD process.
- Determining the required capacity (in FTE) to carry out the various gatekeeper functions.
- Incorporating IT employees to design a system for the Stage-Gate(-TD) process. It should enable the registration of all project data and automatically present development phase maps with the progression of the current products being developed (see figure 20 as an example). Hence, software is to make the process and its content intelligible and easily communicable.
- Organizing a (set of) NPD meeting(s) with Liander's business units to present the development phase maps with development projects their current progression.

The last activity succeeding the detailing of the specific product innovation strategy is the execution of the preparations. This involves the following:

- Search employees that meet the functional specifications and assign the best fitting ones. - Fully inform the assigned employees on their new job requirements.
- Free the required time for these assigned employees required to execute the activities.
- Schedule the activities' execution in the assigned employees' agendas.
- Schedule a location where the activities can take place.
- Gather the necessary information for the activities and share it via the NPD wiki.

Set up and fill an NPD wiki

An activity that has to be started simultaneously with the workgroup detailing the design and preparing the change is setting up an NPD wiki. This NPD wiki has to be set up so to:

1. Form an NPD handbook or encyclopaedia for all NPD related information.
2. Facilitate a Q&A, FAQ and a page on which employees can post implementation related ideas.
3. Present the workgroup's progression in detailing the design and preparing the change.

IT personnel in collaboration with the NPD workgroup should design the wiki interface. The entire wiki content is the responsibility of the NPD workgroup. The workgroup's detailing progression on the wiki creates transparency in its activities and should bolster the culture of employee involvement. All Stage-Gate documents and the process' misconceptions need, for example, be made available via the wiki so that employees can look into them prior to its actual introduction. This activity is carried out simultaneously with the workgroup detailing the design and preparing the change so that they immediately can report their progression on the wiki.

Inform and involve stakeholders

Next to the involvement of stakeholders by forming the NPD workgroup and providing them with an informative wiki, it is to be advised that the CEO gives a presentation on NPD in front of all employees faced with NPD activities. These employees are obliged to be present so that not just the representatives in the NPD workgroup and the Management Team are well informed but rather all NPD employees. Just like the first activity of the change plan, the CEO will need to introduce (formal) NPD, the NPD problems at Liandon and the importance of improving Liandon's NPD effort. Subsequently, the specific product innovation strategy is presented with its **five** major components. When the Management Team's desire to implement the specific product innovation strategy and the change plan progression have been presented, all attendants are asked for their participation in the change and implementation process. Employees can communicate ideas and questions both through their related representatives and through the NPD specific wiki on Liandon's intranet.

Note that this activity incorporates all three intervention types to confront all possible sources of resistance:

- The technical 'solution' (entailing the thorough explanation of the specific product innovation strategy);
- The political 'formal order' ('the CEO orders it so we'll have to'), and
- The cultural 'participatory' intervention (everybody is asked to think along).

4.3.5 Change plan timeslot month 6 - 7

Set up criteria for the SPIS (pilot) implementation

Designate a SPIS process owner

The next activity when the specific product innovation strategy has been detailed is setting up criteria for a (pilot) implementation. Without the (pilot) implementation criteria, there is no way of telling if the implementation is actually a success since it is unclear if the initial NPD problems are solved. Note that the pilot implementation will include all specific product innovation strategy components but without contacting other parties. The decision for a Liandon internal pilot is made since the dialogue and discussion with Alliander and Liander on a pilot scale is not considered feasible. The NPD workgroup therefore has to set up criteria for the pilot implementation and the entire implementation so to have performance metrics which to consult afterwards. Performance metric examples can be found in paragraph 2.7 Moreover, the NPD workgroup will need to seek an environment (e.g. a department within Liandon) where the implementation of the specific product innovation strategy can be tested. This practically entails approaching business unit managers for potential pilot implementation environments. An environment with development projects in difference phases is preferred to test the Stage-Gate(-TD) process as completely as possible. Obviously, not all activities of the specific product innovation strategy can be carried out within the borders of a single department. It is therefore important to execute the activities in the small-scale specific environment and incorporate as little other employees as possible. The appointed time for this activity is a single month.

Designate a SPIS process owner

The designation of a process owner takes place simultaneously with the pilot implementation criteria being set up and succeeding the detailed specific product innovation strategy. This process owner will be responsible for the continuation of the specific product innovation strategy after it is implemented and the workgroup is disbanded (see paragraph 4.3.9). The Stage-Gate(-TD) process will most likely be the most demanding process to operate. The process owner is to be assigned by the NPD workgroup and has to be a workgroup member or an NPD employee the workgroup and steering committee see fit as a process owner. Above all, it's important that the process owner is (to be) involved in the entire change process.

4.3.6 Change plan timeslot month 7 - 9

Conduct a SPIS pilot implementation

When the NPD workgroup has set up the pilot implementation criteria and has found an environment where the pilot can be held, it is time to conduct the pilot implementation. The by the workgroup detailed five specific product innovation strategy components need to be executed on a small scale and environment specific. For example, function specifications are to be assigned to employees in the specific pilot environment and when the pilot environment is the gas NPD department, gas NPD goals need to be determined from the overall business goals. The Stage-Gate(-TD) process needs to be filled with the specific pilot environment's new development projects as well as their current development projects. This way, all stages and gates of the Stage-Gate(-TD) process can hopefully be tested.

Appointed people are the pilot environment specific NPD employees and the NPD workgroup following the pilot progression. Appointed time for this activity is two months. The pilot implementation is not cut off after these two months but this is the period in which the pilot implementation is closely monitored and after which the performance metrics are consulted for its results. The pilot implementation may continue and merge in the actual implementation of the specific product innovation strategy a month later when permitted by the NPD workgroup. Needless to say, this will only be the case when the pilot implementation is thought to be a success by both the NPD workgroup as the related NPD employees.

4.3.7 Change plan timeslot month 9 - 10

Review the SPIS pilot

Conduct the necessary alterations to the SPIS design

When the two months of the pilot implementation have passed, the pilot is reviewed by the NPD workgroup by using both the pilot implementation criteria and related NPD employees' opinions on the implementation. Whether the change plan activities took away the resistances against change is also an important question to be answered by the workgroup. The process improvement points resulting from the pilot implementation are to be documented and shared with all NPD personnel via a wiki update or revision.

Conduct the necessary alterations to the SPIS design

The NPD workgroup can now alter the detailed design of the specific product innovation strategy with the points of improvement brought forward by the pilot review.

Both the pilot review and the immediate alterations to the design together have to be conducted in a single month.

4.3.8 Change plan timeslot month 10 - 12

Implement the SPIS

Organize frequent NPD information meetings

The actual implementation of the by the workgroup detailed (and with help of the pilot implementation adapted) specific product innovation strategy can now be commenced. A staged implementation is advised so to manage the implementation as well as possible. The workgroup will therefore need to determine the actual order in which the new NPD approach is to be introduced among the departments.

The earlier on assigned employees can now start their new functions and execute their allotted activities. The implementation is actively supported by the steering committee so to conduct a ('political intervention' with the) 'formal order' that commands all employees involved to implement the specific product innovation strategy. The appointed time for implementing the specific product innovation strategy is two months. This duration will be sufficient due to the preparations conducted earlier on by the workgroup. Additional Liandon specific implementation recommendations concerned with the content of the specific product innovation strategy can be found in appendix XIV.

Organize frequent NPD information meetings

Concurrently with the implementation of the specific product innovation strategy, the workgroup has to organize recurring NPD meetings with both Liandon employees as well as Liander's business units and Alliander's Strategy department. A continuous dialogue on the joint NPD effort has to prevent suboptimization from happening due to misalignment with the interests of the holding. In the meetings with Liandon's NPD employees, 'hot' issues will be dealt with. In these meetings (a delegation of) the workgroup can answer the most important questions uttered on the wiki so to meet uncertainty and a possible lack of trust in the design. The NPD information meetings may continue to be organised even after the twelfth month depending on employee demand.

4.3.9 Change plan timeslot month 14 - 15

Review the SPIS implementation

Conduct the necessary alterations to the SPIS design

Disband the NPD workgroup

A two-month gap between the implementation of the specific product innovation strategy and its review is maintained so to provide slack and gather information before conducting the review. The NPD workgroup reviews the implementation utilizing both the predefined criteria and the stakeholders' opinions on the implementation. Whether the change plan activities really did take away the resistances against change is a question that needs careful examination and possible new interventions to be undertaken. The process improvement points resulting from its implementation are to be documented and shared with all NPD personnel via a wiki update and a possible new NPD information meeting. This implementation review is scheduled a single month.

Conduct the necessary alterations to the SPIS design

The NPD workgroup can now alter the detailed design of the specific product innovation strategy with the points of improvement brought forward by the implementation review.

Disband the NPD workgroup

The change phase of the specific product innovation strategy can be ended when the workgroup has carried out all activities of the change plan. The responsibility for the specific product innovation strategy is then handed over to the assigned process owner and the workgroup is to be disbanded. The NPD steering committee will not be disbanded but is inactive as long as the process owner does not need them to decide on something important.

Together with the change plan's required content (paragraph 4.1) and the preliminary stakeholder analysis (paragraph 4.2), the change plan concept has now been fully covered. Recall the second part of the research question '*how can it be applied at Liandon to solve its NPD problems?*' that now has been answered by providing a change process guide that enables a sound implementation of the specific product innovation strategy.

5 Conclusions

This thesis has introduced the problem of current literature not being sufficient to meet NPD problems at R&D companies in a specific business context where they are part of a holding and develop other business units' desired product and lack NPD budget. It also introduced the Liandon descriptive case study with its (indicated) NPD problems of a missing NPD process and a missing coherent NPD project portfolio in this specific business context. These scientific and company relevant issues are to be confronted by a specific product innovation strategy that helps R&D companies in general to improve their new product performance. The formulated research question that guided the research on this topic:

(1) What does the product innovation strategy for a R&D company in the specific business context look like, and (2) how can it be applied at Liandon to solve its NPD problems?

How this thesis led to answering the research question is briefly summarized in the first paragraph. This research's limitations together with Liandon specific and future research recommendations are discussed in the second and third paragraph and conclude this chapter and thesis.

5.1 Answering the research question

The answer to the first part of this question can be stated: as a detailed version of Cooper's (2005) product innovation strategy, but with a strong emphasis on aligning the product innovation strategy's components with the holding and business units' NPD goals and arenas.

The ambiguity concerning what party needs to conduct which component and how to meet the potential interface issues due to suboptimization is met and elucidated using figure 25.

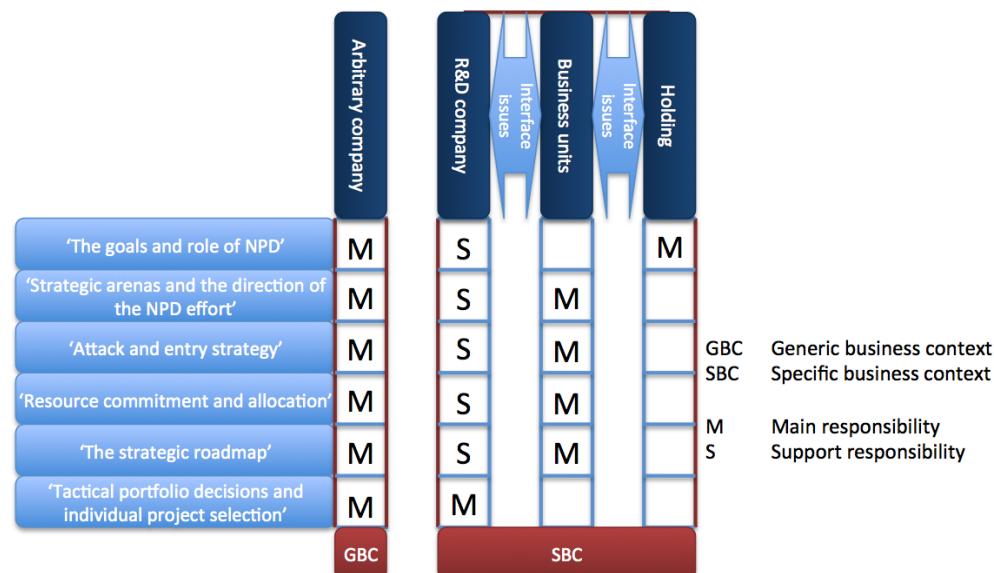


Figure 25 Division of PIS components in the GBC and SBC

Where arbitrary companies in the generic business context conduct all Cooper's (2005) product innovation strategy components, R&D companies in the specific business context are only to conduct the bottom one on holding level. The other five components are to be determined by the business units and the holding and are not the R&D company's main responsibility. This division of roles logically follows from their current activities. However, that the other five components are not the R&D company's main responsibility does not prevent it from determining the components on a company level. Fully aligned and in dialogue with the business units and the holding' management, the first five components are to be strategically determined on an R&D company level. By defining, for

example, their own NPD goals in line with the holding's, the risk of suboptimization is partly countered by considering the entire holding in giving substance to the R&D company's NPD activities. Additional NPD meetings and continued dialogue with the business units and holding has to entirely prevent suboptimization from occurring. Lastly, it's the holding and business units management's responsibility to arrange NPD budget for the R&D company. The R&D company can merely appeal to this responsibility to help obtain it.

The most important differences related to the specific product innovation strategy's components are that resource commitment and allocation, the strategic roadmap and part of tactical portfolio management are blended to form a new component. This new component is set up since it utilizes the by Cooper (2005) described best practices in a rather different way than described by Cooper (2005). The responsibilities depicted in figure 25 are translated to each individual product innovation strategy component and have altered them to meet the specific business context.

The second part of the research question on 'how this specific product innovation strategy can be applied at Liandon to solve its NPD problems', is answered by conducting an NPD problem diagnosis and by drawing up a Liandon specific change plan.

The NPD problem diagnosis in chapter 3 concludes that Liandon does not administer tactical portfolio management like it is supposed to. Other components it should determine on Liandon level are absent as well. In sum, no product innovation strategy is currently guiding its NPD effort and helps it develop products like the best-practice companies. All specific product innovation strategy components therefore need to be implemented so to solve Liandon's NPD problems.

With the NPD problem diagnosis in mind, an organizational change plan according to Van Aken et al. (2007) is set up to help Liandon apply the specific product innovation strategy.

Figure 26 presents this change plan and comes down to:

- Informing the Management Team and the business units of Alliander and Liander on the importance and necessity of sound NPD and gaining their commitment.
- Forming an NPD workgroup with all stakeholders involved that details the specific product innovation strategy and prepares its implementation.
- Setting up a digital environment where all related information and news can be shared.
- Conducting a pilot implementation to learn and improve the detailed design.
- Implementing the actual detailed specific product innovation strategy design.
- Organizing NPD meetings frequently to prevent suboptimization between the holding's parties and answer Liandon NPD employees' questions on NPD.
- Reviewing its implementation to conduct necessary actions to improve its performance.

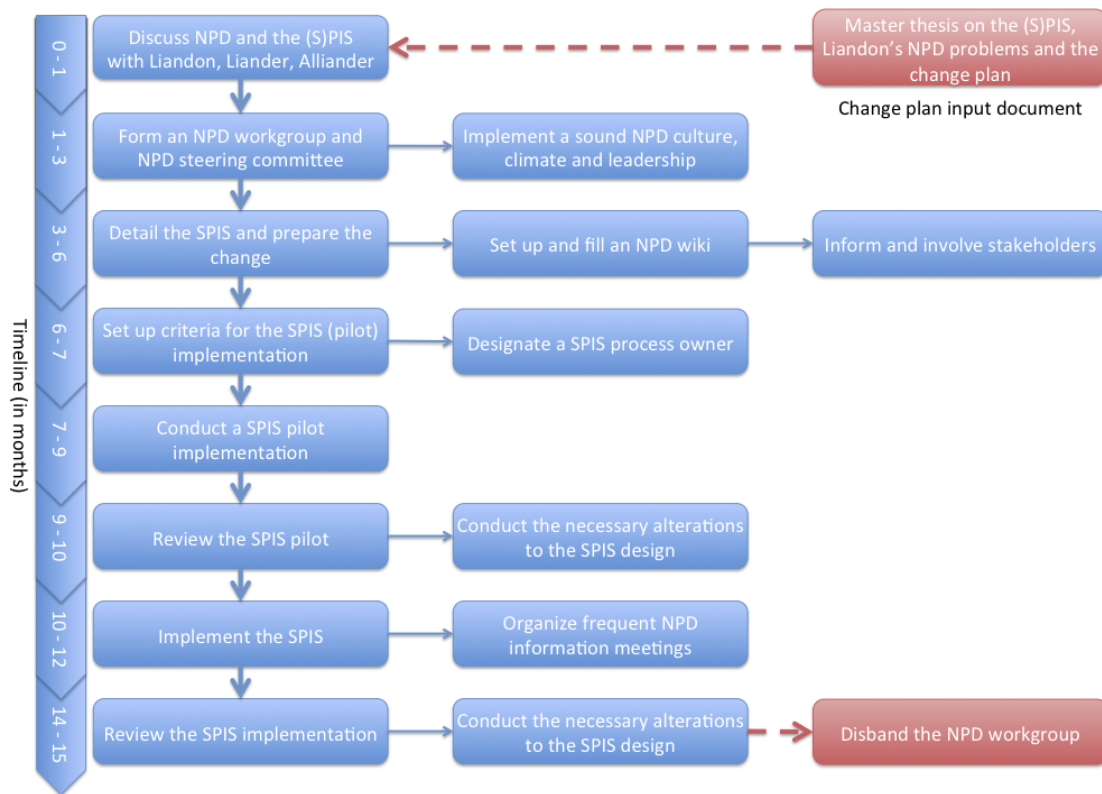


Figure 26 Liandon specific change plan

In sum, when considering Liandon’s situation, Liandon is responsible for tactical portfolio management and has a supportive responsibility on the other components but is depending on Alliander and Liander’s business units’ sufficiency in conducting NPD. When these other parties do not conduct sound NPD but rather have scattered, unorganized development portfolios, Liandon will never fully conduct decent NPD. Liandon can communicate this but cannot alter the other parties’ NPD management. Liandon is in the specific product innovation strategy advised to proactively bring up NPD meetings on the components of the other business units to maximize its NPD initiation role. This altogether results in the conclusion that Liandon will only be able to conduct adequate NPD when Liandon, Alliander and Liander share a common NPD view and jointly conduct a product innovation strategy on holding level. Liandon can take the initiative by implementing her part of the product innovation strategy.

5.2 Limitations

The research methodology

The quality of the utilized case study methodology is as sturdy as the ‘sources of evidence’ it yields. Both in-depth interviews and company data were researched to gather the necessary information and are now mentioned with their possible limitations.

The in-depth interviews are limited by:

- Possible too small amount of interviewees;
- Possible poorly communicated questions;
- Possible bias in the interviewees’ responses;
- Possible inaccuracies due to poor remembering;
- Possible playing up to the interviewer (Yin, 2009).

The company data is limited by:

- Difficulty of finding related documentation;
- Possible selection of a part of a larger collection of information;

- Possible bias of an unknown (and not spoken to) author;
- Possible deliberate withholding of information (Yin, 2009).

Hence, the case study at Liandon is limited by these two information gathering methods and need to be kept in mind while applying or generalizing it.

Problem diagnosis

The NPD problem diagnosis is a snapshot of the situation at Liandon based on a number of interviews and company data. In line with the limitations of the research methodology, there is a chance that not all relevant company documents were incorporated in the diagnosis. This fact could possibly have resulted in a slightly different diagnosis.

Not a panacea

The difficulty with suggesting a specific product innovation strategy is that also when it is well implemented, the possibility remains that a company's NPD problems aren't solved. That is to say, implementing the specific product innovation strategy will help organize a company's NPD effort backed by the industry's best practices and logic, but is not a plug-and-play solution. Senior management still has to seriously consider how employees can be motivated to actually back and use a newly introduced NPD approach and how the principles of innovation come back in all its NPD activities. Recall the fact that a company's innovation effort cannot be improved by simply implementing some ingredients, but can flourish if it is integrated in the right setting.

Possible bad assumptions

The assumptions that an unclear NPD added value and NPD project portfolio negatively influence a company's funding position within a holding are not researched in-depth and therefore are susceptible to the fact that this is not correct.

The fact that an NPD strategy, sound portfolio management and an idea-to-launch system are missing at Liandon does not directly mean that its NPD problems are mainly caused because of these missing new product performance enhancing factors.

The last bad assumption mentioned is that best practices of what to do in certain NPD activities are mentioned (e.g. conducting an industry assessment) but nothing is mentioned about best practices in carrying them out. This limits the solution capacity of the solution design model since it still can be implemented badly and not work accordingly.

Cooper's authority

Literature of Cooper is being referred to a lot and forms perhaps a limitation of this thesis.

Although, being a legitimate choice to wield his literature in the field of NPD, the proposed specific product innovation strategy is set up within the framework of Cooper's (2005) product innovation strategy and is thereby bound to the same limitations.

5.3 Recommendations

This research results in both Liandon specific as well as future research recommendations.

5.3.1 Liandon specific

Next to the Liandon specific change plan of chapter 4 and the implementation recommendations in appendix XIV, additional recommendations are now submitted.

Liandon's senior management is, most of all, recommended to rethink the role of (Liandon's) NPD within the Alliander holding. It is of utmost importance that Liandon's position and added value in the holding is made clear by (among others) how Liandon proactively organizes and communicates its NPD effort. The ultimate goal for Liandon is to become the best NPD professional within the holding so that it can maybe draw additional product innovation strategy component into its main responsibility.

Next to this, Liandon is recommended to investigate the effects of its roots as business officials on its NPD effort compared to competitors who do not have this background. Results from this investigation can help senior management understand and acknowledge the effects of this background to better organize its NPD effort.

5.3.2 Future research in scientific literature

According to van Aken et al. (2007), “*a series of business problem solving projects followed by reflection and cross-case analysis may be used to develop general business design knowledge.* (p. 12)” That is to say, more case studies in this specific business context have to determine the validity of the (in this thesis) proposed specific product innovation strategy and help generalize it. Other case studies therefore need to be conducted at R&D companies who indicate having NPD problems so to test the specific product innovation strategy’s generalizability.

Further recommendations for additional research mainly focus on extending the best practice literature with possible other specific product innovation strategies. Companies in these possible other business contexts that remain unable to translate NPD best practices into a workable product innovation strategy can then wield these detailed NPD strategies to set up proper NPD.

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Appendix I Company background information

After the act on independent network management (*Wet onafhankelijk netbeheer*) was accepted in 2006, all integrated utility companies were forced to split up to separate energy production, transmission and distribution. Consequently, Nuon N.V. as a holding ceased to exist on the third of June 2009, continuing independently as Nuon Energy N.V. with its aim solely on energy production and delivery. The entire high voltage network was sold to TenneT in June 2009, which thereby took over the transmission responsibility from Nuon. Alliander holding N.V. was founded on the first of July 2009 from the former Continuum, Nuon Network Service, Nuon Tecno and Dynamicon companies. The Alliander holding thereby took over the distribution of the energy produced and delivered by companies like Nuon Energy. The Dutch government considers energy distribution as vital and therefore regulates all energy distribution companies. Multiple energy distributors each have their private geographical area in which they are monopolists. Figure 27 illustrates the organizational structure of the Alliander holding after it's founding in July 2009 and its relations with former companies.

Alliander's **mission** is to help create a better society in the regions in which they operate and to contribute to social and economic growth by:

- Managing their energy grids.
 - Working on a reliable energy supply.
 - Facilitating energy-related developments.
- Their **vision** is to be:
- Reliable in the provision of services.
 - To be engaged with all their stakeholders.
 - To be the best in the sector.

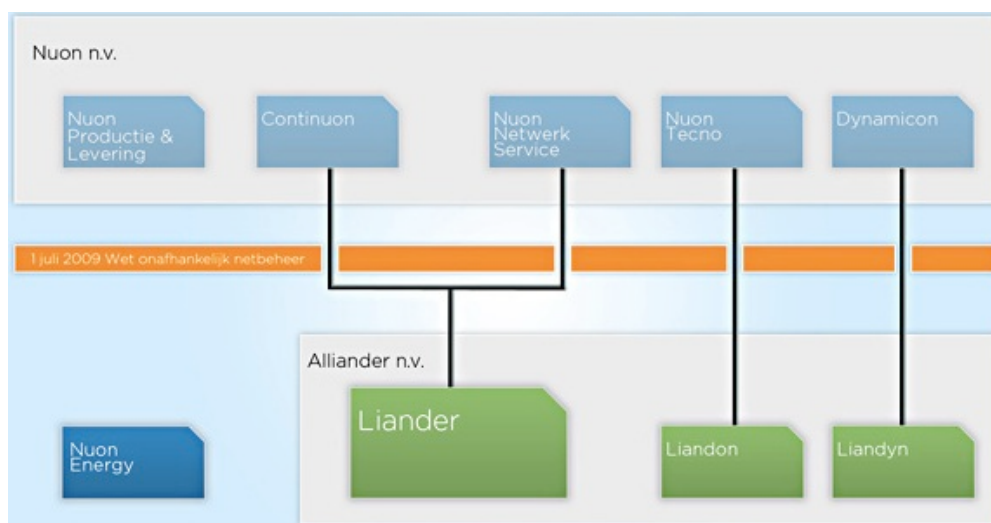


Figure 27 Consequences of the Dutch unbundling act of 2006 for Nuon N.V.

Their **strategy** to achieve this is by positioning their customers at the heart of all their activities. Their core business is the management of electricity and gas grids, which they reinforce by supplying a wide range of products and services. These products and services result in lower charges for their customers, greater expertise and opportunities to realize renewable energy initiatives⁹.

Liander N.V.

Liander N.V. is the Dutch nation's largest grid operator of the medium and low voltage network and of the (high and low pressure) gas grid and also the main activity of the Alliander holding. This latter fact manifests itself in the practice that Liandon has barely any free innovation budget. As a result, Liandon currently needs to obtain funding for almost every innovation project from Liander.

⁹ <http://www.alliander.com/en/alliander/about-alliander/strategy/index.htm>

Moreover, it is important to note that due to the great dependence of the Dutch nation on the power grid, Liander is working in the regulated domain and is monitored by the government. Hence, the energy distribution price is once a year determined by Liander¹⁰ and scrutinized by the Dutch Energiekamer. The Energiekamer checks if the determined rates are realistic to the costs being made for actually distributing the energy. These static energy distribution rates are set because of the monopoly position grid operators have in the geographic regions in which they operate.

Thus, Liander's

- major aims on safety and reliability ("*if it's working, why change anything?*"),
- guaranteed workload and revenue (because of their monopoly position),
- and their background as former officials (see figure 28 on the next page)

could jointly result in lurking risk aversion or susceptibility to a lack of organizational change. Guaranteed work and revenue is obviously not a strong motivator for organizational change. The susceptibility could consequently translate into a related business culture and an approach not promoting free market thinking.

Liandon B.V.

Liandon B.V. designs, builds, manages and maintains complex energy networks and large (industrial) plants. Liandon is a service provider serving Liander, TenneT and other parties in terms of high voltage, medium voltage and gas. Liandon is furthermore primarily responsible for innovation, construction, renovation, management and maintenance of networks and installations *within* the Alliander holding. Unlike Liander, Liandon is not regulated and has (besides its main task of servicing Liander and TenneT) serious growth potential in the free domain. Ambitions of Liandon include (among others): facilitating the (R&)D¹¹ for Liander and also for TenneT (since Liandon's predecessor already did the latter before the Dutch unbundling act was accepted). Moreover, next to Liandon's solid technological capabilities, they have a significant potential in bringing technological innovations to market. These innovations can provide direction in novel technologies that can aid in fulfilling Alliander's mission. An important note of organizational nature is the fact that Liandon is currently reorganizing what brings along uncertainty related to employees' function specifications.

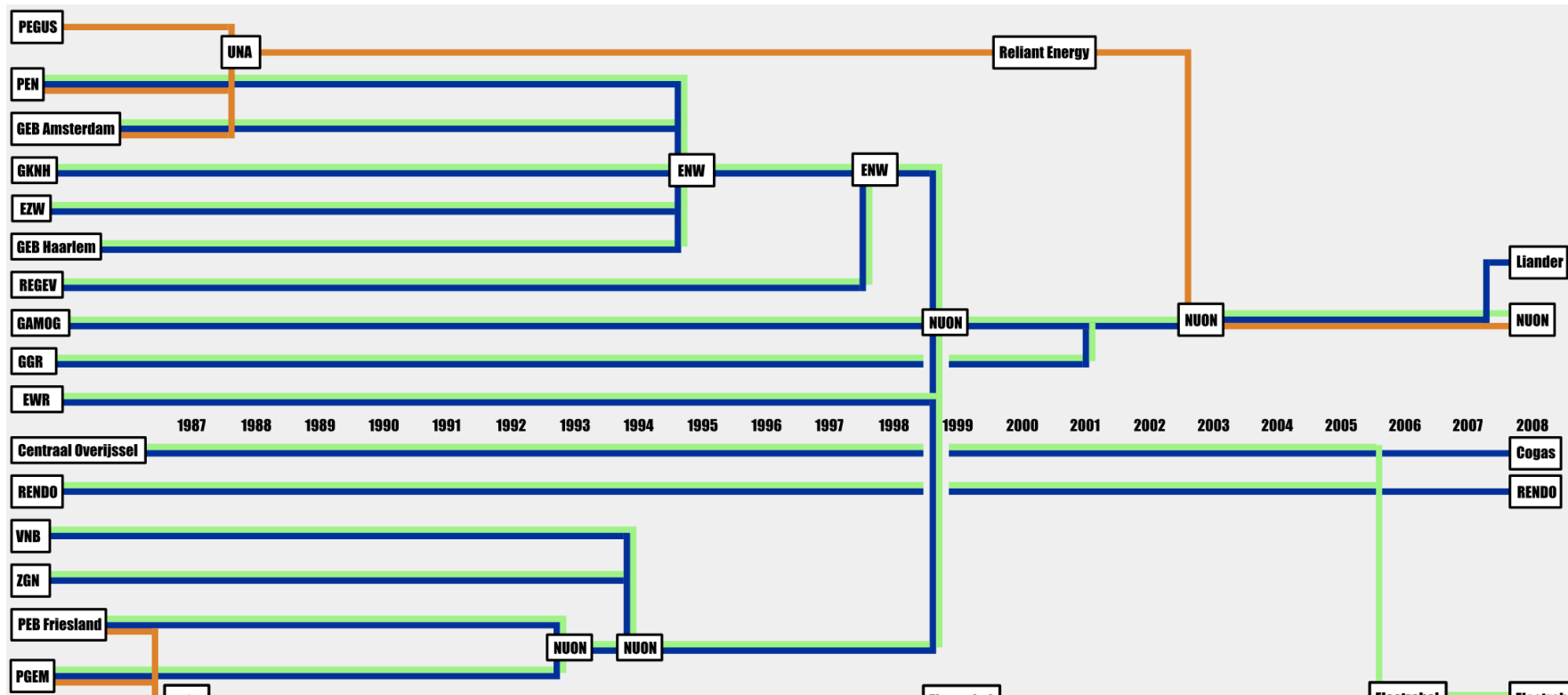
Other Alliander holding companies

Liander and Liandon take the main roles in this thesis and other Alliander companies are now mentioned only briefly.

Liandyn B.V. is a company active in public lighting and merged in November 2009 with Enexis Lighting to become Ziut B.V. Alliander bought grid operator Endinet B.V. in March 2010 thereby strengthening their number 1 network grid operator position. A joint venture between TenneT and Liander (called Reddyn) was furthermore formed on the 5th of July 2011. Both parties agreed to utilize Liandon employees for construction, management and maintenance of both parties' assets in Liander's geographical area.

¹⁰ Liander distinguishes connection rates (per connection) and transportation rates (per kWh).

¹¹ (R&)D instead of simply R&D due to the fact that Liandon does not have a research department but indeed does develop products.



Afkortingen bedrijven in 1986:

NRE: Nutsbedrijf Regio Eindhoven
SEP: Samenwerkende Elektriciteits-Productiebedrijven
EZH: Elektriciteitsbedrijf Zuid-Holland
ERL: Energiebedrijf Rijswijk-Leidschendam
EMH: Energiebedrijf Midden-Holland
GZO: Gasbedrijf Zeist en Omstreken
GMK: Gasbedrijf Midden-Kennemerland
EZK: Energiebedrijf Zuid-Kennemerland
GNOF: Gasbedrijf Noord-Oost-Friesland
ONS: Openbaar Nutsbedrijf Schiedam
GCN: Gasbedrijf Centraal Nederland
PUEM: Provinciale Utrechtse Elektriciteits Maatschappij
PEGUS: Provinciaal en Gemeentelijk Utrechts Stroomleveringsbedrijf
PEN: Provinciaal Elektriciteitsbedrijf van Noord-Holland
GKNN: Gasbedrijf Kop van Noord-Holland
EZW: Energiebedrijf Zaanstreek-Waterland

REGEV: Regionaal Energiebedrijf Gooi en Vechtstreek
GAMOG: Gasmaatschappij Oost-Gelderland
GGR: Gasvoorziening Gelders Rivierengebied
EWR: Energie- en Watervoorziening Rijnland
RENDO: Regionaal Nutsbedrijf voor Zuid Drenthe en Noord Overijssel
VNB: Veluwe Nutsbedrijven
ZGN: Zuidgelderse Nutsbedrijven
PGEM: Provinciale Gelderse Elektriciteits Maatschappij
EGD: Elektriciteitsbedrijf voor Groningen en Drenthe
GAZO: Gasbedrijf Zwolle en Omstreken
Limagas: Limburgse maatschappij voor gasdistributie
PLEM: Provinciale Limburgse Elektriciteits-Maatschappij
RNH: Regionaal Nutsbedrijf 's-Hertogenbosch
PNEM: Provinciale Noordbrabantse Energie-Maatschappij
PZEM: Provinciale Zeeuwse Energie-Maatschappij

Afkortingen fusiebedrijven:

REMU: Regionale Energiemaatschappij Utrecht
UNA: Utrecht, Noord-Holland, Amsterdam
EPON: Elektriciteits-Produktie maatschappij Oost- en Noord-Nederland
EPZ: Elektriciteits-Productie maatschappij Zuid-Nederland
EDON: Energie Distributie maatschappij voor Oost- en Noord-Nederland
ENW: Energie Noord-West
TZH: Transportnet Zuid-Holland

Herkomst buitenlandse partijen:

RWE: Duitsland
PreussenElektra: Duitsland (later E.ON)
E.ON: Duitsland
Reliant Energy: Verenigde Staten (Texas)
Electrabel: België (overgenomen door het Franse SUEZ)
DONG: Denemarken

LEGENDA

— Grootschalige productie van elektriciteit in Nederland
— Beheer van gas- en/of elektriciteitsnetten
— Levering (verkoop) gas en/of elektriciteit aan particulieren

* Datum fusie/splitsing bij benadering

Andere producten en diensten, zoals kabeltelevisie, drinkwater en stadsverwarming zijn buiten beschouwing gelaten

Alleen die bedrijven zijn opgenomen die op enig moment eigen gas- en/of elektriciteitsnetten in beheer hebben gehad

Opmerkingen en correcties:
paulb.wiki@gmail.com

N.B. Niet alle afkortingen en namen zijn courante handelsnamen geweest!

Appendix II Portfolio management methods

The strategic bucket method

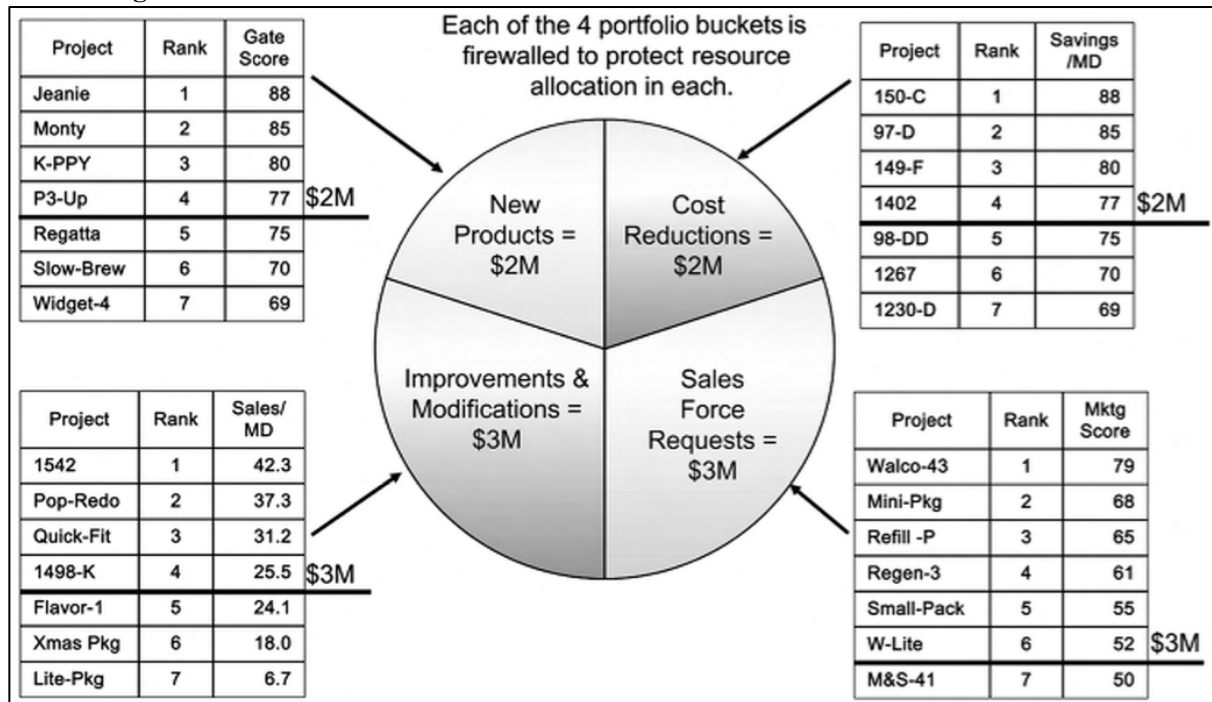


Figure 29 The strategic buckets method (Cooper & Edgett, 2010)

The product roadmap

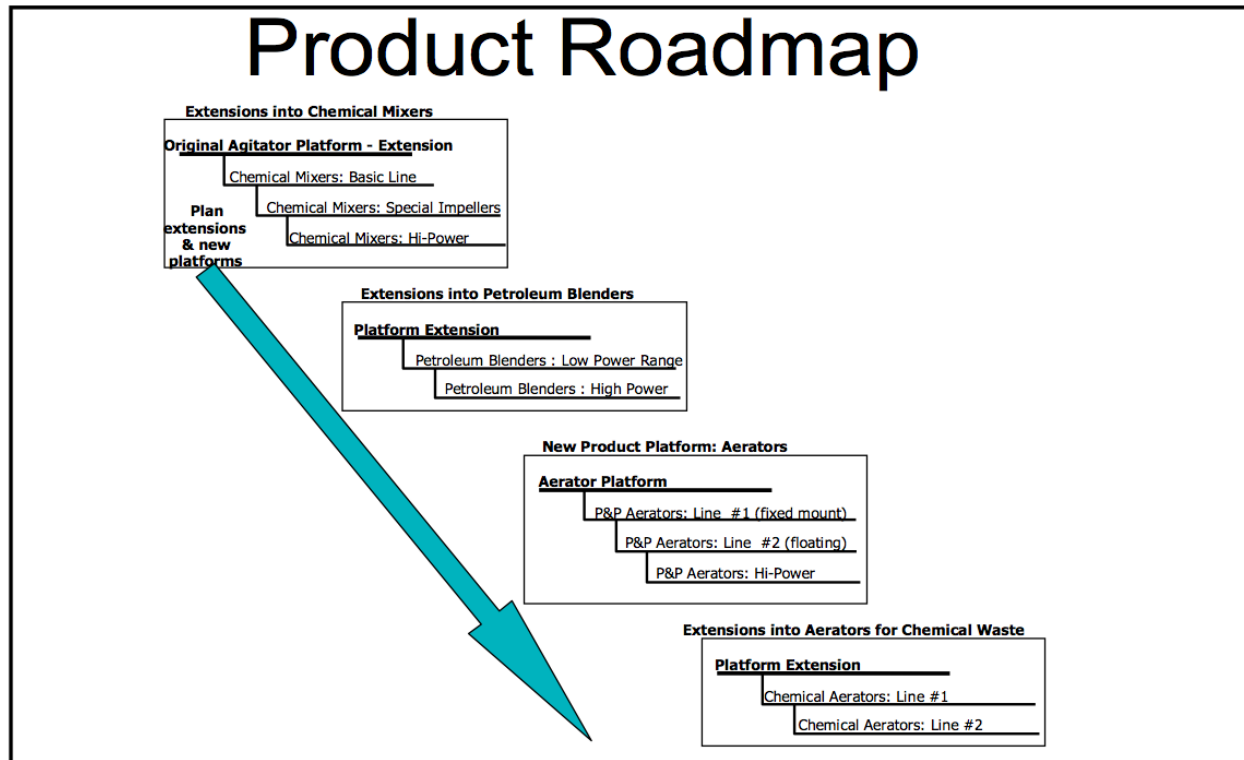


Figure 30 Product roadmap method (Cooper & Edgett, 2001)

Cooper (2005) advises multiple assessments and analyses in determining the main development projects for a strategic roadmap:

1. Already determined strategic arenas can make the required projects/products apparent;
2. A portfolio review of existing products clarifies products that need replacement and maybe even a complete new platform;
3. A competitors analysis assessing their (future) product lines to clarify private gaps;
4. A trend analysis of technological developments which presents the required (timing of) new technology or platform developments;
5. A trend analysis of the market that sheds light on the required projects to prepare for these market changes.

The NPV method

The NPV method is about the net present value of a project and is most of the time divided by the constraining resource. Projects are ranked according to these ratios until resources run out. This way, the sum of the ratios (and thus the value of the portfolio) is always at its maximum (Cooper & Edgett, 2001).

The ECV method

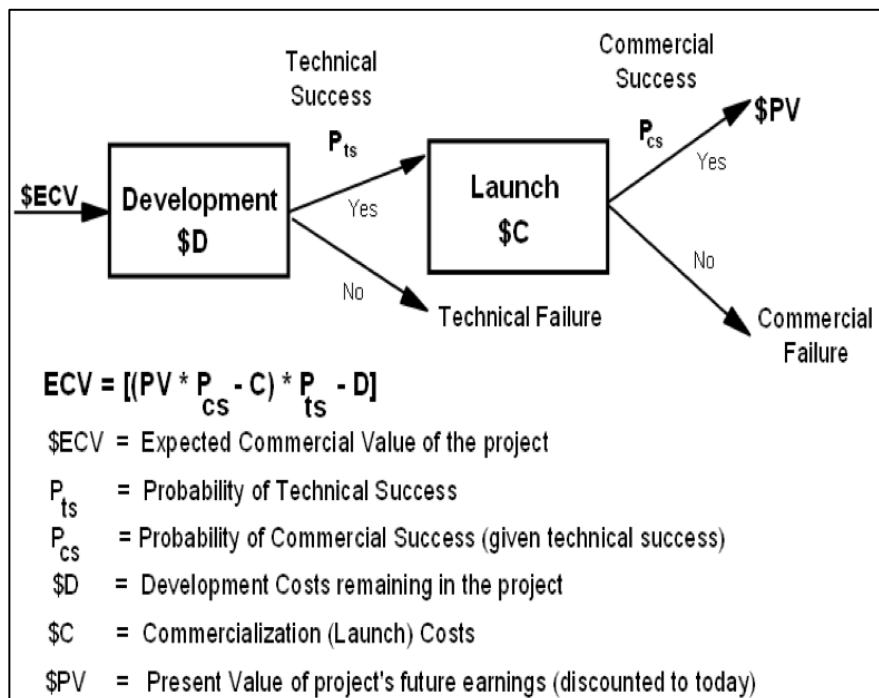


Figure 31 The ECV method (Cooper & Edgett, 2001)

The ECV method seeks to maximize the commercial worth of the portfolio and differs from the NPV method in that it takes along risk and probabilities. According to Cooper et al. (1998b) it is one of the more well thought out financial methods. Figure 31 shows a visual representation of the method with the formula on how the ECV value is calculated.

The scoring model method

<p>Strategic Alignment:</p> <ul style="list-style-type: none">• Degree to which project aligns with our strategy• Strategic importance <p>Product/Competitive Advantage:</p> <ul style="list-style-type: none">• Offers customers/users unique benefits• Meets customer needs better• Provides value for money for the customer/user <p>Market Attractiveness:</p> <ul style="list-style-type: none">• Market size• Market growth rate• Competitive intensity in the market (high=low score) <p>Synergies (Leverages Our Core Competencies):</p> <ul style="list-style-type: none">• Marketing synergies• Technological synergies• Operations/manufacturing synergies <p>Technical Feasibility:</p> <ul style="list-style-type: none">• Size of technical gap (large=low score)• Technical complexity (barriers to overcome) (many/high = low score)• Degree of technical uncertainty (high=low score) <p>Risk Vs. Return:</p> <ul style="list-style-type: none">• Expected profitability (magnitude: NPV)• Return on investment (IRR)• Payback period (years; many=low score)• Certainty of return/profit estimates• Low cost & fast to do <p>The six Factors are scored (0-10) for each project at gate review meetings by the 'gatekeepers'. Bulleted items are discussed to arrive at Factor Scores. Each Factor must clear a minimum hurdle. They are then added (weighted or unweighted) to yield the Project Attractiveness Score, which is used to make Go/Kill decisions at gates and to prioritize projects.</p>

Figure 32 The scoring model method (Cooper & Edgett, 2001)

The scoring model method follows from decision makers scoring projects on questions recognizing superior products. The assumption that not everything can be reduced to a single quantitative figure pleads in favour of the scoring model due to its multiple scoring criteria. All projects receive a Project Attractiveness Score that must meet minimal requirements to remain in the portfolio (Cooper & Edgett, 2001).

The bubble diagram method

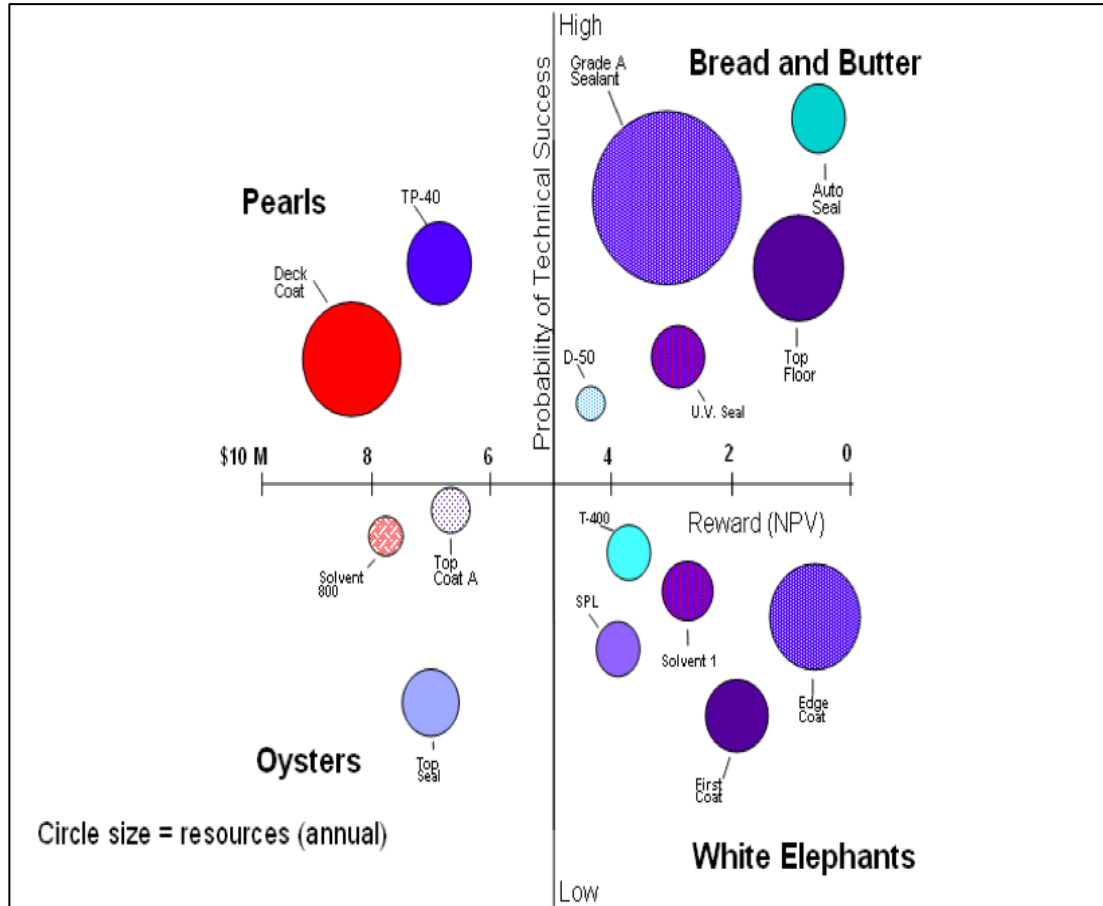


Figure 33 The bubble diagram method (Cooper & Edgett, 2001)

The size of the bubbles represent the relative amount of resources spent on the project.

Appendix III Benefits and drawbacks of portfolio management methods

Multiple portfolio management methods have been mentioned in this subparagraph and will now be summarized and compared (see table 8) to present an overview that grants (companies) insight in the methods' benefits and drawbacks.

NPV and ECV are summarized under the heading financial methods and strategic buckets and product roadmaps under the heading strategic methods. Although financial methods are the most frequently used methods (Cooper, 2005), they are worst in aligning the project portfolio with strategy, providing a very high value portfolio, preventing 'pipeline gridlock' and balancing the portfolio. This would implicate they are no good but that's one of the important notes within portfolio management: there is no single right method!

The financial methods have unreliable data as their input in the starting phase of a project and are therefore better in place in later phases. Strategic methods have clear benefits in terms of reflecting business strategy in spending, preventing 'pipeline gridlock' and selecting the right number of projects but on the other hand may result in an unbalanced portfolio. Strategic methods are used by 73% of the top performers in the industry compared to only 39% by the worst performers (Cooper, 2005).

A balanced portfolio and providing a very high value portfolio are results of the scoring model, which addresses rewards, strategic fit and probability of commercial and technical success. When the previously mentioned three methods would be implemented, a visual tool that provides overview of the entire portfolio would be missing. Such a visual tool is the (risk-versus-reward) bubble diagram. This tool shows every project with its place in terms of risk and reward and the size of a bubble representing relative resource investment, thus making it easy to monitor the balance of projects within the portfolio.

In short, no single portfolio management method is sufficient in fulfilling all portfolio management goals (Cooper, 2005; Barczak et al., 2009). Barczak et al. (2009) state that only the utilization of the strategic buckets method differentiates the "best" from the "rest". Therefore, companies need to use multiple methods (but strategic buckets at all times) to cover all goals and cover each method's weakness by another method's strength.

Portfolio management method	Benefits	Drawbacks
Financial methods - NPV - ECV	- Most attractive and popular - Output easy to communicate - Can help make go/kill decisions	- Radical innovations valued incorrectly thus favouring incremental projects - Lack of accurate and reliable data in first phases of NPD - Worst in: <ul style="list-style-type: none"> • Aligning projects with business objectives • Providing a very high value portfolio • Projects finished on time (no gridlock) • Balancing the portfolio
Quantitative criteria		
Strategic methods - Strategic buckets - Product roadmaps	- Radical innovations valued correctly - Best in: <ul style="list-style-type: none"> • Reflecting business' strategy in spending • Projects finished on time (no 	- May result in an unbalanced portfolio

	gridlock) <ul style="list-style-type: none"> • Selecting the right number of projects 	
Scoring model	<ul style="list-style-type: none"> - Captures multiple goals - Forces deeper considerations - Best in: <ul style="list-style-type: none"> • Providing a very high value portfolio • Balancing the portfolio 	<ul style="list-style-type: none"> - Imaginary precision (valuing projects is imprecise) - Tends to favour large projects - Allocating resources
Bubble diagram (Pie charts)	<ul style="list-style-type: none"> - Best in: <ul style="list-style-type: none"> • Aligning projects with business objectives • Balancing the portfolio 	<ul style="list-style-type: none"> - Information display, not a decision method - Worst in: <ul style="list-style-type: none"> • Reflecting business' strategy in spending
Qualitative criteria		

Table 8 Overview of portfolio management methods' benefits and drawbacks. Information distilled from Cooper et al. (2002a), Chao and Kavadias (2008), Kavadias et al. (2005), Grahn (2008), and Cooper et al. (1998a).

Multiple methods are needed along projects' lifespan as well to effectively assess their worth. So-called 'integrative firms' as described by Kester et al. (2009) are preferred since they utilize all portfolio management methods to gain a thorough understanding and overview of the value and position of both radical and incremental innovations. The only drawback would be potential 'pipeline gridlock' which could in turn be dealt with by the strategic buckets method in which clear budgets are defined.

Appendix IV Disproving Stage-Gate® misconceptions

Companies sometimes implement a process they label as Stage-Gate while some essential parts are not present or done wrong. Nine frequent occurring examples according to Cooper (2008a):

Not a functional, phased-review process

Activities in the Stage-Gate process are not (like in the heavy phased review process of NASA) carried out in a sequential way but rather in parallel. The problem with the sequential model is that accountability is absent and departments sometimes just throw projects over the wall.

The Stage-Gate process on the other hand is built for speed and activities are undertaken in parallel. Stages are cross-functional, and therefore not owned by a single department. Management of the process is straightforward since the amount and content of the stages and criteria are predetermined so to make systematic, well-timed decisions. The project team is empowered and accompanied by an entrepreneurial team leader.

Not a rigid, lock-step process

The Stage-Gate process is a map to get from A to B and not a rulebook with 'thou shalt's'. Thus diversions or shortcuts are certainly possible to bypass certain stages, deliverables or reorder activities along the stages.

Not a linear system

Figure 15 may insinuate that the Stage-Gate process is purely linear, but this is not the case. Within stages there is much looping, iterations, both sequential as well as parallel activities and overlapping. Even the stages themselves may overlap each other. Therefore, although the graphic representation is rather linear, the actual process is definitely non-linear.

Not a project control mechanism

The Stage-Gate process was never planned to be a project control mechanism for executives and financial people. Instead, (besides being a map) it is (also) a playbook to let team leaders get resources and shorten the project's time-to-market.

Not a dated, stagnant system

Although the Stage-Gate process originates in the late 1980s, the process of this very day shows little resemblance with the original process. Principles as putting the customer first still hold and new principles and best practices are now incorporated in the process. Lean manufacturing and Six Sigma do not replace the Stage-gate process but are actually integrated into the process. Hence, the Stage-Gate process is an evergreen process that evolves over time with help of changing principles and best practices.

Not a bureaucratic system

The suffix process or system let some managers think the Stage-Gate process is only more bureaucracy while the sole objective is a streamlined and structured process. In a pure pragmatic sense, every form of non-adding value can be excised.

Not a data entry scheme

The output from the activities during each stage can be managed using IT but it is important to stress the fact that it's not mainly about the data entry scheme. Moreover, IT can be a valuable tool in the Stage-Gate process for document management and communication between the group members.

Not just a back-end or product-delivery process

Both the fuzzy front end as well as the product-delivery process (development and commercialization) is incorporated in the Stage-Gate process. The fuzzy front end even entails the first three stages in figure 15 before the actual product development commences, thus becoming the most vital part of the process and contributing to a higher success rate.

Not the same as project management

This is also a misconception about the Stage-Gate process. Project management is a layer beneath the Stage-Gate process that without it would not function as well as it does. The Stage-Gate process is therefore no substitute for sound project management and is in fact used alongside the Stage-Gate process, especially in stages three, four and five (see figure 15).

Appendix V Dealing with common Stage-Gate® process fail points

Besides the possibility that companies do not fathom the Stage-Gate process, pitfalls and problems with the concept occur even when companies do understand the concept correctly. Seven of the most mentioned problems that companies encounter with implementing and working with the Stage-Gate process are (Cooper, 2008a):

1. Problems with the Stage-Gate manage process – making the gates work

Possibly the greatest of challenges is making the gates work. In a Stage-gate process with solid gating, inadequate projects are spotted early and are killed so to prevent further sunk costs. Projects that are in trouble are detected as well and send back with a ‘recycle’ decision to get the projects back on track.

Gates seem not to suffice as quality checkpoints since a lot of bad projects still are in the NPD pipeline. Only 33% of companies have solid gates that indeed kill bad projects (Cooper et al., 2002a; Cooper, 2005). Hence, too many bad projects or projects that are in trouble undesirably pass gates which is caused by:

- Gates with no teeth

Gates with no teeth is the number one complaint throughout companies that have implemented the Stage-Gate process. Both non-existent gates and gates with no teeth are causes for serious concerns. Jenner (2007) for example states that projects are rarely killed at gates while their main goal is to sift out bad projects. The projects are like express trains, slowing down certain stations (gate) but never actually stopping until they reach their final destination, market launch. Consequently, gates having no teeth make the Stage-Gate process a tunnel instead of a funnel not filtering out the bad projects and thus letting them take resources much needed on other projects. Too many firms use the Stage-Gate process as a one gate and five-stage process only checking them once and not frequently on strategy and consumer fit, lucrativeness and so on.

- Hollow decisions at gates

Another situation is that a go decision is made but no resources are committed and the project leader and members still cannot commence with the succeeding stage. Gatekeepers need to comprehend that gate meetings are moments on which to decide whether to continue to invest in the project (with the deliverables from the preceding stage as input for this decision) or bail out and keep the resources lost to a minimum.

- Who are the gatekeepers?

Further company difficulties are linked with whom to opt for the role of gatekeeper. Senior management feels he or she should be a gatekeeper and therefore too many gatekeepers are the result. When executives are reluctant to delegate authority to others, the product is a gatekeeper and a project leader being the same individual, obviously colliding with mind-set of the Stage-gate process.

As a rule of thumb, gatekeepers can be said to be the senior people in business who possess the resources required for a project team to move onwards. For great new product projects, the gatekeepers should be a cross-functional group of heads of the various departments concerned in the product (sales, R&D, finance and marketing). Note that in early stages, the amount of gatekeepers should be kept low so to avoid spending valuable executives’ time and having only the key resource owners present.

Furthermore, a clear distinction between a project leader and a gatekeeper can help managing the correct identification of the right gatekeepers: a gatekeeper gives advice, oversees and provides the financial resources for the project, much like a rugby coach. The project leader leads the team to the ultimate goal (market launch) by coaching them along the stages.

- Gatekeepers behaving badly

Senior management often misbehaves in the role of gatekeepers. A few examples:

- Pet projects. Projects diverting the gates since no one had the courage to go into discussion with senior management petting their private projects that have the highest fail rates (Cooper & Kleinschmidt, 1993).
- No resources committed and no decisions made.
- Go and kill decisions based on subjectivism, political reasons or a hidden personal agenda.

A strict distinction between the various roles is of utmost importance since senior management is in the Stage-gate process just a part of the decision making team and thereby cannot pet their projects anymore. Senior management frequently implements the Stage-Gate process in the belief that it will shake up lower layers so to change behaviour, but the most significant change in behavior will take place at their own layer(s). An example of rules of engagement can be found in appendix VII.

2. Misapplying cost-cutting models to innovation projects

In short, companies sometimes tend to apply concepts as Six Sigma and Lean Manufacturing to the innovation process. Both concepts are meant for manufacturing processes and not for a more failure, variation and good luck asking process like innovation is.

3. Trying to do portfolio management without a stage-and-gate process

Portfolio management is sometimes mistakenly believed to be the solution so that the Stage-Gate process is not needed for go/kill decisions and prioritizing projects. This is the case when gates have no teeth and killing and prioritizing simply do not come about thus putting portfolio management on the foreground. An effective Stage-Gate system is vital for durable portfolio management for the following reasons:

- Through gates with teeth, bad projects are filtered out early, thereby causing the funnelling effect which results in a healthier project portfolio
- A sound Stage-Gate process leads to data integrity that can be achieved by (more specifically) building in best practices and key tasks that ensure high quality data being acquired. Edgett (2007) finds data integrity as being one of the top issues in portfolio management.
- Without an appropriate Stage-Gate process in place, project teams do not know which and how the correct data can be gathered. The Stage-Gate process aids in gathering data the right way and the same way so that projects can be compared across each other and prioritized. Hence, portfolio management needs a layer beneath it to present it with sound data on which decisions can be made.

4. Too much bureaucracy in the idea-to-launch process

Some companies design a cumbersome process that does not fit the underlying thought of speeding products to market in an efficient way. They rather come up with a bureaucratic process that suffer from:

- Deliverables overkill. Too much (not relevant) information is gathered and presented at the gates for consideration. This detracts both the project team as well as the gatekeeper since the information overload costs time that is misspent. Three causes of this overkill:

- The project team is uncertain what to deliver at the gates; therefore over delivering to make sure the project passes.
 - Too detailed templates that are standardized across all projects cause incremental product innovation project teams to deliver information that is really not needed and an information overkill.
 - Some information that is interesting is in essence not vital for the decision to be made at the gate. The deliverables and templates for the project teams must be focused on the essential information to make an informed decision.
- Departments demanding much non-value-adding work in the stages trying to outdo other departments in their thoroughness. The process adds too much bureaucracy and should instead be slim, trim and thereby effective (Arra, 2007).

5. Too much reliance on software as a solution

Some people think that a software tool will be fixing an inefficient innovation process or will be a substitute for a solid idea-to-launch process. Although IT can facilitate an idea-to-launch process, it is always a layer above processes like NPD. *'You need a solid innovation process first, that you then incorporate into your software'* (Cooper, 2008a). Furthermore, vigilance is needed when utilizing elaborate software since it can also become distractive from processes that it should initially be serving.

6. Expecting the impossible from a process

The Stage-Gate process is not a universal remedy to all problems. The innovation process itself will be more transparent and clear but other weaknesses are thereby exposed that can be remedied by using the product innovation strategy as a benchmark for the NPD effort.

7. No pain, no gain

Implementation of a new process, system or concept always requires a certain amount of effort. Project leaders, team members and gatekeepers need to adapt to their new (and different) roles, which they maybe do not like. Fortunately, the results of their effort are significant and encompass increased success rates, higher profits and shorter time-to-markets.

Appendix VI Stage-Gate[®] process best practices

1. Integrate a best practice formal idea-to-launch framework.

This is the first best practice, not to just try product development in an informal process but professionally organize a framework. All people involved in the process (senior management as well as project members) need to understand, accept and comply with the process so to bring new products quickly and efficiently to market. This point in turn consists of twelve checkpoints to verify if this is really the case:

(1) The framework is a *clearly defined* and outlined idea-to-launch new product process (Cooper et al., 2004c). (2) The process is *visible and well documented* so that managers and team members are guided and know what to do. (3) The process consists of *clearly designated stages* that lead a product from idea to market launch. (4) *Activities are defined* within the stages and additional guidelines make clear how to execute them. (5) The process is an *enabling process* that helps project teams to receive management's recognition and resources and empowers them to drive their projects to market. (6) The framework is adaptable to the risk, size and needs of every individual project, thus making it *adaptable and scalable*. (7) All prior points mentioned are unnecessary when the process is not *really used* or avoided. (8) *Defined (go/kill/hold/recycle) decision points* need to result in real meetings between senior management and project teams to decide on and commit resources to the project. (9) *Visible go/kill criteria* at all gates need to make sure all people involved know exactly where projects are judged and prioritized on. (10) Next to known criteria where projects are judged on, *deliverables are defined* beforehand in the form of templates so that becomes clear what is to be produced. (11) *Gatekeepers are designated* to each gate that are project independent. This to prevent escalation of commitment amongst senior managers. (12) Lastly, a *process manager* is *in place* so to administer and monitor the process' performance and facilitate its entirety.
2. Quality of execution of critical tasks.

Vital tasks in the process need to be qualitatively well executed and may not ever be bypassed. Eighteen critical activities that should be built into the idea-to-launch framework and are vital for NPD success are now enumerated. The eight activities with the greatest impact on performance are designated with '(n-m)', where m=1 denotes the activity with the highest impact.

(1-5) Idea generation, (2) initial screening of the suggested idea, (3) preliminary market assessment, (4) preliminary technical assessment, (5) preliminary operations (or manufacturing) assessment, (6-7) a detailed market research on customer needs, (7-4) concept testing to verify the customer's response to the novel concept, (8-2) a (strategic, economic) value assessment of the product's value to the business, (9) a strategic business or financial analysis leading to a go/kill decision prior to actual development, (10) product development resulting in a prototype product, (11) alpha testing (internal product testing at the developer's location), (12-6) beta testing (product testing with customers in the field), (13-3) a trial sell to a selected customer base to test the marketing plan, (14) trial production to test the production and operations facilities, (15-8) a pre-market-launch business or financial analysis succeeding the development stage, (16) the start-up of full-scale production or operations, (17) the full-scale market launch with marketing and selling activities, (18-1) and lastly, a post-launch review that evaluates the project in terms of results, lessons learned and a formal closing of the project.
3. Competitive advantage through superior new products.

Products need to be (1) *superior in quality* and (2) *in meeting customer needs compared to competitors' products*. Moreover, a product needs to (3) *hold benefits important to the customer* and provide them with (4) *new and unique benefits* plus (5) *better value for their money*. These five factors seriously impact a new product's performance and therefore need

to be incorporated in the idea-to-launch framework as project selection and prioritization criteria.

4. Built-in voice-of-the-customer.

This best practice is based on the perspective that a customer should be involved as soon as possible to continuously gauge and check their problems, interests and (latent) needs. Incorporating the voice of the customer at every single stage of the Stage-Gate process is thus essential.

This point contains five best practices (Cooper et al., 2004c): (1) *The identification of customers' latent needs and problems* through voice-of-the-customer research is the strongest best practice.

(2) *Work with highly innovative users* like Von Hippel's (1986) lead users is widely incorporated to come up with major innovations. An important characteristic of so-called lead users is that they "face needs that will be general in a marketplace – but face them months or years before the bulk of that marketplace encounters them", and "are positioned to benefit significantly by obtaining a solution" (Von Hippel, 1986, p. 796).

(3) *Incorporate market research in defining the product*. Market research is an important input for the product design instead of a market acceptance verification tool. Start with the customer!

(4) *Fully integrate the customer in the development process* so to continuously have customer-input iterations alter the upcoming product (launch) to perfection.

(5) *Utilize studies on buyer behaviour as input for the market launch plan*. This additional best practice's focus is on the purchaser (who may not always be the same person as the end-user) and his buying behaviour.

5. Early product definition.

The sooner the product is defined on paper with a sound value proposition and various assessments, the less risky the development project will be due to unclearness. A fivefold of elements that are defined in time and discriminate best performing companies from the average and poor performing companies (Cooper et al., 2004c): (1) *the market targeted*, (2) *the product concept*, (3) *the benefits that the product will deliver to the customer*, (4) *the positioning strategy*, (5) and lastly, *the product's detailed specifications and features*. These five elements can jointly be mentioned in a template for project definition so to check off this point.

6. Solid upfront homework.

Solid upfront homework needs to be conducted to reduce uncertainty and vagueness as much as possible to prevent new and undesirable cost items. When for example the market is poorly analysed and an important market segment suddenly disappears, a new product platform may suddenly become completely redundant. According to Cooper (2005) homework is not done due to the fact that senior management does not demand it. The scoping and business case forming stages in figure 15 are deliberately put into place to carry out sufficient homework before the serious spending commences. With sound gatekeepers after both stages verifying the homework, this practice can be fended off.

7. Solid decision gates.

Solid decision gates that kill bad projects early are required to discontinue the bad projects from draining valuable resources that otherwise could have been invested in more profitable projects (Cooper, 2009). Hence, rigorous go/kill gates (as also described in best practice point number one) together with inserting the tactical portfolio management methods (as mentioned in paragraph 2.6.2) make the gates really work.

8. Put metrics in place.

Both the management of individual projects as well as the management of the entire project portfolio need metrics to gauge progress and performance. Without metrics, management has no tools to make rationally based decisions and cannot manage anything. Cooper (2005) even mentions the placement of metrics as the most important best practice of all. Furthermore, Cooper (2005) states three types of metrics need to be employed:

(1) *Metrics for individual NPD projects* (like the net present value, expected commercial value, market share, time to market, et cetera).

(2) *Metrics on how well the NPD process is working* check inter alia whether processes indeed stick to the process, if gates are effective and if schedules are met.

(3) *Metrics to gauge the business' overall NPD performance* are for example the percentage new products contribute to a business' revenue and profits, growth in sales, overall profits et cetera. No single metric is a panacea, what forces companies to utilize multiple metrics to gauge NPD performance. Moreover, focusing on a single metric may cause undesirable behaviour since for example "percentage of sales" can be attained by cannibalism of new products in the portfolio.

Note that business' overall NPD performance metrics are dependent on the quality of individual project metrics.

These eight main best practices with all their described subparts really contribute to the effective implementation or revision of an idea-to-launch framework.

Appendix VII Stage-Gate rules of engagement

1. **Gatekeepers must hold the meeting & be there**
 - postponed or cancelled meetings are not an option
 - if you cannot attend, your vote is "Yes"
2. **Gatekeepers must have received, read & prepared for the meeting**
 - contact the gate facilitator or Team if there are show-stoppers
 - no "surprise attacks" at the gate meeting
 - no "last minute reading" at the meeting
3. **Gatekeepers cannot request information beyond that specified in the deliverables**
 - no playing "I gotcha"
 - not a forum to demonstrate your machoism, political clout or intellectual prowess
4. **Gatekeepers must make their decision based on the criteria for that gate**
 - gatekeepers must review each criterion and reach a conclusion
 - a scoring sheet or "scorecard" for each gatekeeper
5. **Gatekeepers must be disciplined**
 - no hidden agendas
 - no invisible criteria
 - decisions based on facts and criteria – not emotion & gut feel
6. **All projects must be treated fairly & consistently**
 - must pass through the gate – no special treatment for executive sponsored or "pet" projects
 - subjected to the same criteria & same rigor
7. **A decision must be made**
 - within that working day
 - if deliverables are there, cannot defer the decision
 - a system built for speed
8. **The Project Team must be informed of the gate decision**
 - immediately
 - face-to-face

Figure 34 Senior management should develop and use "rules of engagement" for more successful gate meetings (Cooper et al. 2002b)

Appendix VIII Stage activities and gate questions of a typical Stage-Gate® process

NPD process phase	Stage description	Stage activities and gate questions
Discovery stage		
Gate 1 – Idea screen		Does the idea merit any work?
Stage 1 – Preliminary investigation	Scoping: a quick investigation and sculpting of the project.	<ul style="list-style-type: none"> - Preliminary market assessment - Preliminary technical assessment - Preliminary financial & business assessment - Action plan for Stage 2
Gate 2 – Second screen		Does the idea justify extensive investigation?
Stage 2 – Detailed investigation	Build the business case: the detailed homework and up-front investigation work leading to a business case; a defined product, a business justification and a detailed plan of action for the next stages.	<ul style="list-style-type: none"> - User needs & wants study - Competitive analysis - Value proposition defined - Technical feasibility assessment - Operations assessment - Product definition
Gate 3 – Decision to develop		Is the business case sound?
Stage 3 – Development	Development: the actual design and development of the new product. Additionally, the manufacturing (or operations) process is mapped out, the marketing launch and operating plans are developed, and the test plans for the next stage are defined.	<ul style="list-style-type: none"> - Technical development work - Rapid prototypes - Initial customer feedback - Prototype development - In-house product testing - Operations process development - Full launch & operations plans
Gate 4 – Decision to test		Should the project be moved to external testing?
Stage 4 – Testing & validation	Testing & validation: the verification and validation of the proposed new product, its marketing and production.	<ul style="list-style-type: none"> - Extend in-house testing - Customer field trials - Acquisition of production equipment - Production/operation trials - Test market/trial sell - Finalized launch and operations plans - Post-launch & life cycle plans
Gate 5 – Decision to launch		Is the product ready for commercial launch?
Stage 5 - Launch	Launch: full commercialization of the product – the beginning of full production and commercial launch and selling.	<ul style="list-style-type: none"> - Market launch & roll-out - Full production/operations - Selling begin - Results monitoring - Post-Launch & life cycle plans under way
Post launch review		<ul style="list-style-type: none"> - How did we do vs. projections? - What did we learn?

Figure 35 Content of a typical Stage-Gate process by Cooper (2000)

Appendix IX Integrating the portfolio review with the Stage-Gate® process

Consider this integration in perspective of figure 11's tactical portfolio management subdivision in the portfolio review and the Stage-Gate process.

Cooper et al. (2000) present (after initially mentioning the approaches in their book in 1998b) two approaches to link portfolio management methods with a Stage-Gate process:

1. The gates dominant approach
2. The portfolio review dominant approach

Besides the literature of Cooper et al. (2000), these approaches are further mentioned and legitimized in books (Cooper, 2001; Cooper, 2005), articles (Cooper et al., 2002a; Vähäniitty, 2004) and doctoral and master theses (Larsson, 2007; de Klerk, 2006; Jalonen, 2007).

Two approaches for integrating the concepts

The first approach is focused on the gates with the philosophy that when your Stage-Gate process is working well, the management of the portfolio will take care of itself. Gates with teeth are therefore of utmost importance and carry the emphasis in this approach.

Thanks to these 'toothed' gates, poor projects are killed, good projects are continued, mutually prioritized and resources are then committed. Mostly larger companies in mature businesses with reasonably static portfolios are well suited for this approach.

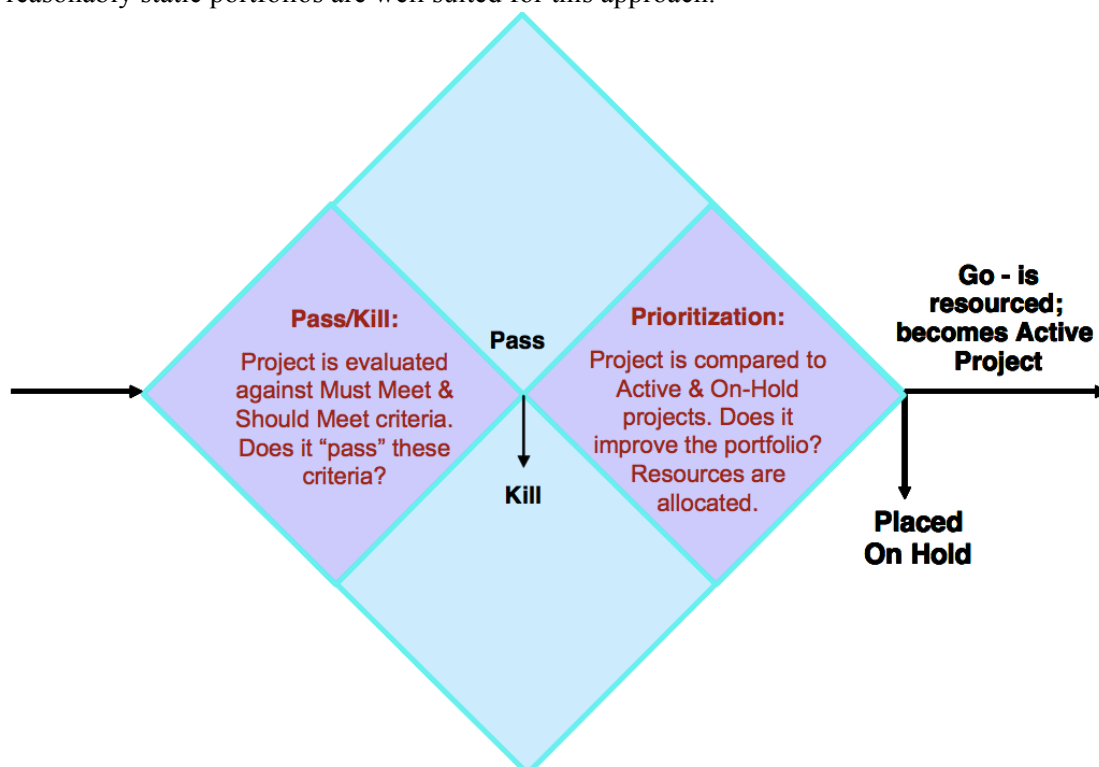


Figure 36 Gates dominant approach by Cooper et al. (2000)

Figure 36 illustrates this approach and presents the two decision parts that each gate encompasses. First a go/kill decision is made with methods like the NPV, ECV and the scoring model. The second part is the prioritization part in which the project is compared with other projects that are either active or set on-hold. The financial methods (NPV and ECV), the scoring model and balancing methods (the bubble diagram and pie chart) are used for prioritizing the projects. The output of this part is

dichotomously a go or hold decision. A portfolio review (conducted maybe twice a year) is in this review solely used for checking if the gates are working well (Cooper et al., 2000).

The second approach is backed by the philosophy that all projects do compete against each other. A single review (e.g. two to four times a year) with all projects on the table replaces the second gate as shown in figure 37. Other gates in the Stage-Gate process serve merely as checkpoints thereby totally differing from the gates dominant approach. These checkpoints check if the projects are on time, on budget, and still good projects, thus as input in an upcoming portfolio review. Fast paced companies in fluid markets may use this approach to save time in having only one portfolio review moment.

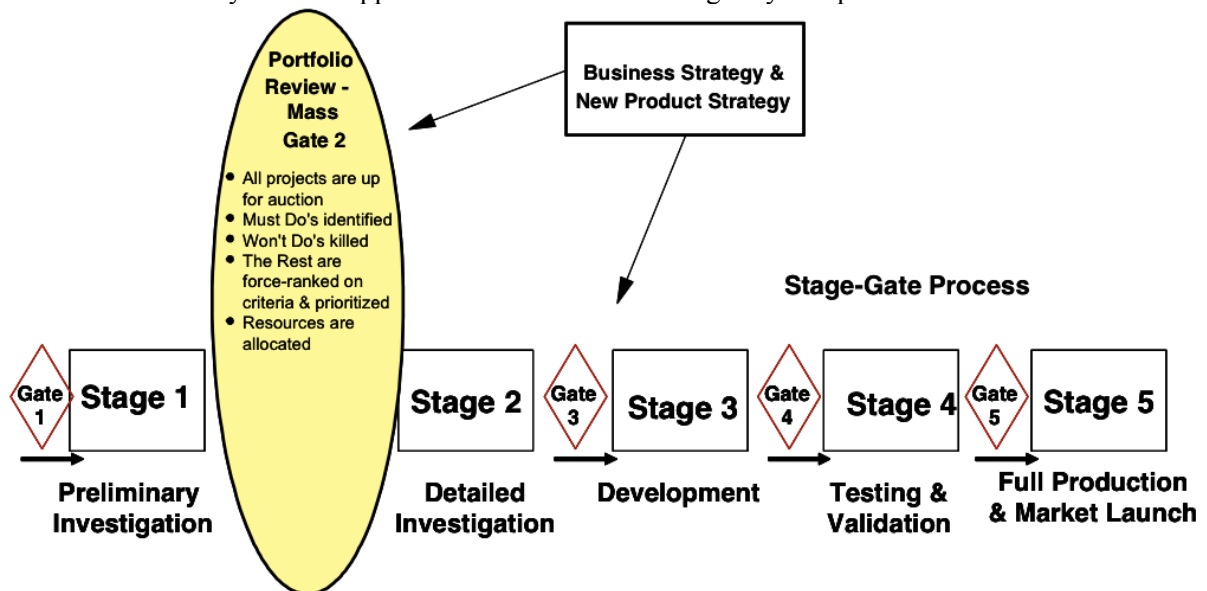


Figure 37 Portfolio review dominant approach by Cooper et al. (2000)

Figure 37 plainly shows that projects finishing stage 1 enter the second gate only through the portfolio review. This way, there is already data available on which decisions can be made for (dis)continuation of the project. In the portfolio review, all projects in succeeding stages of the NPD pipeline are put on the table to review and rank them. Senior management, which often consists of portfolio managers, first identifies must-do projects (still good or strategically crucial projects that are well underway) and then won't-do's which are immediately killed. Consequently, the remaining projects are ranked according to a forced ranking method. This method encloses ranking projects directly against one another instead of each individually on various criteria. Consequently, resources are committed from the best to the least good projects. As a result, an overview using bubble diagrams, pie charts and scoring models is presented (see figure 38) so to give insight in the portfolio balance and strategic alignment.

Prioritized Scored List of Active and On Hold Projects

Project	Rank (Priority Level)	Total Project Score	Portfolio Balance Factor	Adjusted Total Project Score
Soya-44	1	80	1.10	88
Encapsulated	2	82	1.00	82
Legume N-2	3	70	1.10	77
Spread-Ease	4	75	1.00	75
Charcoal-Base	5	80	0.90	72
Projects on Hold				
N2-Fix	1	80	1.00	80**
Slow-Release	2	70	1.10	77*
Multi-Purpose	3	75	.90	68
etc...	etc...			

Spending Breakdown by Project Type

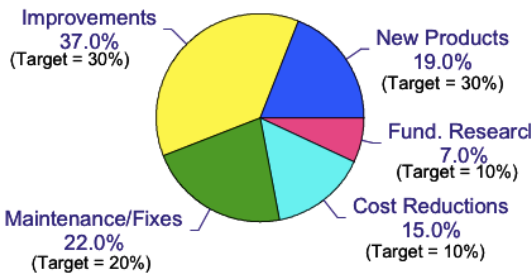
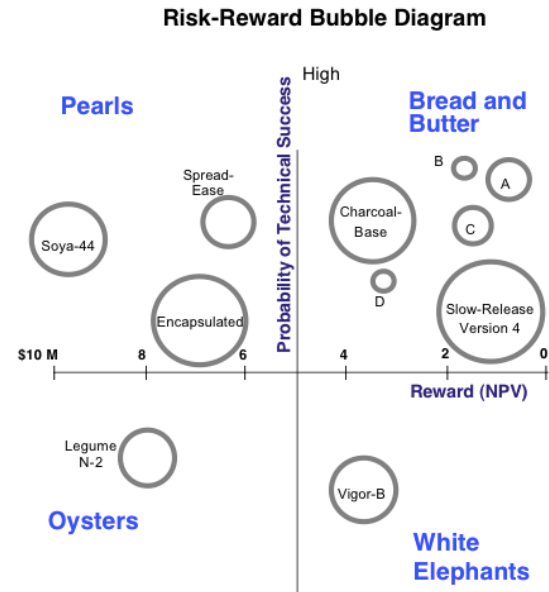


Figure 38 A scoring model, pie chart and bubble diagram showing portfolio balance and strategic alignment by Cooper et al. (2000)



An important difference with the gates dominant approach is the fact that resources are allocated exclusively in the portfolio review during the second gate and not at (succeeding) gates. Other gates can still kill and hold projects according to the criteria used, but these latter projects are only re-examined at a next portfolio review (Cooper et al., 2000).

Unique benefits of both approaches

Both approaches have their specific benefits compared to each other and therefore each company needs to consider what is most important in their context.

Benefits gates dominant approach	Benefits portfolio review dominant approach
Project team is present when their project needs defence or up-to-date information	Easier to prioritize projects periodically when looking at all projects rather than one-at-a-time at real-time
Portfolio review approach needs paramount time commitment from senior management	People finding difficulty with the two-part gate approach due to a lack of a comprehensive resource allocation perspective on all projects
Provides a more thorough assessment than a portfolio review could ever provide on all reviewed projects on the table	Prioritization of all projects in the NPD pipeline is done repeatedly (no pet projects)

Table 9 Unique benefits of the gates dominant and portfolio review approach by Cooper et al. (2000)

The U.S. Department of Energy (2007) states that gate meetings could be more informal and Stage-Gate components are an integral part of portfolio reviews thereby referring to the portfolio review dominant approach. Input from gates can help make the central portfolio decisions. According to Becker (2006) gates are *business decision checkpoints* where projects are checked and go/kill decisions are performed according to earlier conducted portfolio reviews. Hence, both articles prefer

the portfolio review dominant approach based on making the gates a not too bureaucratic occurrence. What is also underneath both statements is the portfolio review determining the light in which to view the individual projects at the gates.

Both approaches are thus about which part dominates the other, about the emphasis and if prioritization decisions are to be taken centralized at a portfolio review or rather taken decentralized at the various gates. Appendix X shows this principle and the fact that the portfolio review always has to deal with the various stages and gates no matter which approach is employed.

Appendix X Tactical portfolio management elements

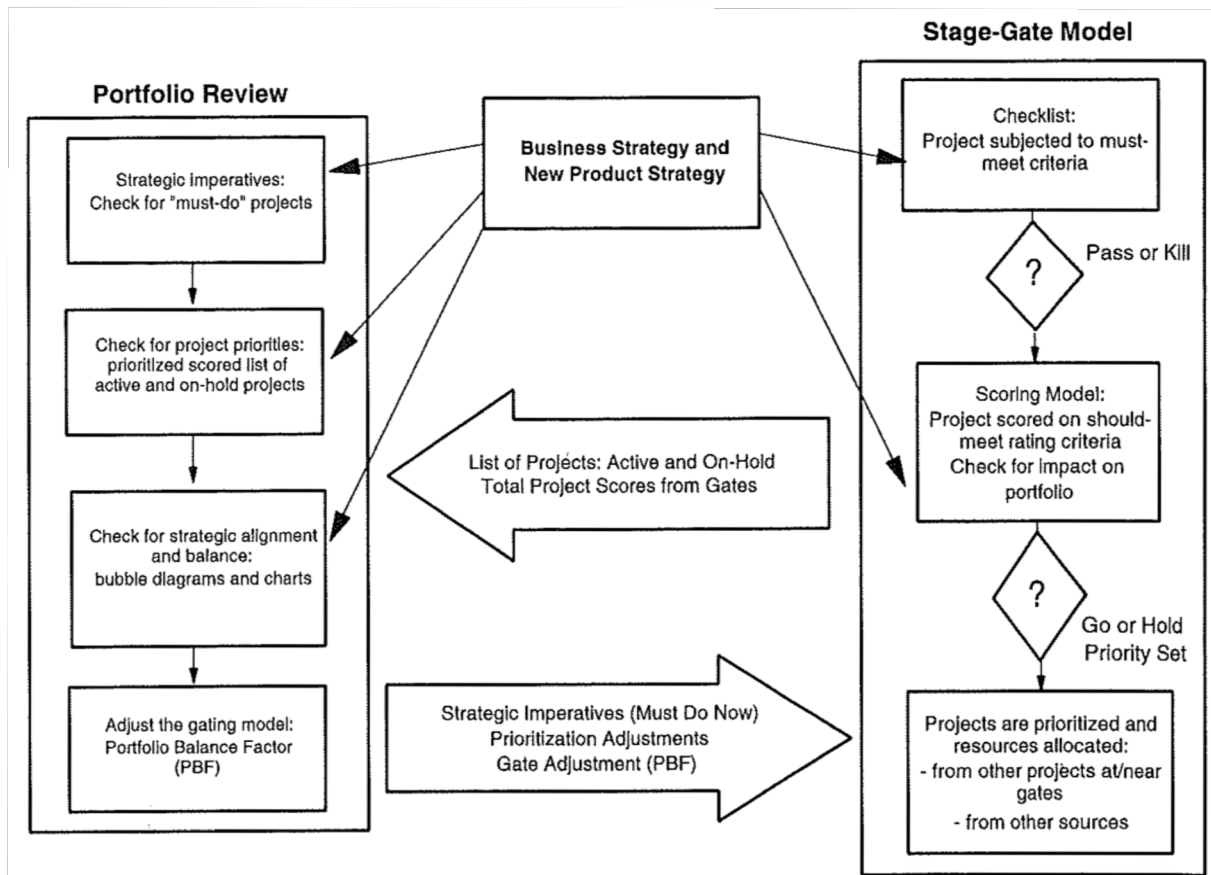


Figure 39 The tactical portfolio management elements by Cooper et al. (1998b)

Appendix XI Project Reporting Form

Information about this report	
Last update by:	VRIJGEDEVEN
Last update:	5-7-2011 10:47
Reporting blocked:	Nee
Agreed:	Concept
Date SAP-data in form:	5-7-2011 11:05
Information about the project	
Project number:	TEP-00001456
Kapstok number:	2110
Project name:	ET 2110 Superconductivity R&D 8
Period:	201106
Quotation Liandon:	dd.
order number:	dd.
Project status:	VRIJ
Project kind:	REGIE (3 monthly)
Project type:	WVDI
Other:	
Project manager:	Danny de Pater
Project controller:	Willie Kregting
Portfolio manager:	Maarten van Riet
Reference:	
Account number SD:	1336
Cost unit:	

Sales order SD:	0
Ledger number:	0

1. Project size

Project description

201102: HTS Superconductivity cable Phase 2 Proof of concept

201106:

Endproduct

201106:

2. Finance

	Budget	Realized				Expectancy	
	Budget	Realized Previous Years	Realized In 2011 until now	Total Realized Costs	Obligations / outstandings	Year Expectancy 2011	End Project Expectancy
Staff costs:		201.679	11.540	213.219		10.000	211.679
Materials:		0	11.000	11.000		0	0
Services:		600.535	229.351	829.886		300.000	899.535
Total cost price:	250.000	802.214	251.891	1.054.105	0	310.000	1.111.214
Int./ext.revenues:	250.000	842.081	0	842.081		123.000	965.081
Internal:				592.721			
External:				249.360			
Difference:	0	39.867	251.891	212.024		187.000	146.133

Notes deviation EPV over Budget.

Total budget amount:

Project completion expectancy:

Explained:

Cost price (€)	Yield (€)	%
250000	250000	0
1.111.214	965.081	-13
861.214	715.081	

Notes deviation EPV over Budget.

200904:

Cost price (€)	Yield (€)
0	0

201002: Budget overrun, EPJ en EPV aligned to actual costs	188.404	112.997
201012:	0	0
201102: The project has run longer and the corresponding revenues are not reported	0	652.000
201103: Subsidy revenues are most likely € 50K lower	0	-50.000

201012: Financial project details are no longer correct. In 2011, a new superconductivity project will be started consisting of 2 parts. The first part will deal with phase 3 and 4 and the second part with long-term conferences and publications.

201103: Subsidy revenues are probably € 50K lower due to not executing one of the original activities.

201106:

201106:

3. Time / Delivery date

Landmark status		Original	Most recently agreed with client	Expected	Realised
MS-Project milestone	MS-Project date	Baseline 10 Finish	Baseline Finish	Finish	Actual Finish
First delivery		31-dec-2010	31-dec-2010	1-jul-2011	
Final completion		31-dec-2010	31-dec-2010	1-jul-2011	
Administrative closure					

Techn. readiness: 95%

Project progress

201102: Comment on why project is exceeding the budget.

201103: Less work is done; therefore subsidies are no longer awarded.

201104: Person X will produce a financial report for the stakeholders and there also need to be made an accounting statement → has been communicated with person Y.

201106:

Planning

201103: Person X will produce a final report to send to company X this April.

201104: A to be composed financial report is scheduled for May by person Z + a discussion about the final report by person X

201106:

4. **Risks**

201103: Phase 2 had a term from January 1, 2009 till 31-12-2011. Biggest project risk is that phase 3 cannot proceed because of internal politics.

201106:

5. **Quality**

For the following reasons this project cannot be conducted according to a KAM system:

201106:

6. **Information**

201106:

7.

8. **Organisation**

Projectteam composition

201106:

Customer contacts

201106:

9. **Miscellaneous**

201106:

	Period	Edited by	Status info
	200905	RELEASED	✗
	200906	RELEASED	✗
	200907	RELEASED	✗
	200908	RELEASED	✗
	200909	RELEASED	✗
	200910	RELEASED	✗
	200911	RELEASED	✗
	200912	RELEASED	✗
	201001	RELEASED	✗
	201002	Matthijs Schenk	✓
	201003	RELEASED	✓
	201004	RELEASED	✗
	201005	RELEASED	✓ IPH
	201006	RELEASED	✓
	201007	Maarten van Riet	✓ IPH
	201008	RELEASED	✓
	201009	RELEASED	✗
	201010	Theo Boomsma	✓
	201011	RELEASED	✓ IPH
	201012	Maarten van Riet	✓ IPH
	201101	RELEASED	✓ IPH
	201102	Danny de Pater	✓ PV
	201103	Danny de Pater	✓ PV
	201104	Danny de Pater	✓ IPH
	201105	RELEASED	✓
Current ->	201106	RELEASED	✗

Appendix XII PRF related Kapstok overview

Meer informatie: KapstokID: **2110**

Omschrijving: ET 2110 Innov. Alliander 09: Supergeleiding
 Aangemaakt: 20-4-2009 8:40:52
 Opdrachtnemer: **LIANDON**
 Gewijzigd: 12-7-2011 10:49:32
 Aangemaakt door: Maarten van Riet
 Projectnummer: [TEP-00001456](#)

[Kapstokleden](#)
[Emaillijst in klembord](#)

ZOEKEN: Alle haakjes

Metadata **Algemeen** → General

Titel/Naam Kapstok	Title/Name Kapstok	ET 2110 Innov. Alliander 09: Supergeleiding	ET 2110 Innov. Alliander 09: Superconductivity
EindVerantwoordelijke	Final responsibility on	Maarten van Riet	
Projectleider	Project leader	Danny de Pater	GEACCORDEERD
Business Controller		Willie Kregting	+ Akkoord.
Afdeling / bedrijfsonderdeel Liandon	Business unit Liandon	PTO	
Vakgroep	Department	A&I Electrotechniek	
Projectnummer	Project number	TEP-00001456 ET 2110 Supergeleiding R&D 8	TEP-00001456 ET 2110 Superconductivity R&D 8
Calculatie			

Naar de klant verstuurde offerte in PDF
 Getekende Opdracht van de klant in PDF
 Vraag - door naar intakefase
 Verder naar opleveringfase?
 Metadata E toevoegen?

To the customer sent quotation in PDF
 Signed customer order in PDF
 Question – on to intake phase
 On to delivery phase?
 Add Metadata E?

Meer informatie: KapstokID: **2110**

Omschrijving: ET 2110 Innov. Alliander 09: Supergeleiding
 Aangemaakt: 20-4-2009 8:40:52
 Opdrachtnemer: **LIANDON**
 Gewijzigd: 12-7-2011 10:49:32
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 Projectnummer: [TEP-00001456](#)

[Kapstokleden](#)
[Emaillijst in Klembord](#)

ZOEKEN: Alle haakjes

Metadata **Algemeen** → General

Geen SAPCRM data beschikbaar

KTV formulier aanvragen
 Documenten Project Control
 Documenten Project Control
 Documents project control

No data available
 Request KTV form
 Documents project control
 Documents project control

Appendix XIII Core competencies literature

In the early 1990s, the Harvard Business Review placed an article by Prahalad and Hamel (1990) about so-called core competencies. These core competencies are “*the collective learning in the organization, especially how to coordinate diverse production skills and integrate multiple streams of technologies*” (Prahalad and Hamel, 1990, p. 4).

Three ways of identifying these core competencies (Prahalad and Hamel, 1990) are:

1. A core competence provides potential access to a wide variety of markets.
2. A core competence should make a significant contribution to the perceived customer benefit of the end product.
3. A core competence should be difficult for competitors to imitate.

Tampoe (1994) furthermore adds that core competencies must be little in number and vital to the development of core products.

Prahalad and Hamel (1990) further compared two companies starting with comparable business portfolios but with dissimilar performance results. The main cause was one firm did conceive itself in terms of “core competencies” where the other did not.

Senior management in the successful firm reckoned that success would depend on acquiring core products and competencies. Hence, the firm formed a committee of top managers to supervise the development of core products and core competencies. Furthermore, tremendous amounts of resources were aimed at developing these core competencies (Prahalad and Hamel, 1990).

Preceding the formulation of the core competencies, the firm carefully identified interrelated streams of technological and market advancements. The understanding rose that a company possessing the required competencies to serve these (latent) markets’ needs successfully would gain enormous growth potential. The firm got involved in a multitude of strategic alliances to speed up the development of competencies at relative low cost. Nearly all collaborations were oriented at technology access to build the core competencies and subsequently come up with the necessary core products.

At the company not conceiving itself in terms of core competencies, senior executives did not communicate a commonly accepted view on which competencies were required. Although serious effort was put in identifying key technologies, management continued to act as if they were managing autonomous business units. “*Decentralization made it difficult to focus on core competencies*” (Prahalad and Hamel, 1990, p. 4). The resulting practice was business units becoming increasingly dependent on external knowledge and skills that in turn led to staged market exits.

Real sources of competitive advantage are found in the ability of management to integrate necessary technologies and skills into competencies. This way, individual businesses can be equipped with the ability to adapt rapidly in changing environments. Additionally, project portfolios may for instance be altered while being rooted in the same competencies.

Prahalad and Hamel (1990) summarize the practical cultivation of a core competency mindset with three statements:

1. Stop considering business units as sacrosanct, this would result in resources being divided over business units instead of competencies.
2. Determine people and projects that represent the firm’s core competencies. This results in the message that core competencies are corporate resources, not business unit resources.
3. Assemble managers to determine next generation competencies. Determine the quantity of resources (financial and staff) every competency needs as an investment and how much each business unit should contribute.

Figure 40 summarizes this elaboration on core competencies by illustrating that competencies form the roots of a company. Combined, competencies enable the development of core products (e.g. superior engines), which in turn can enable business units to deliver their end products (e.g. cars) to the marketplace.

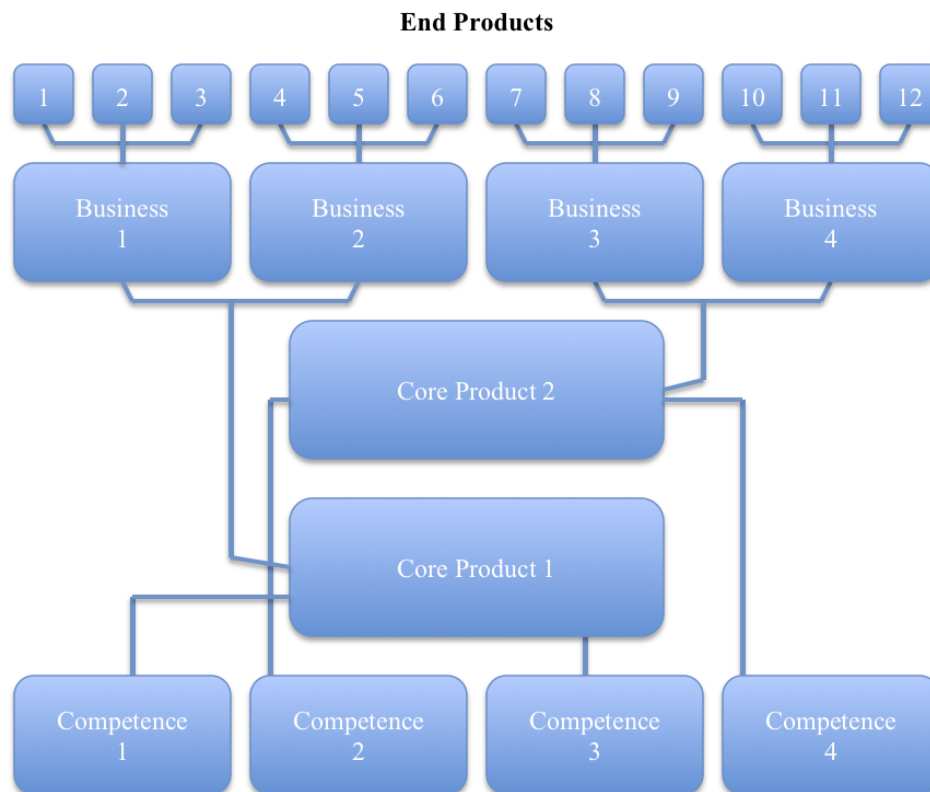


Figure 40 Competencies: The roots of competitiveness (Prahalad & Hamel, 1990)

Appendix XIV Liandon specific implementation recommendations on the content of the SPIS

Setting up NPD goals

Translate the formal business goal of *making innovation Liandon's business driver* into explicit NPD goals like “in 2020, 30% of Liandon's annual profit will come from new products”. This is a first step to link Liandon's NPD targets with those of the Alliander holding in light of the *strategy, goals and task* resource commitment approach.

Strategic arenas and the direction of the NPD effort

The marketing and sales (support) department needs to (conduct and) professionalize its market and industry analyses to secure a sound analysis of the world surrounding Liandon.

Both the market and the industry need not only be described but also assessed so to identify Liandon's markets and interesting technologies and products to develop. The business context already makes clear that Alliander and Liander are Liandon's main market and other market opportunities will form less important customers. Products meeting not only Liandon's primary market are more than welcome since they show potential in serving a much larger market. The SOAR analysis furthermore needs to be bend to a SWOT analysis incorporating Liandon's weaknesses and threats compared to its main competitors. The strengths of the SWOT analysis furthermore need to be translated into Liandon's core competencies that give it the necessary leverage.

Next, product-market and technology-product matrices need to be drawn to jointly provide insight in products and technologies that meet market (and first of all Alliander/Liander's) needs.

Lastly, the desired product portfolio needs to be determined from these business opportunities using the strategic map. Note that products meeting Alliander/Liander needs are considered firstly and have a high potential of being chosen as a desired product. This activity to, again, determine Liandon's products and technologies to be developed in line with Alliander/Liander's needs and (latent) desired products.

Drawing up strategic product and product-technology roadmaps

Liandon does not currently employ a formal resource commitment approach and since this is the first activity in this component, Liandon needs to formalize it to strategically obtain and commit resources. Moreover, Liandon does not put to use one single portfolio management method with which she could determine the various balances in its development portfolio. Required activities in this product innovation strategy component:

- Mapping all their selected business opportunities' products in a strategic product roadmap.
- Identifying and mapping the required technology and product development projects per desired product in a product-technology roadmap. These projects can be tacitly available at Liandon's major innovator but need to be made explicit.
- Next, senior management has to organize resources to draw up business cases of the individual development projects to make them explicit/tangible.

Now product-technology roadmaps aim at Alliander/Liander desired products and are made explicit with business cases per underlying development project:

- The product-technology roadmaps are communicated with their specific clients to 'sell' the roadmap's content.

Again, this is done with the *strategy, goals and task* resource commitment approach in mind. Liandon's clients are also guaranteed that they are incorporated in the individual development project decision-making process and help determine projects' deliverables.

- When funding for multiple clients' desired products can be organized and there are more than sufficient products to develop, tactical portfolio management methods are to be used to determine the best-balanced project portfolio.

- The last activity in this product innovation strategy component is mapping this balanced project portfolio in a strategic roadmap so to schedule Liandon's NPD projects in a single figure.

Tactical portfolio decisions and individual project selection

Individual development projects currently are 'managed' by PRF and Kapstok. These systems can indeed be used by a solid NPD process but are not a replacement for it. Senior management therefore has to design a Stage-Gate process that incorporates the industry's eight best practices (see paragraph 2.6.1) and the client as a gatekeeper and monitor. A technology development Stage-Gate process (called a Stage-Gate-TD process) also has to be organized to guide technology development projects that need differing assessment criteria and deliverables. The concluding piece of the NPD challenge puzzle is to set up a client-specific development project portfolio review. This portfolio review wields the development phase map, which is a summary of the client's desired product development progression. Proactively communicating the portfolio review and incorporating the client in the NPD process will increase the client's perceived degree of influence and lower his uncertainty.