Formalizing New Product Development Activities in a Multinational Food Company

From ideation to product qualification

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This thesis presents the findings of a case study into the management and organization of the front-end new product development (NPD) activities of a multinational food company.

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Max Dummer,

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Management Summary

Background
The multinational food company under study has production and sales facilities all over the world. Many products enjoy number 1 and number 2 market share positions in more than 50 countries and has a turnover of 10 billion globally. In the last four years the company under study implemented many changes with regard to new product development; introduction of a new business structure for Europe, new management and growth in number of employees at the R&D Centre. Although many tasks and responsibilities are documented, not all details per task are clear or described in the innovation stage-gate process. Another consequence of the lack of knowledge and unclear process is the individual way of working and problem solving process within each discipline.

Problem Statement
The main goal of the company is to develop sustainable products for the consumer market. Nowadays, many new products are not sustainable which result in disappointing product cycle times in retail and poor NPD performance. In order to develop more successful sustainable products, the company needs to improve the NPD process.

Research Objective
The objective of this research project is to formalize and coordinate tasks and responsibilities in the NPD stage-gate process with focus on front-end activities, based on a case study at a multinational food company, in order to make the process more effective. The research scope includes the investigation of the front-end stages in the NPD process; ideation and concept qualification. In the front-end stages costs are minimal and concept changes can be made without spending much effort. Finally, this research gives recommendations with regard to coordination and formalization of front-end activities in the NPD process of the company under study. Moreover, a redesign of the front-end stages is presented that is mainly based on the recommendations. Therefore, the central research question in this thesis is:

How to coordinate and formalize NPD activities in the front-end stages of the NPD stage-gate process of a multinational food company in order to deliver sustainable products to the market?

Methodology
The project context can be described as a 'practice-oriented research', which is about intervention in order to change an existing practical situation (Verschuren & Doorewaard 2005). In addition, the research can be divided into three phases:

1. **Problem finding**
   The first steps in this research framework are preliminary interviews and the execution of a survey on company level. These two approaches should reveal the problem in this case study and give a first impression of the company's innovation position compared to other companies in the Dutch food industry.

2. **Diagnosis**
   After identification of the problem as such and acknowledged by all stakeholders, the background and the cause of the identified problem are examined in the diagnostic stage. In this phase the desk research is completed which gives a profound background of the problem. Further, activities in this phase include: organizational wide in-depth interviews including 35 informants in order to gain deeper understanding of the identified problem and a project based survey including 9 NPD projects.

3. **Design**
   This phase gives a description of tasks and responsibilities for the redesign. Finally, conclusions and recommendations are derived based on this case study and literature.

Results

The results from the company analysis show that the company scores were on many aspects lower than the benchmark of the food industry. Some particular points that were incorporated in the redesign are: internal communication, sharing of information between marketing and R&D, open innovation and recognizing business opportunities. The project survey revealed the following points for improvement: product superiority, market potential and marketing support. Finally, the results from the open interview confirmed many of the previous mentioned points. In addition, informants stated that lack of project management and lack of higher management attention are points that should be improved in the current situation. Moreover, the company is internally focused with regard to recognizing new potential business opportunities. Finally, it became clear that multi-disciplinary cooperation in the front-end is not optimal which often leads to unclear project definitions.

Redesign

The redesign focuses on the ideation, concept qualification and the first part of the product qualification stage. Furthermore, this redesign is based on the outcome of the two surveys, literature study and the open interviews. Finally, it proposes a formalized way of working with regard to the front-end stages, in which needed input, responsibilities, activities and way of working are described. Moreover, the redesign facilitates the need for cooperation between the three disciplines that are heavily involved in the front-end; R&D, marketing and consumer insights.

Discussion and Conclusion

It is concluded that the potential of new products is highly depended on the front-end activities of the NPD process (Cooper *et al.* 2004). Therefore, it is recommended to follow the proposed redesign in order to increase multi-disciplinary input in order to create synergy in particular between R&D and marketing. Furthermore, by improving project management skills and increasing management attention in the front-end stages, one may ensure better project definition setting which will finally result in more high value projects with higher market potential and less time and resource consuming scope changes during the project cycle time.

List of Abbreviations

NPD	New Product Development
R&D	Research and Development
CI	Consumer Insights
TPL	Technical Project Leader
CPL	Commercial Project Leader
TBM	Technical Brand Manager
MM	Marketing Manager
PMR	Project Management Review
CTM	Consumer-Technology Matrix
KPI	Key Performance Indicator
NSV	Net Sales Volume
GP	Gross Profit
FY	Fiscal Year
WIAT	Wageningen Innovation Assessment Tool
UK	United Kingdom
NZ	New Zeeland
STU	Strategic Technology Unit

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1. Introduction

This research is conducted as part of the MSc program of the Management Studies Group of Wageningen University. The aim of this research is to gain a deeper understanding of new product development (NPD) practices in the food industry by conducting a case study at multinational food company based in Europe. The research focuses on the front-end stages of the new product development process, which include; ideation, concept qualification and product qualification.

In section 1.1 the company understudy is introduced. Section 1.2 concerns an introduction of the research and provides background information on the problem in question. Subsequently, the problem statement is stated in section 1.3. In Section 1.4 the conceptual design is discussed and elaborates on the research objective, research issue, research framework and the key concept definitions. Section 1.5 discusses the technical research design which deals with the research materials and research strategy. Section 1.6 describes the report structure. This chapter ends with the confidentiality statement in section 1.7.

1.1 Introduction to the Company

The multinational food company under study has production and sales facilities all over the world. Many products enjoy number 1 and number 2 market share positions in more than 50 countries and has a turnover of 20 billion globally. Two-third of annual sales are determined by the company's top 20 power brands. The vision of the company is to become the most innovative and productive R&D organization in the food industry by putting focus on consumer driven innovation and an open innovation approach to NPD.

1.2 Introduction to the Research

In the last four years the company under study implemented many changes with regard to new product development; introduction of a new business structure for Europe, new management and growth in number of employees at the R&D Centre. Despite all the efforts, not all employees within R&D Centre have sufficient knowledge about the innovation stage gate process. Further, employees are not always aware of current business needs, which results in misalignment in business goals and development efforts. Although many tasks and responsibilities are documented, not all details per task are clear or described in the innovation stage-gate process. Another consequence of the lack of knowledge and unclear process is the individual way of working and problem solving process within each discipline. Last but not least, the employees mindset is mainly driven by meeting deadlines, speed-to-market and quick wins, which finally results in deterioration of quality.

Despite the enormous amount of literature on NPD structures and processes (Kleinschmidt & Cooper, 1991; Cooper & Kleinschmidt, 1994; Cooper, 2001; Filippini *et al.*, 2004; Troy *et al.,* 2006; Cooper & Edgett, 1995a; 1995b; 2008) the question of how firms should implement an effective NPD process design for increased innovative productivity remains unanswered. However, some literature suggest that a flexible, project-by-project contingency approach is likely to result in better NPD efforts. In addition, Griffin (1997) stated that project

characteristics such as, product complexity and product newness also interact with the NPD process and affect cycle time. It appears there is no 'one-size-fits-all' solution (Olson *et al.*, 1995; Griffin & Hauser, 1994, 1996; Tatikonda, 1999; Milosevic & Patanakul, 2005; Hamancioglu *et al.*, 2007).

The scope of this research will be limited to only the front-end stages of the NPD process under study due to time reasons and the significant importance of this part. A solid front-end development part is particularly important for NPD in setting a well-defined project definition in which the target market, product concept and positioning, the value proposition, and the features and specifications are defined (Brown & Eisenhardt, 1995). Moreover, Cooper *et al.* (2004) state that much of the product success is determined in this front-end. Figure 1.1 shows the relationship between cost made during the NPD process and NPD funnel activities. The costs made in the front-end concern the ideation and concept qualification phase are minimal and concept changes are relatively easy to implement. Furthermore, the front-end should be characterized by multi-disciplinary teams that work closely together on four critical points (see Figure 1.1).

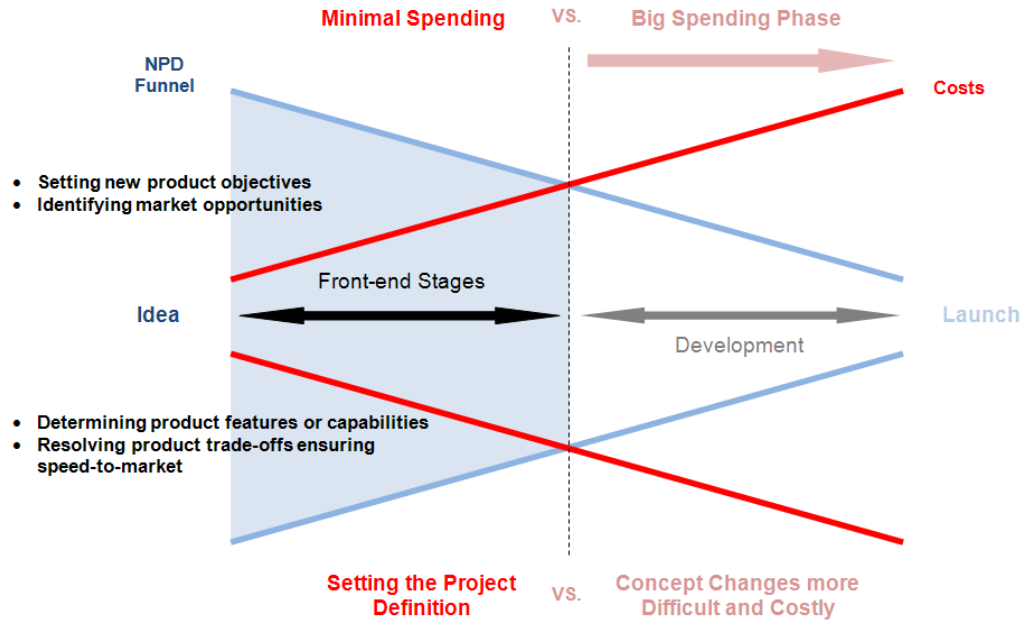


Figure 1.1 The importance of a solid front-end development part.

1.3 Problem Statement

The main goal of the company is to develop sustainable products for the consumer market. Nowadays, many new products are not sustainable which result in disappointing product cycle times in retail and NPD performance. In order to develop more successful sustainable products, the company needs to improve the NPD process.

1.4 Conceptual Design

The conceptual design gives direction to the research on what, why and how much is studied. Further, It also includes the research objective, the research questions, the research framework, and definition of the key concepts (Verschuren & Doorewaard, 2005).

1.4.1 Research Objective

The objective of this research project is to formalize and coordinate tasks and responsibilities in the NPD stage-gate process with focus on front-end activities, based on a case study at a multinational food company, in order to make the process more effective. The research scope includes the investigation of the front-end stages in the NPD process; *ideation* and *concept qualification*. The front-end stages in the NPD stage-gate process are crucial for companies to weed out the "bad" ideas in order to ensure successful launching of new products into the market. Secondly, costs are minimal in the front-end stages and concept changes can be made without spending much effort. Finally, this research gives recommendations with regard to coordination and formalization of front-end activities in the NPD process of multinational food companies in general and the company in particular.

1.4.2 Research Issue

The research issue can be divided into the formulation of one central research question which is based on three main research questions divided per research phase. The three main research questions are then broken down into several sub-questions which focuses on the information needed to answer the main research question of the particular phase. The research questions had also a steering function and stated what activities needed to be performed in the study (Verschuren & Doorewaard, 2005). The following research questions were stated:

Central-question:
How to coordinate and formalize NPD activities in the front-end stages of the NPD stage-gate process of a multinational food company in order to deliver sustainable products to the market?

Research questions per phase:

Problem Finding Phase

1 How innovative is the company under study and what points for improvement can be identified?

1.1 How innovative is the food industry in general?
1.2 How innovative is the company under study compared to the Dutch food industry?
1.3 How was NPD projects performance of the company in the past?
1.4 What points for improvement can be identified in the company's current NPD process to make it more successful and effective?

Diagnosis Phase

2 How are NPD activities currently organized at the company under study?

2.1 Why is NPD important for companies and how did NPD evolve in the last decades?
2.2 How is NPD currently organized in the food industry?
2.3 What does the literature mention about the critical factors of NPD?
2.4 What is according to literature the importance of strategy in front-end NPD activities?
2.5 How are NPD activities of the company under study currently organized in the front-end stages, *ideation* and *concept qualification*?
2.6 What are critical points in the company's NPD process?

Design Phase

3 How to re-design and formalize the front-end stages in the NPD process?

3.1 How to organize NPD activities in an efficiently and transparent way?
3.2 What steps are necessary in the NPD process from marketing brief into R&D brief, "the technical translation", in order to make the NPD process more effective?
3.3 How to design and implement a feasibility study for the front-end NPD process to ensure project viability in later stages?

1.4.3 Research Framework

The project context can be described as a 'practice-oriented research', which is about intervention in order to change an existing practical situation (Verschuren & Doorewaard, 2005). An appropriate method to carry out the problem analysis is the so-called intervention cycle. This means following a predefined set of steps to reach a solution in case of operational problems.

Verschuren & Doorewaard (2005) distinguished five steps or stages, however, in this research project the 4th and 5th stage will be skipped because of time reasons and the limited scope of the project.

1. *Problem finding*
   The first steps in this research framework (see Figure 1.2) will be preliminary interviews and the execution of a survey (WIAT Company). These two approaches will reveal the problem in this case study and give a first impression of the company's innovation and NPD performance compared to other companies in the Dutch food industry.

2. *Diagnosis*
   After the problem has been identified as such and acknowledged by all stakeholders, the background and the cause of the identified problem are examined in the diagnostic stage. In this phase the desk research is completed which gives a profound background of the problem. Further, activities in this phase include: organizational wide in-depth interviews to gain deeper understanding of the identified problem and a project based survey (WIAT Project) will be used in order to make an analysis of nine NPD projects.

3. *Design*
   The design phase is the third and last step in this research and consists of determination of the success and failure factors of projects. In this phase also a description of tasks and responsibilities in the feasibility phase is given. Finally, conclusions and recommendations are derived based on this case study and literature.

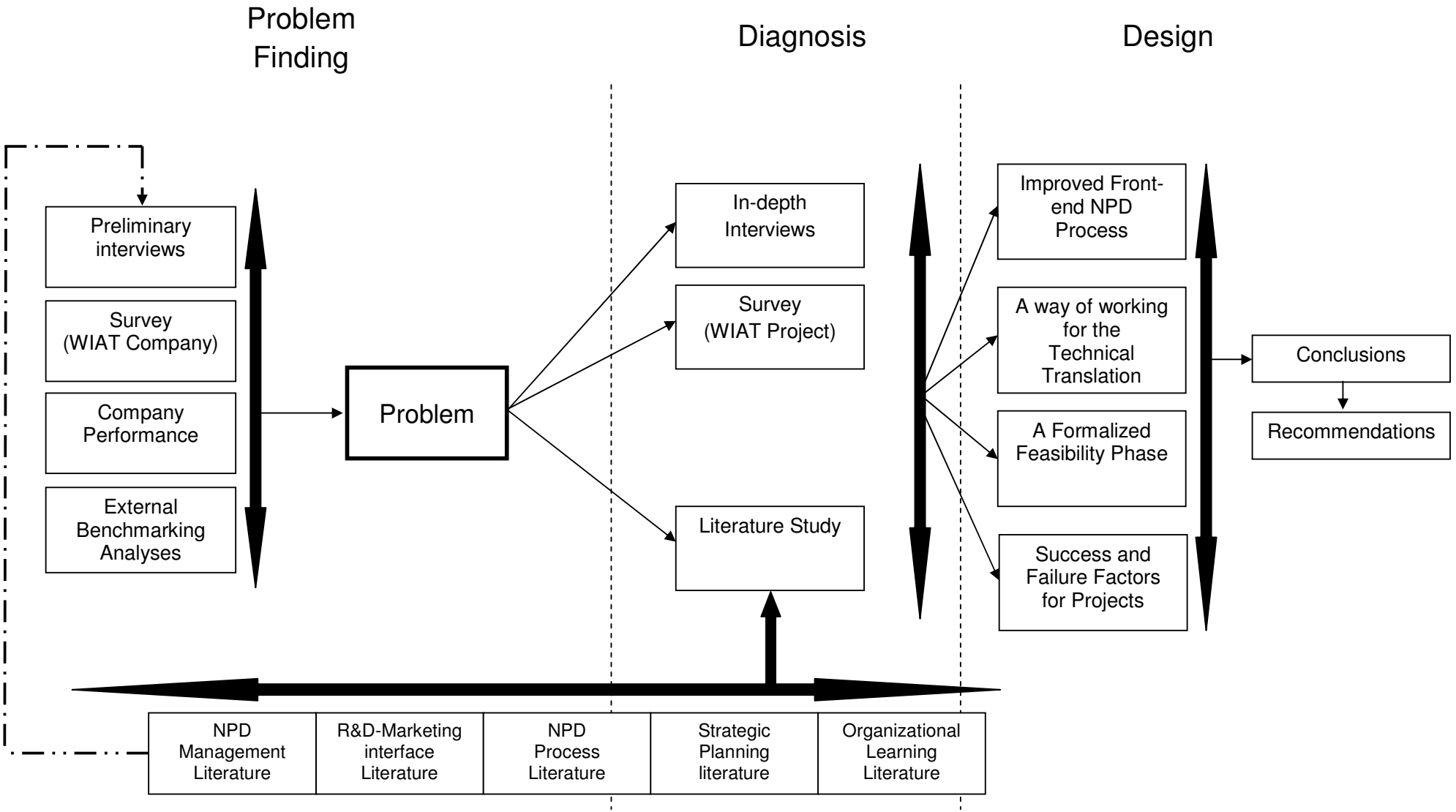


Figure 1.2 Research framework.

1.4.4 Key Concept Definitions

Innovation
Innovation is the process of translating ideas into useful- and used- new products, processes or services (Tidd *et al*., 2005)

New Product Development
The complete process of bringing a new product or service to market (Cooper, 2001).

New Product
A product that has been on the market for five years or less, and includes extensions and significant improvements (Cooper, 2001).

Integration
A state of continuous exchange of information between organizational subunits and conformity with regard to decision-making authority (Bonoma, Slevin & Narayanan, 1977).

Feasibility Study
The assessment of the possibility that a design process, or material for production fulfils all the engineering requirements with the minimum capacity required at the specified volumes (Sorli & Stokic, 2009).

Front-end NPD activities
The front-end stages of the NPD process refer to the ideation, concept qualification and product qualification stage.

Ideation Stage
Deep dive into opportunity and use of consumer-closeness for development of platforms for ideation.

Concept Qualification Stage
Development of ideas into consumer-validated concepts.

Product Qualification Stage
Development of R&D prototype and marketing mix.

Technical Translation
The translation process from marketing brief into a workable R&D brief.

Sustainable
Sustainable development implies a corporation with long range vision, sustainable profit and an expanded definition of corporate assets that includes the natural capital used by the firm (Rubenstein, 1994).

1.5 Technical Research Design

This section discusses the technical research design of the project. Research materials, research strategies.

1.5.1 Research Material

For this research, the following research material is used:

- *Scientific literature*: Reports, scientific articles, journals, documents, e.g. Tidd *et al*. (2005), Cooper (2001), Wheelwright & Clark (1992), Hamel & Prahalad (1994), Roussel *et al.* (1991)
- *People*: Respondents for Wageningen Innovation Assessment Tool (WIAT) surveys, informants, industry experts, employees
- *Internal information company*: Internal reports, experts, Marketing Academy Tool, experiences, opinions.
- *Techniques*: WIAT analyses.

1.5.2 Research Strategy

The research started with defining the research area and the initiation of the literature study, this part can be characterized as a desk research strategy. In order to make a thoroughly problem analysis, a survey (WIAT Company by Fortuin & Omta, 2009) and preliminary interviews were completed. In addition, the WIAT Company enabled us to make a comparison of the company to eight other (multinational) food companies in the Netherlands. Further, also a comparison between R&D and Marketing was possible in order to identify differences in vision with regard to innovation and NPD.

WIAT Company

The WIAT questionnaire relies on subjective managerial input on multiple criteria from both marketing and R&D management. The analysis of the results from the questionnaires may point at points for improvement within the organization, which can also be incorporated in discussions, learning and decision making to become more innovative.

Desk Research

For the desk research part, the Wageningen University library was used to find topic related articles, papers and books but also conferences, NPD workshops, internal and external reports. The searches in the University library were done in the databases Scopus, and Web of Science. Articles were mainly retrieved from the following journals; R&D Management, Journal of Product Innovation Management, Technovation, Journal of Marketing Research, and Journal of Marketing.

Open Interviews

The next step in the research was a case study based on in-depth interviews which helped to gain a profound insight into the company's innovation stage gate process. Especially in a practice-oriented research project, a case study has its advantages. Firstly, it offers a perfect opportunity to gain an overall picture of the NPD stage gate process of the company, which is in addition an advantage in a research project aimed at changing an existing situation.

Secondly, this variant of research needs less pre-structuring and as a result is more flexible in this way. A case study is characterized by the following attributes (Verschuren & Doorewaard, 2005):

1. A small number of research units
2. Labour-intensive data generation
3. More depth than breath
4. A selective, i.e. a strategic sample
5. Qualitative data and research methods
6. An open observation on site

Several modalities and variants can be distinguished within the case study strategy. This research project implemented the single case study variant in which only one case is thoroughly examined. In addition, the concept of triangulation on both sources and methods was applied in the case study strategy and included the use of various sources and methods in order to eliminate chance as much as possible.

Another method that will be used in the diagnosis phase of this research is a survey, the Wageningen Innovation Assessment Tool (WIAT) analysis which is a benchmarking tool that investigates the potential of innovation projects. The WIAT project is based upon studies from among others Cooper & Kleinschmidt (1991) and Hollander (2002). While most of the previous studies have researched other sectors (i.e. high tech sectors) and industries than the agri-food sector, WIAT focuses mainly on the application of the tool and collection of data in agri-food companies (Tepic *et al.,* 2009 and Fortuin *et al.,* 2007).

WIAT Project
The WIAT project detects the strengths and weaknesses of innovation projects, by predicting the potential of an innovation project by extracting the tacit knowledge of the innovation project at the start or during the innovation process.

The WIAT is used as a survey. A questionnaire of a total of 41 statements is filled out by all team members from different disciplines involved in 9 pre-selected new product development projects. The analysis of results from the questionnaires may point at early warning signals, which can then be incorporated in discussions, learning, and decision making to enhance the chances to success of the project (Tepic *et al.*,2009).

1.6 Report Structure

This report starts with the introduction to the company, the introduction to the research, the problem statement, the conceptual and technical research design. Chapter 2 discusses the changes in NPD in the last decades. Chapter 3 provides an overview of the critical factors in the front-end NPD activities. In chapter 4 the methodology of this research project is discussed. Chapter 5 concerns the company analysis and discusses the results. In chapter 6 the results of the NPD project analysis are presented. Chapter 7 deals with the outcome of the open interviews. In chapter 8 the redesign of the front-end stages is presented. This research report ends with some conclusions, recommendations, discussion and further research in chapter 9.

1.7 Confidentiality

For matters of confidentiality, the official version of the thesis has been adjusted to this public version. Certain confidential parts e.g. the company name, product descriptions, interviews and appendices have been removed. The adjustment of this thesis is done by carefully taking into account the readability of the thesis for students for learning purposes.

2. New Product Development in the Last Decades

2.1 Introduction

This chapter deals with an introduction to NPD in general and the food industry particular by discussing a number of key concepts which are essential for understanding NPD. The chapter starts with an introduction to NPD and the importance for companies in section 2.2. In section 2.3 NPD key concepts are explained and their change during the last decades. In section 2.4 NPD introductions in the food industry are discussed. Also part of section 2.4 is the elaboration of the current NPD approach applied in the food industry and its impact on new product introductions. The chapter ends with some concluding remarks in section 2.5. Last, this chapter aims to answer the following research questions:

RQ 2.1: Why is NPD important for companies and how did NPD evolve in the last decades?

RQ 2.2: How is NPD currently organized in the food industry?

RQ 1.1: How innovative is the food industry in general?

2.2 What is New Product Development?

Getting the right product to market, rapidly and efficiently, is crucial for every company that is trying to succeed in today's fast-moving competitive environment. Innovation is one of the few means of achieving lasting competitive advantage against increasingly sophisticated low-cost producers and the private label trend. In addition, sustainable growth is a desire and a challenge to most firms (Hamel & Getz, 2004). A crucial aspect in establishing this sustainable growth is the development and the introduction of new products into the market. Moreover, new product development is probably the most important process for many companies in order to create growth of the business, but also one of the least understood (and, perhaps, executed). Despite many efforts companies put into NPD, several studies show that NPD productivity is going down (Griffin & Page, 1996; PDMA, 2004; Cooper & Edgett, 2008; Barczak *et al.,* 2009).

Definition of new product development
Cooper (2001) defines NPD as the complete process of bringing a new product or service to market.

Why is NPD important?
A study conducted by SAP in 2004 identified four important drivers for NPD:

Trends in New Product Introductions
In most markets and especially those relating to consumer products, the number of new product introductions per annum has increased dramatically (SAP, 2004). Shorter product life cycles, new technologies and more demanding consumers, force companies to bring more and more products to the market in order to remain competitive.

Financial Performance

As a result of the high rate of new product introductions and short product life cycles, companies are increasingly dependent on revenues from new products to drive their sales each year. Another direct consequence is that in the future companies will have fewer opportunities to live on past successes.

Sustainable Growth

NPD allows companies to grow revenues and retain high margins by launching new products and creating new customers in new markets. Even when sales are stable, company's need new products to the replace the existing products that are reaching the end of their product life cycle. In addition, new products enable companies to use higher margins in the market. Well executed NPD keeps a pipeline of new, high-margin products flowing to the market (SAP, 2004).

Company Value

Successful companies have higher stock market valuations than their less successful counterparts. This is a direct consequence of successful NPD which is responsible for growth and directly drives value. By investing in the NPD process, companies are directly investing in themselves, by creating high returns. A recent study by CSFB/HOLT and Deloitte Consulting, shows how successful companies have valuations that far exceed the value of their underlying assets (see Figure 2.1).

Company	Share Price		% of Valuation Based on: New Investments	Existing Assets
Dell Computer	28.05		78%	22%
Johnson & Johnson	56.20		66%	34%
Procter & Gamble	90.76	↑	62%	38%
General Electric	32.80		60%	40%
Lockheed Martin	62.16	Growth Companies	59%	41%
	36.94	Past Cash Cows	8%	92%
	49.40		5%	95%
	35.00	↓	3%	97%

Figure 2.1 Stock Market Valuations Exceed Existing Asset Values (SAP, 2004)

High valuated companies can more easily find funding for acquisition of competitors or attract the best people. All of these companies have one thing in common: a track record of growth and margins fueled by new products (SAP, 2004).

2.3 New Product Development in the last Decades

Maintaining and increasing successful innovation activities in NPD seems to be a crucial component in order to ensure future prosperity. However, NPD is also regarded as one of the riskiest, yet most important endeavors for today's businesses (Cooper, 2001). The persistently high rate of new product failure also shows that NPD is risky and there is a high

probability of large financial loss (Schmidt *et al*., 2009). Further, also radical technology developments, short product life cycles and increased competition as result of the globalization make NPD more risky and difficult (Droge *et al*., 2008). NPD involves competing goals of minimizing risk by acquiring sufficient market information while reducing costs and time to market, these two important NPD characteristics lie great emphasis on the process design and implementation of the NPD program in an organization (Hamancioglu *et al.,* 2007). Especially the organizational design is a problem for NPD processes because the design needs to enable effective coordination and conflict resolution and facilitate cross-functional sharing of resources (Olson *et al.,* 1995).

Implementing and correct using a formal NPD process and not skipping steps in the process has long been a differentiating factor between success and failures at the project level of analysis (Cooper *et al*., 1999; Barczak *et al.,* 2009). Figure 2.2 demonstrates that 69% of all companies report using a formal, cross-functional process for NPD. This represents an increase from 60% in 1995. Further, processes are revised on an ongoing basis for 30% of the firms and every two to five years for 37% of the firms (Barczak *et al.,* 2009).

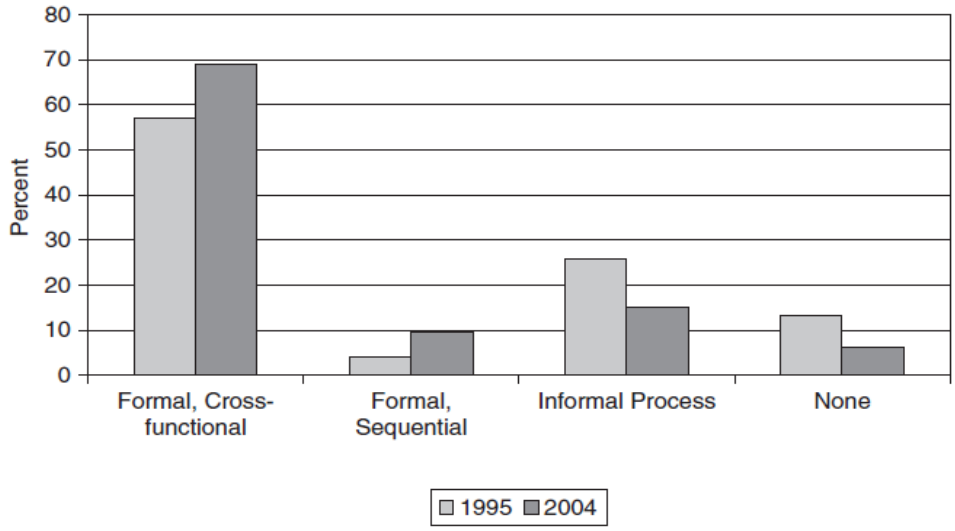


Figure 2.2 Product development process (Barczak *et al.,* 2009).

The PDMA study also shows that formal process owners use 70% of the time to guide their NPD teams through development stages in radical and more innovative projects compared to incremental projects, which use them only 60% of the time (see Figure 2.3).

Furthermore, only about 40% of the radical or more innovative projects have overlapping gates or skip stages in the NPD process, 46% of the incremental projects have overlapping gates and almost 60% skip entire stages in the process (Barczak *et al.,* 2009).

Almost 50% of all projects proceed with conditional decisions made at the gates, where the conditions for continuance are specifically stated. The results from this study suggest that the majority of the participating companies have moved from second-generation to third generation types of new product processes, which are more flexibly applied across different types of projects (Cooper, 1994; Barczak *et al*.,2009).

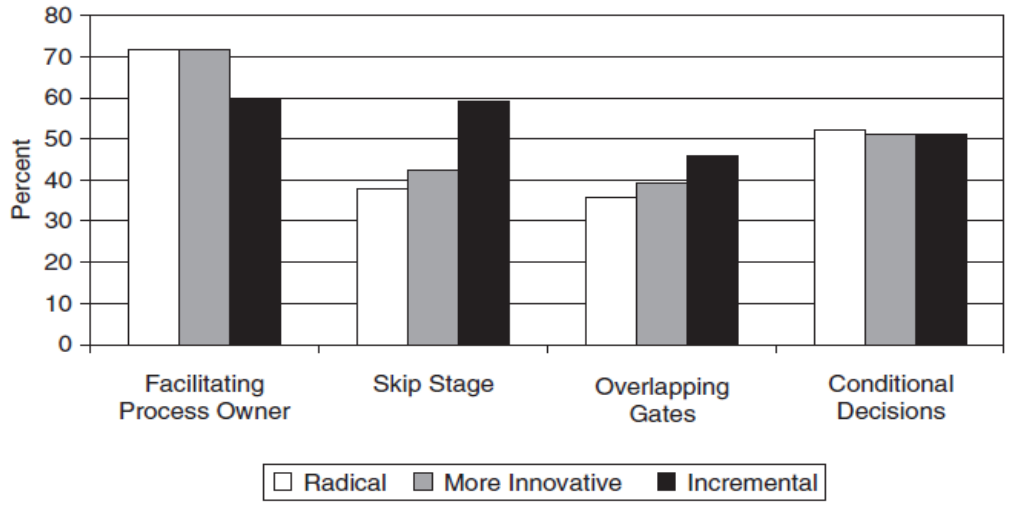


Figure 2.3 Process issues (Barczak *et al.,* 2009).

2.3.1 Stage Gate Process

A NPD process that guides projects from idea to launch is a well –recognized key to NPD success (Cooper, 2001). According to Cooper *et al*. (2004b) a NPD process is more than just a flowchart and should include all process elements: the stages, stage activities, gates, deliverables and gate criteria that constitute a well-defined NPD process. Nowadays, most companies involved in new product development make use of stepwise approaches such as stage-gate processes (see Figure 2.4), where required tasks, their sequences, and taskforces are specified in detail (Harmancioglu *et al.,* 2007). Managers consider a stage gate process as an important control tool to bring discipline to "chaotic" new product development activities and to manage the process for improved new products, enhanced efficiency, and faster introduction of new products (Sethi & Iqbal, 2008).

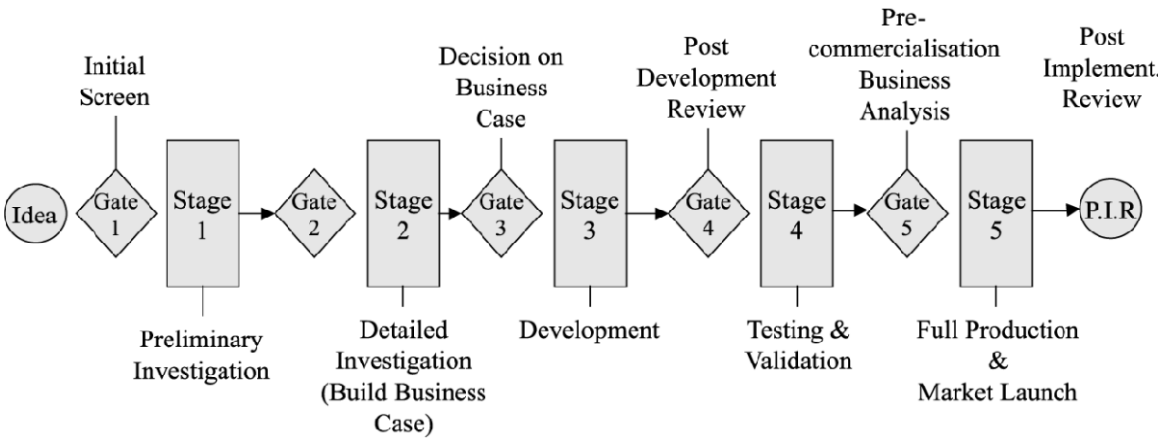


Figure 2.4 Stage-gate process by Cooper (2001).

2.3.2 Success Rates New Ideas

The 2004 PDMA study confirmed also earlier findings with regard to NPD processes executed more efficiently by the best performers. In this PDMA study the terminology: the "best" performers was defined as those business units that were the best or top third in their

industry, and that rated their processes and performance above the mean. Table 2.1 also illustrates that "Best" performers need only 4 ideas compared to 9 ideas for the "rest" to generate 1 commercial success (PDMA, 2004; Barczak *et al.,* 2009).

Table2.1. Ideas "The Best" versus "The Rest" over the period 1995-2004 (PDMA, 2004).

	The "Best"	The "Rest"
# Ideas for one success	4.0	9.2

The "best" weed out ideas early in the process and thus had very high success rates in the later stages of product development. These are typically the phases where less time and money had been spent on a particular idea (Page, 1993). Furthermore, The efficiency improvement in the development phase is regarded as saving money, resources and time (Souder, 1992). In summary it can be stated that early elimination of projects had a positive effect on new product portfolios of companies as a result of efficient use of resources and less wasting money on unsuccessful projects in the last decade.

Figure 2.5 shows that the mortality curves of new product ideas across the product development process is stable from 1995. An explanation for the stable mortality of new product ideas is probably the continued use of a clear new product strategy, which acts as a guide for idea screening activities within many companies (Barczak *et al*., 2009).

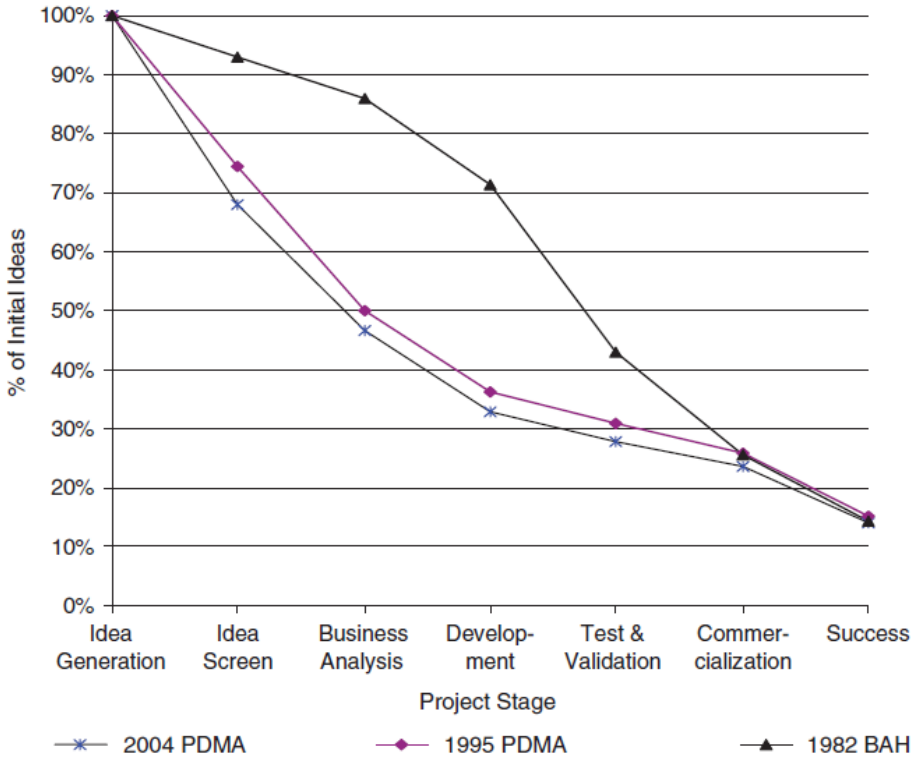


Figure 2.5 Project mortality curves (Barczak *et al.,* 2009).

2.3.3 Project Cycle Time

Project cycle time is the total time spent on an R&D project from the start of the conceptualization phase to the launch to the (internal or external) customer (Fortuin, 2006). In the last decade, overall project cycle time for all types of development projects have declined, with the greatest decline (42.5% faster) attributed to new-to-the-world products (see Table 2.2). New-to-the-world products had in 2004 an average cycle time of almost 2 years compared to about 3.5 years in 1995. The smallest decrease occurred for incremental products (12.1%). Further, more innovative projects spend significantly more time on each stage than incremental projects (Barczak *et al.,* 2009).

Table 2.2 Project cycle time (Barczak *et al.,* 2009).

1995 Categories	Average 1995 (Weeks)	Average 2004 (Weeks)	2004 Categories
New-to-the-World	181	104	New-to-the-World
New Product Lines	126		
Major Revisions	78	62	More Innovative
Incremental	33	29	Incremental

A study by Prasard (1997) shows that shorter project cycle times in NPD come not from reducing the number of tasks but from executing them in parallel and making them more effective. Table 2.3 shows that putting more effort in setting the project definition, like Japanese firms, is significantly reducing the need for redesigning in later stages. Most cases of redesign stem from a product definition that failed to take account of the potential future problems of other departments in the development process. Redesign increases cost, effort, and it always means lengthening the time span (Tonchia, 2008)

Table 2.3 Effort percentages by stages (Prasard, 1997).

Stages of the process			
Company	**Definition**	**Design**	**Re-Design**
British	17%	33%	50%
Japanese	66%	24%	10%

2.3.4 NPD Strategy

A strategy which indicates the importance of NPD is crucial in every company. Wheelwright & Clark (1992) and Cooper (2003) state the importance of having a NPD strategy to enhance and encourage the development of new products. However, effective managing of the radically altered environment is not only determined by organizing and coordinating NPD activities or spending simply “more” money. The solution, rather, must be to deploy R&D and marketing investments more effectively and more efficiently (Roussel *et al*., 1992; Olson, Slater & Hult, 2005). Deciding what the business to undertake and at what level of resources and priority is one of the most complex and critical decisions general management faces today (Roussel *et al*., 1992). A NPD strategy ties the effort on new product and technology developments to the overall business strategy by giving NPD a central place in the overall

strategic platform. In addition, top management support is needed to make the NPD strategy successful.

The results of the PDMA study of 2004 show that 56% of the companies have a specific strategy for its new product activities which directs and integrates the entire new product team. On the other hand, only 55% of the companies followed a well defined, structured process for the development of all or most of its new products. In addition, only 43% had both a new product strategy and form development process, whereas 33% still had neither one (Page 1993, Barczak *et al.,* 2009).

The management changes and conservatism over the period 1995-2004 were perhaps the result of a poor economic period in 2001. The PDMA reported in 2004 a strategy shift for North American companies to fast follower strategies. Figure 2.6 illustrates that fast follower strategy increased to 36% in 2004 from only 27% in 1995 (PDMA, 2004). In the same period the percentage of business units implementing first to market strategies remained more less constant.

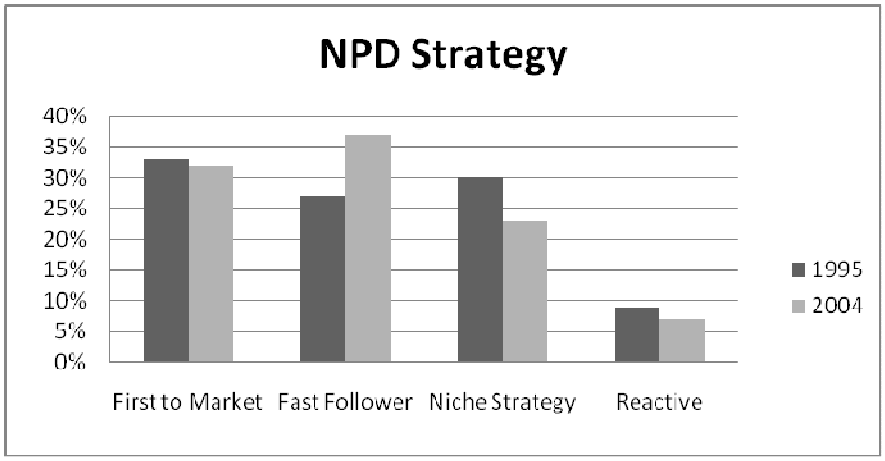


Figure 2.6 Trends in NPD strategy 1995-2004 (Barczak *et al*., 2009).

Several studies specifically relate business strategy to NPD. In this context, Heskett (1987) stated that a strategic vision requires an understanding of what firms' future products and future markets should be, and such understanding affects success (Heskett, 1987). Atuahene-Gima, Slater, & Olson (2005) found that NPD success is contingent on market orientation, which is a critical element of both corporate and product strategy. Further, Montoya-Weiss & Calantone (1994) conducted a meta-analysis and concluded that strategy is one of the two most important drivers of new product success, second only to product advantage.

2.3.5 New Product Development Funnel

Successfully interlinking the essential strategies, companies will develop a group-wide understanding, which enables them to make efficient and more effective decisions with regard to the company's NPD project portfolio. Finally, this will result in a healthy and robust NPD funnel (Herfert & Arbige, 2008; Talonen & Hakkarainen, 2008).

Wheelwright & Clark (1992) developed a set of three dimensions that define choices companies make about their development funnel:

1. It's a process for creating development projects – encouraging certain sources of new ideas and selecting which of those to support in the development projects
2. Its means of achieving convergence to a focused product concept and detailed design – through a set of decision-making, review, and control procedures during project execution
3. Its final commitment to the market through final testing, screening, and market introduction plans.

In theory there is a wide variety of funnels with a large number of dimensions of choice, however, in practice two patterns can be distinguished.

Model 1. R&D Push/ Survival of the Fittest
This model (see Figure 2.7) is common in larger, technology-intensive firms. These companies rely primarily on their R&D group to generate many ideas for technologies and for new products and processes. The underlying thought of this model is to be creative and innovative, providing an abundance of opportunities for the larger organization to choose from (Wheelwright & Clark, 1992).

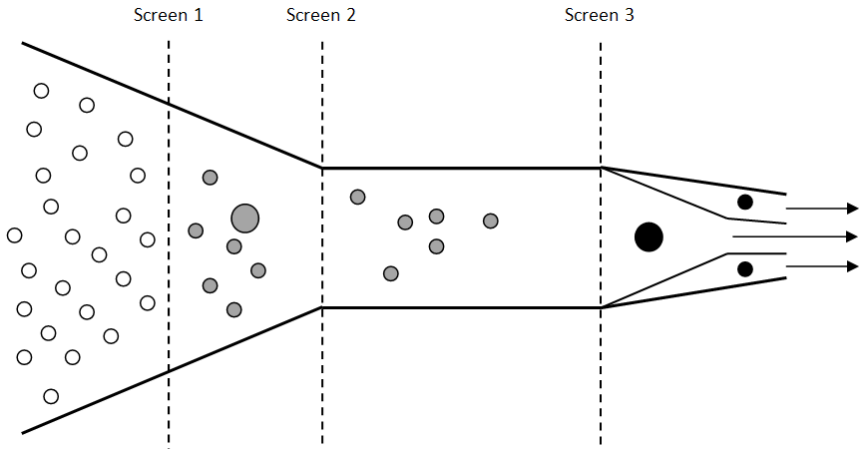


Figure 2.7 R&D driven, survival of the fittest (Wheelwright & Clark, 1992).

The screens or gates in the funnel have the function to narrow down the initial number of projects to a manageable set of products and processes for market introduction. Early screens tend to be primarily technical and focus on technical feasibility and proof of concept. Later screens put emphasis on manufacturing feasibility and economics.

The basic logic of this funnel is that of a hundred good ideas, only a relatively small percentage become a true market success. Only the most potential ideas will pass the screens in the funnel and will be assessed based on current knowledge and understanding. After approval the idea can proceed to the next phase of the funnel, where additional resources will be allocated in order to prepare the project for the next screen, which will bring the project closer to the eventual market introduction. But the screens are not tight enough to narrow the substantially until market introduction is imminent (Wheelwright & Clark, 1992).

Weak points Model 1

- It is a big risk and economically impossible to make use of a broad-ranging, exploratory research group to come up with only a few marketable products.
- Difficult kill decisions for highly committed development teams
- Many companies often lack the discipline and mechanisms to significantly reduce the numbers of development projects in the funnel.
- too many projects in the funnel and not sufficient resources to carry out all the projects in a timely and successful manner
- Projects become more complex, difficult and expensive, which makes it impractical to weed out these "competing projects" at the last moment.

Model 2. A few big bets

Model 2 (see Figure 2.8) is typically used by smaller companies, that cannot afford to spend huge amounts of money for developing new products. The ideal path to launch is to take an idea that is already in the development phase and back it all the way to successful introduction. This approach is even adopted by mature companies that are dominating in slowly evolving and growing markets, but take more time for successful introduction than their smaller counterparts. In addition, prior research into innovation showed that, given the same research and development investment, new ventures, often small firms outperform large firms about three times in terms of number of patents generated, number of new products and the profitability of those products (Read *et al.*, 2008).

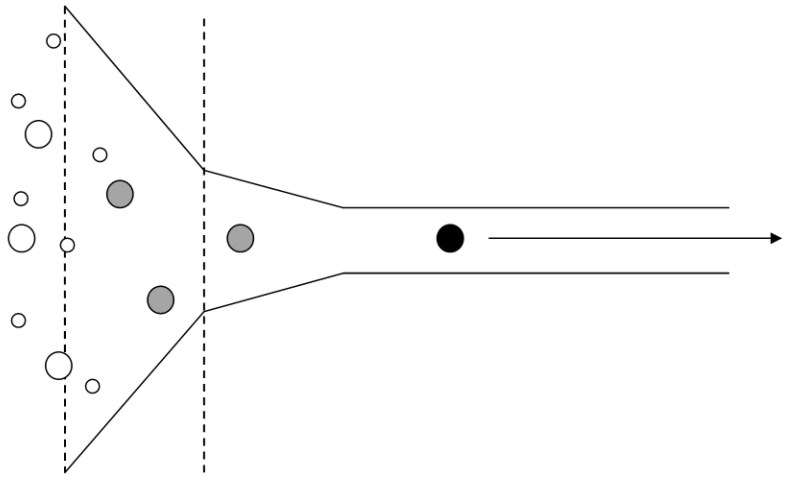


Figure 2.8 A few big bets (Wheelwright & Clark, 1992).

Companies that use the model 2 funnel generally consider a fairly wide range of ideas from a variety of sources at the beginning. Next, the funnel narrows very quickly and only a few projects that meet a set of pre-defined market needs move to the development phase. Most often, top management set the project boundaries, objectives and commitment at the start of the funnel. The primary criteria for project selection are market potential and financial expectations.

Weak points model 2 in large firms

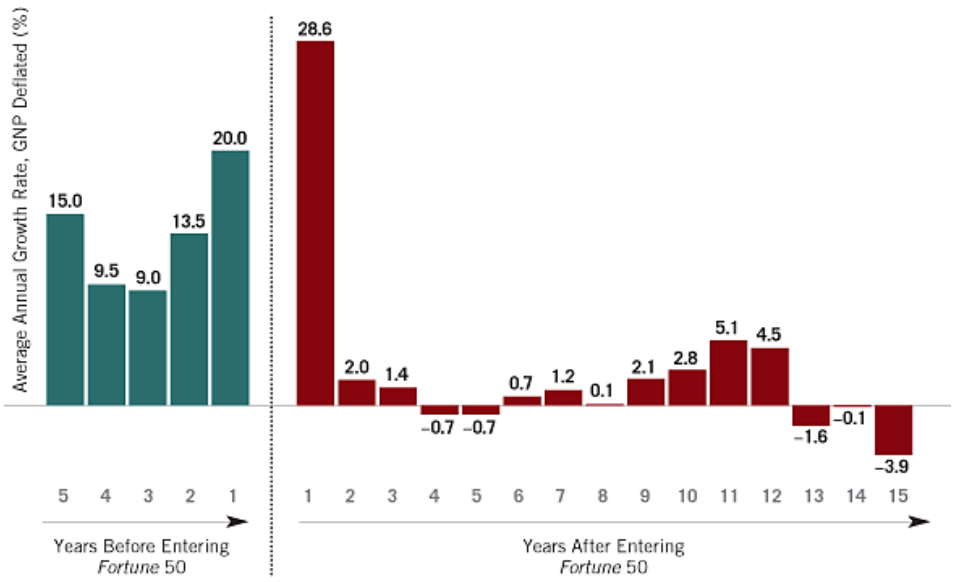
- Multiple market segments and product families make this funnel approach complex
- Often numerous midcourse corrections, modest or even marginal market success and a reputation among their customers as "conservative and no longer innovative"

Key issues in complex and changing environments

- It is of high importance that the development team has sufficient technical knowledge in order to ensure the probability of success and on-time completion
- the firm must have deep understanding of the market, competitors and consumer insights
- Killing projects may necessary, but it is particularly difficult, traumatic and expensive
- A strong focus on the beginning of the funnel may lead to a slow speed-to-market

2.3.6 Strategy and Strategic Organizational Behavior

Many global consumer packaged goods companies are struggling to create and execute a sufficient growth strategy. This is mainly caused by the fact that most industries were primarily focused, at least for one generation, on reducing costs, streamlining operations and creating economies of scale by consolidating research, manufacturing, and distribution (Pandrangi *et al.,* 2009). An approach like this ensured some considerable growth for many companies in the past. Figure 2.9 shows that companies that entered the fortune top 50 by growing quickly, are now struggling with maintaining or even ensuring sustainable growth at all. Therefore, nowadays NPD and innovation have become the main drivers for sustainable growth in many industries.



Source: Compustat, Corporate Strategy Board, Hewlett-Packard

Figure 2.9 The struggle for maintaining and ensuring sustainable growth (Pandrangi *et al.,* 2009).

Miles and Snow (1978) proposed a strategic typology classifying business units into four distinct groups based on conducted field studies in four industries (textbook publishing,

electronics, food processing, and health care). They identified four groups: Prospectors, Analyzers, Defenders, and Reactors (Desarbo *et al.,* 2004)

- **Prospectors** lead change in their industries, principally by launching new products and identifying new marketplace opportunities.
- **Defenders** find and seek to maintain a secure niche in a stable product area. Rather than concentrating on new product or market development, Defenders stay within a limited range of products, focusing more on resource efficiency and process improvements that cut manufacturing costs.
- **Analyzers** share traits of both Prospectors and Defenders. While defending positions in some industries, they may selectively move quickly to follow promising new product or market developments.
- **Reactors** lack a consistent strategy, and respond, usually inappropriately, to environmental pressures as they arise.

According to literature, the key to success for analyzers is to bring out either improved or less expensive versions of products that prospectors introduced while defending core markets and products (Olson *et al*., 2005). These dual demands create a structural conflict that require sufficient marketing capabilities to perform complex tasks while minimizing resource commitments. The inherent tension in the analyzer's entrepreneurial, administrative, and technological challenges suggests that there is no clear structural solution for these firms Consistent with Miles and Snow's assessments, we anticipate that balance and adaptation will be the mode of successful analyzers (Olson *et al.,* 2005). When analyzers act as fast followers marketing has the difficult task to ensure short time-to-market cycles for their new and improved products in order to avoid falling too far behind on competitors. On the other hand, analyzers often have to act as territorial defenders that must control product development and delivery costs while focusing on a stable base of existing customers. In addition, many analyzer companies have difficulties balancing their businesses on one hand between market penetration and leadership and on the other hand between stable and changing product lines (Manion & Cherion, 2009).

As direct consequence analyzers make use of two distinct product development approaches:

1. Developing new products for existing customer segments
2. Marketing existing products to new customer segments.

Golder & Tellis (1993) suggest that followers can be as successful as early entrants if they learn about the structure and dynamics of markets from early entrants' efforts and limit their new product introductions to categories that have already shown promise in the marketplace. Analyzers must always closely monitor and observe customer reactions and competitors' activities in the market to identify business opportunities in either unattended market segments or in potential product improvements. Although customers are certainly important to analyzers, competitors actions are equally important, if not even more important. Furthermore, it is of high importance for analyzers to learn of successes and failures of both competitors and projects within the company (Olson *et al*., 2005).

A study by the PDMA showed that the project portfolios of analyzers include only a small proportion of 6% of the unique new-to-the-world projects versus 30% in prospector project portfolios. Further, analyzers follow a typical product strategy of continuously improving their product lines, while on the other hand prospectors follow a strategy of continuously changing their lines. These findings are also supporting the fact that the project portfolios of analyzers include about 42% of addition to product line projects compared to 21% in project portfolios of prospectors. Addition to product line projects will extend existing products to additional types of customers or provide new product variations for existing customers (Olson *et al.,* 2005; Manion & Cherion, 2009). As a result analyzers are more likely to pursue NPD projects that are lower in degree of newness to the firm.

Table 2.4 shows that analyzers attach a high level of importance on two customer-based measures (customer satisfaction, customer acceptance), and on four financial measures (product return on investment, breakeven time, profit goals, margin goals).

Table 2.4 Most important success measures by strategic types (Manion & Cherion, 2009).

Prospector	Analyzer	Defender
1. Competitive advantage	1. Competitive advantage	1. Competitive advantage
2. Customer satisfaction	2. Product return on investment	2. Profit goals
3. Customer number	3. Breakeven time	3. Customer service
4. Customer acceptance	4. Profit goals	4. Revenue growth
5. Revenue goals	5. Customer satisfaction	5. Margin goals
6. Product return on investment	6. Margin goals	
7. Breakeven time	7. Customer acceptance	

Snell (1992) states that different strategies require different organizational behavior. Literature indicated four types of strategic behavior:

1. *Consumer-Oriented Behaviors*
   Firms with a strong customer orientation pursue competitive advantage by placing the highest priority on the creation and maintenance of customer value. That is also why these firms put great emphasis on organizational wide development of and responsiveness to information about the expressed and unexpressed needs of both current and potential customers (Narver & Slater, 1990).

2. *Competitor-Oriented Behaviors*
   A competitor orientation is characterized by putting priority on the in-depth assessment of a set of targeted competitors. This assessment focuses on targeted competitors' goals, strategies, offerings, resources, and capabilities (Porter, 1980). The result of this approach is a focus at competitor-oriented objectives rather than economic or customer-oriented objectives (Armstrong & Collopy, 1996). The ultimate goal of the firm is to match, if not exceed, competitors' strengths (Olson *et al.*, 2005).

3. *Innovation-Oriented Behaviors*
   Another perspective is that firms build and renew competitive advantage through radical or discontinuous innovations (Christensen & Bower, 1996). Innovation oriented firms are not only open to new ideas but also proactively pursues these ideas in both its technical and administrative domains (Han, Kim & Srivastava, 1998). Furthermore, these firms also incourage risk taking and support actively the development of radically new products (Olson *et al.*, 2005).

4. *Internal/Cost-Oriented Behaviors*
   According to Porter (1980) there are two basic sources of competitive advantage. The first is the differentiation advantage that a firm derives from the customer-, competitor-, or innovation-oriented behaviors. The second is the cost advantage that a firm derives from internal orientation and focuses on creating more efficiency in the value chain of the company (Porter, 1985). Internal or cost oriented firms try to reduce costs in primary activities, such as logistics, operations, and sales and marketing. They also attempt to reduce costs in support activities, such as procurement, research and development (R&D), and administrative functions. By pursuing operational excellence companies can create higher sales through lower prices or higher margins (Treacy & Wiersema, 1993). A drawback of this behavior as a result over overreliance on operational excellence may decrease the companies flexibility to the changing market conditions (Olson *et al*., 2005).

In the case of analyzers, a study by Olson *et al.* (2005) also indicated that analyzers which act as fast followers should be able to make rapid decisions in order to be successful. Another key issue that relates to successful analyzers is the comparison with prospectors' products, analyzers should place a greater emphasis on the responsive dimension of customer orientation, carefully evaluating customers' likes and dislikes regarding prospectors' offerings and introducing improved versions (Olson *et al*., 2005). Within this perspective, occasionally pursuing an innovation orientation can work conflicting within the current organizational structure of the company. Therefore Olson *et al*. (2005) suggest analyzers to place greater emphasis on imitation or incremental innovation than on radical innovation.

2.3.7 NPD Portfolio Management

Following Cooper (1999), portfolio management is defined as the process of evaluating, selecting and prioritizing new projects, and more precisely:

Portfolio management is a dynamic decision process, whereby a business's list of active new product (and R&D) projects is constantly updated and revised. In this process, new projects are evaluated, selected, and prioritized; existing projects may be accelerated, killed, or de-prioritized; and resources are allocated and relocated to the active projects. The portfolio decision process is characterized by uncertain and changing information, dynamic opportunities, multiple goals and strategic considerations, interdependence among projects, and multiple decision-makers and locations.

Roussel *et al.* (1991) stated already in 1991 that new product development portfolio analysis and planning would grow in the 1990s to become the powerful tool that business portfolio planning became in the 1970s and 1980s. Although many introduced methods dealing with portfolio management (e.g. Boston Consulting group and McKinsey), a benchmarking study conducted by Cooper & Kleinschmidt in 1996, mentioned project selection and project prioritization as the weakest facet of new product management. In addition, The benchmarking study of Cooper and Kleinschmidt which included 161 business units acknowledged that management rated themselves very low on:

- Achieving the right balance between the number of active projects and available resources (too many projects) – a poor "proficiency rating" rating of 51 points out of a possible 100.

- Undertaking solid ranking and prioritization of projects – an even poorer rating of 49 points out of 100.

This fact was strongly confirmed by a PDMA study in 2004, the comparative performance assessment study (CPAS). The mix of projects composed by a company has changed significantly during the last decade (Cooper & Edgett, 2008). In the 1990´s companies performed much higher value projects compared to the last few years. *"Businesses today are preoccupied with minor modifications, product tweaks, and minor responses to salespeople's requests, while true product development has taken a back seat."* (Cooper, 2005). This statement of Cooper was supported by numbers derived from a PDMA study in 2004 (see Table 2.5). 'New to the world – true innovations' projects decreased with 44% between 1990 and 2004. Also the project type 'new product lines to the company declined from 39% in 1990 to a poor 27% in 2004. On the other hand 'additions to existing product line in the company' projects and 'improvements and modifications to existing company products' projects increased with respectively 21% and 80% over the same period.

Table 2.5 Breakdown of the portfolio by product types- 1990 and 2004 (APQC study, 2004 & PDMA, 2004).

% of Projects in the Development Portfolio				
Development Project Type	Best Performers 2004	Worst Performers 2004	Average Business 2004	Average Business 1990
New-to-the-world	17.05%	8.53%	11.48%	20.4%
New product lines to the company	25.87%	22.99%	27.12%	38.7%
Additions to existing product line in company	26.82%	22.01%	24.66%	20.4%
Improvements & modifications	30.26%	46.47%	36.75%	20.4%

In addition, figure 2.10 visualizes the shift in the mix of types of projects in NPD portfolios over the period 1995-2004. (PDMA, 2004; Barczak *et al*., 2009). It shows an increase in the number of projects motivated by cost reduction, repositioning and improvements, while the percentage of product line additions, new-to-the-firm and new-to-the-world projects had decreased (Barczak *et al*., 2009).

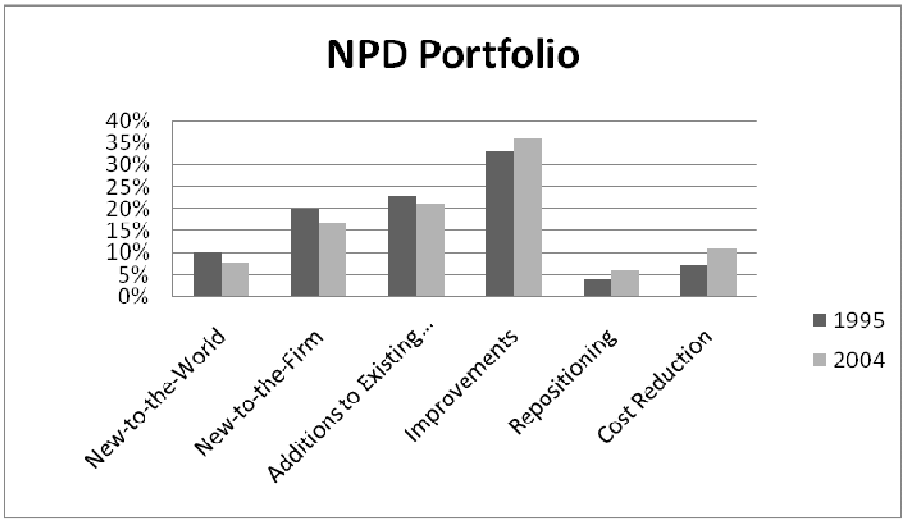


Figure 2.10 Projects in the NPD portfolio by type of project (Cooper, 2005).

2.4 New Product Development in the Food Industry

NPD or new food product innovation is also in the food industry recommended as a suitable strategy to build competitive advantage and long-term financial success in today's global food markets (Knox & Mitchel 2003; Costa & Jongen, 2006; Linneman *et al*,. 2006). However, literature indicates that the European food and beverage industry is quite conservative with regard to R&D investments and introducing truly new products in the market (Costa & Jongen, 2006; Linneman *et al*., 2006).

2.4.1 New Product Development Performance in the Food Industry

The effect of innovation on business success in the food processing industry seems to be very much comparable to that in other industries (Fortuin & Omta 2009). The food market has also become a mature market, particularly Europe and the US, in which food companies have to deal with the cumulative factors of a squeeze from retailers, changing consumer tastes and preferences, private label penetration and price competition (marketing week). In order to ensure profitability food companies must bring different categories of new food products to the market.

Categories of new food products
Food products introduced as 'new' by food companies, can be classified into the following categories (Anon, 1999; Fuller, 1994; Luning, Marcelis & Jongen, 2002):

- *'Me-too products'*. A 'me-too product' is a product that is basically the same as an existing one, but produced by another company. This category of new products represents the largest group of new food products.

- *Line extensions.* These are new variants of a well-known product. Typical examples are new flavours for existing products or new tastes in a family of products. The design process of these products can be characterized by relatively little effort and development time, small changes in the manufacturing process, little change in marketing strategy and a minor impact on storage and/or handling techniques.

- *Repositioned existing products*. These are current products that are again promoted in order to reposition the product. The development time for repositioned products can be minimal and only the marketing department should put efforts in capitalizing the niche market.

- *New form of existing products*. These are existing products that have altered to another form (e.g. solved, granulated, concentrated, spreadable, dried or frozen). For instance, dried soups. These products may require an extensive development time because the physical properties of the product change drastically.

- *Reformulation of existing products*. This group concerns known products with a new formula. Reasons for reformulation can be reducing costs of ingredients, irregular supply of certain raw materials, or the availability of new ingredients with improved characteristics. Examples are products with better colour, improved flavour, more fibres, less fat, etc. The design process for these products is usually inexpensive and needs a relatively short development time. However, for food products minor changes in composition might have great consequences for the quality of the final product.

- *New packaging of existing products*. This involves accepted products with new packaging concepts. For example, the technique of modified atmosphere packaging created opportunities to extend the shelf life of many food products. With respect to the design process, products may have to be reformulated for the new application (e.g. microwave packaging). Moreover, new packaging concepts may require expensive packaging equipment.

- *Innovative products.* These are defined as products resulting from changes in an existing product otherwise than described above. The changes must have an added value. The design process is generally longer and more expensive when more product changes are required. Marketing can also be costly because consumers may have to be educated to the novelty.

- *Creative products, also called true new products*. This type of products is described as one newly brought into existence, i.e. a never-before seen product. Typical examples are novel protein foods (or meat replacers) that are produced from vegetable proteins. Creative products commonly require extensive product development, tend to be costly (much marketing effort, new equipment) and have a high failure chance.

New Product Introductions Europe

Figure 2.11 illustrates the new product type break-down of product introductions in Europe (1999), only 2.2% of total product launches are radically new products. On the other hand, an estimated number of almost 77% represents products characterized as nil or an incremental level of novelty. The other product types, line extensions, seasonal and conversion or substitution, account for the remaining 21% (Lagnevik, 2004; Costa & Jongen, 2006). This conservative approach of keeping R&D costs low and minimizing risks, makes it possible to introduce a relatively high amount of different products in a short time span. However, such a NPD approach will not result in truly new products that will ensure the desired sustainable growth of the business.

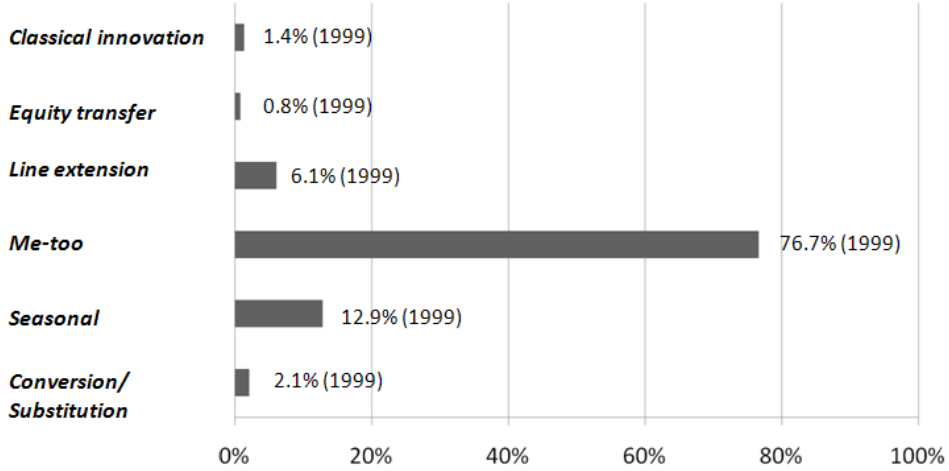


Figure 2.11 New products introduced into the European market in 1999. From: Jolink (2009) based on a study of Ernst & Young Global Client Consulting (1999).

Further, a research conducted in 1999 by Ernst & Young Global Client Consulting showed high failure rates of new products in retail. An estimated 40-50% of new product introductions are out of retailers' shelves within a year. Other studies have shown that failure rates vary from 33 – 50%, depending upon the uniqueness of the product and the nature of the product category (Crawford & Di Benedetto, 2008). The highest failure rate was given by IRI president of Consumer and Shopper Insights, Bob Tomei who stated in 2008 that 80% to 90% of new products are disappearing from stores shelves within a year and that success rates of launches have gone virtually unchanged for the past 30 years (Conroy *et al.,* 2009). An important factor that increases the likelihood of failure is the similarity of the new product to others already on the market, in other words the new product has to differentiate itself strong in order to become successful (Crawford & Di Benedetto, 2008). Furthermore, figures on new product introductions are supporting the fact that following a conservative NPD approach does not pay off anymore: me-too products launched in Europe fail (on country average) 18% more often compared to line extensions and 24% more than truly new products (Costa & Jongen, 2006). In this perspective, private label products are mostly "me-too" products. However, private label products have the big advantage of guaranteed distribution, an advantage not enjoyed by A-brands. As the proportion of private label is still growing in many categories, manufacturers will be competing for less and less shelf-space in order to ensure sufficient distribution for their products. This private label trend forces A-brand manufacturers even more to introduce new products that are well-differentiated in order to realize sustainable growth and ensure long term profit. Especially, European food retailers such as Sainsbury in the U.K., and Ahold in the Netherlands have been much quicker to adopt a branding strategy for their own label packaged goods. In addition, the proportion of private label products in retail in Europe is estimated around 40% (Crawford & Di Benedetto, 2008). Introduction of new products seems to be crucial for A-brands to survive in today's food market.

2.4.2 New Product Development Process in the Food Industry

In general, most food companies make use of either a 'Process-Oriented' or an 'Organization-Oriented' approach in their new product development process. The new product development approach reflects the organizational structure of the company (Moskowitz *et al.,* 2009). Many large food companies use a stage-gate based system, which

helps to focus on prioritized initiatives and ensures that every department can process the work required to bring specific initiatives to the market (Moskowitz *et al.,* 2009).

However, the majority of the food companies use an 'Organizational and Discipline Oriented' approach in which the project moves from Consumer Insights-to-Marketing-to-R&D/Packaging-to-Engineering-to-Manufacturing-to-Sales. A 'Discipline Oriented' approach is characterized by the following sequence of steps (Moskowitz *et al.,* 2009):

1. The Marketing Research/Insights team uncovers an 'insight' that can be exploited with new products.
2. The Marketing/Brand management team ideates and prepares a series of product concepts that 'address' the targeted insight.
3. The most promising concepts are then given to R&D to begin development work. Next, the R&D team returns back to Marketing with prototypes of the concepts.
4. Marketing writes a marketing plan that includes the launch parameters and financial scenario's for the launch.
5. R&D and Operations have the responsibility for the scale-up production.
6. The plan and product are tested in some sort of simulated or small test market for validation.
7. The product is launched into the market place.

Additionally, Moskowitz *et al.* (2009) identified six factors for new product failures in the food and beverage industry:

1. *Off-base targeting*
   Targeting and knowing exactly who to target, is the basis for all product successes. Defining the precise consumer target and meet consumer's needs may result in many opportunities for growth.
2. *The food did not perform*
   The performance of the food in fulfilling consumers expectations is the driver for repeat purchases and ultimately commercial success. On the other hand, low performance will not lead to repeat purchases and finally market failure.
3. *The packaging was not right*
   In retail, often, the packaging sells the product, especially in the case of fast moving consumer goods. It is of great importance that the package shape, construction, and graphics properly communicate the proposition of the new product.
4. *The name, positioning, and advertising just did not connect with product*
   The products strengths and appealing attributes must be properly positioned in the media and at the shelf.
5. *The trade had a different 'interpretation' of the product*
   For the new product development team it is essential to understand the trade's interpretation of the new product in terms of shelf placement, margins, handling and pricing already in an early stage in order to develop the right propositioning of the product.
6. *The product was inconsistent with corporate strengths or financial goals*
   The new product has to meet financial, logistics and culture of the company to ensure sustainable growth and long-term success.

The low rate of innovation coupled to the high failure rates of new products launched into the market demonstrates that there is clear room for improvement (Knox & Mitchel, 2003; Fortuin & Omta, 2009) An explanation is given by Costa & Jongen (2006) and Linneman *et al.,* (2006) which are actively supporting the view of implementing and effective integrating of consumer-led food product development. Linneman *et al.* (2006) state that a successful food product nowadays requires a consumer-orientated approach; only if a product satisfies the demand of a consumer, a product can be successful in the market (Linneman *et al.,* 2006). The change in focus from a supply-based approach to a demand-based approach is called 'chain reversal'. Several researchers in the area of food and innovation (Folkerts & Koehorst, 1998; Traill & Meulenberg, 2002; Omta & Folstar, 2005; Fortuin & Omta, 2009) agree that new product development plays a key role in this more consumer oriented approach and confirm the importance of aligning new products with consumer's needs. Furthermore, the lack of intra- and inter-organizational coordination and integration of R&D and marketing's research activities and know-how is also considered to be a major barrier in the quest of food companies to become more innovative (Costa & Jongen, 2006; Batterink *et al*., 2006).

2.5 Concluding Remarks

This chapter provided an introduction to NPD and elaborated on the importance of NPD and changes in the last decades. Furthermore, NPD in the food industry particular was discussed. The rationale for inclusion of this chapter was to make the reader more familiar with the complex world of NPD. Additionally, this chapter answered the following research questions:

RQ 2.1: Why is NPD important for companies and how did NPD evolve during the last decades?

Getting the right product to market, rapidly and efficiently, is crucial for every company that is trying to succeed in today's fast-moving competitive environment. Innovation is one of the few means of achieving lasting competitive advantage against increasingly sophisticated low-cost producers and the private label trend. Vital in ensuring sustainable growth is the development and the introduction of new products into the market. Moreover, new product development is probably the most important process for many companies in order to create and maintain growth of the business, but also one of the least understood (and, perhaps, executed) (Griffin & Page, 1996; PDMA, 2004; Cooper & Edgett, 2008; Barczak *et al.,* 2009).

Maintaining and increasing successful innovation activities in NPD seems to be a crucial component in order to ensure future prosperity. The persistently high rate of new product failure also shows that NPD is risky and there is a high probability of large financial loss (Schmidt *et al*., 2009). Further, also radical technology developments, shorter product life cycles and increased competition as result of the globalization make NPD even more risky and difficult than before (Droge *et al*., 2008).
As a consequence of this highly dynamic NPD environment, companies were forced to adapt their NPD approach in order to remain competitive. A big leap forward was the introduction of a stage-gate based NPD approach and resulted in a more formalized and cross-functional approach. However, management changes and conservatism over the period 1995-2004 were perhaps the result of a poor economic period in 2001. The PDMA reported in 2004 a strategy shift for North American companies to fast follower strategies. This strategic shift

had also implications for the NPD portfolio that also shifted towards more improvements and minor modifications. However, it has to be stated that the best performing companies of their industry are not as conservative with regard to NPD as their less performing counter parts.

RQ 1.1: How innovative is the food industry in general?

Fortuin & Omta (2009) stated that the food industry is characterized by a low rate of innovation and coupled to the high failure rates of new products launched into the market there is without doubt room for improvement. This finding was confirmed by a study of Ernst & Young (1999) that showed more than 75% of the new product introductions were mainly me-too products. An explanation is given by Costa & Jongen (2006) and Linneman *et al.* (2006) which are actively supporting the view of implementing and effective integrating of consumer-led food product development. Linneman *et al.* (2006) state that a successful food product nowadays requires a consumer-orientated approach; "*only if a product satisfies the demand of a consumer, a product can be successful in the market"* (Linneman *et al.,* 2006). Furthermore, the lack of intra- and inter-organizational coordination and integration of R&D and marketing's research activities and know-how is also considered to be a major barrier in the quest of food companies to become more innovative (Costa & Jongen, 2006; Batterink *et al.*, 2006).

RQ 2.2: How is NPD currently organized in the food industry?

In general, most food companies implemented a 'Process-Oriented' or an 'Organization-Oriented' approach in their new product development process, which is based on a stage-gate system that helps to focus on prioritized initiatives and ensures that every department can process the work required to bring specific initiatives to the market (Moskowitz *et al.,* 2009). However in reality, the majority of the food companies use an 'Organizational and Discipline Oriented' approach in which the project moves from Consumer Insights-to-Marketing-to-R&D/Packaging-to-Engineering-to-Manufacturing-to-Sales.

The next chapter will focus on the critical factors in NPD and describes important front-end activities and their link to NPD.

3. Front-end New Product Development Activities: The Critical Factors

3.1 Introduction

The aim of this chapter is to review the critical factors that influence the success of the front-end NPD activities. Section 3.2 introduces the front-end development part, its importance in the NPD process and its pitfalls. In section 3.3 the concept of project management and the link to NPD is explained. Section 3.4 discusses project organization in NPD projects and focuses on the project team and senior management attention. Section 3.5 elaborates on the R&D – Marketing interface and its importance in NPD. Subsequently, section 3.6 discusses the people involved in R&D and their characteristics. In section 3.7 the impact of past project and post launch evaluation on NPD is discussed. Section 3.8 elaborates on the NPD strategy and its relevance in NPD, while section 3.9 discusses the importance of a technology strategy and its added value to the business. Section 3.10 discusses portfolio management in NPD and its accompanying product strategies This chapter ends with some concluding remarks in Section 3.11. Last, this chapter aims to answer the following research questions:

RQ 2.3: What does the literature mention about the critical factors in NPD?

RQ 2.5: What is according to literature the importance of strategy in front-end NPD activities?

3.2 The Front-end Development Activities

The front-end development activities concern the activities that precede the formal development and manufacturing of the product. These front-end activities take place in the ideation and the concept qualification stage of the NPD process and includes. (Wheelwright & Clark, 1992). Activities that belong to these stages are: idea generation, initial screening of the concepts, preliminary market assessment, preliminary technical assessment, detailed market study and business/financial analysis (Cooper, 2001).

The outcome of the front-end development activities is a well-defined product definition in which the target market, product concept and positioning, the value proposition, and the features and specifications are defined (Brown & Eisenhardt, 1995). But next to the product's specifications and product physical configuration, also the extended product offerings such as life-cycle services and after-sale supplies are defined. This product definition should be fact-based and agreed upon by the entire project team and is pivotal for the remaining part of the process.

A proficiency in the front-end development activities is especially important to be able to deliver a superior product because in the front-end much of the product success is determined (Cooper & Kleinschmidt, 2004; Henard & Szymanski, 2001). However, focusing inward on the process efficiency is not sufficient for creating a well defined concept brief. Particularly, information from the market place regarding consumer needs is highly needed in this stage of the process. This information supports the understanding of consumer needs and preferences, which will help in achieving in-market success with more innovative and

differentiated products. According to literature, the quality of execution of predevelopment activities play a key role in NPD projects and often determines success or failure (Khurana & Rosenthal, 1998; Cooper & Kleinschmidt, 1995a, 1995b; Cooper, 1988). The need for a solid upfront development part stresses also the need for a well-defined future direction of the company which concerns the brands in particular. A relatively small amount of resources is needed for the front-end activities but decisions made here have a major impact on later resource spending and on the probability of success.

However, there are a lot of factors that can 'brake' or 'make' a project. In addition, Wheelwright & Clark (1992) identified several factors that can cause great disparity between promise and reality of new product development projects:

The Moving Target
Too often the basic product concept misses a shifting technology or market, resulting in a mismatch. This can be caused by locking into a technology before it is sufficiently stable, targeting a market that changes unexpectedly, or making assumptions about the distribution channel, that don't hold. In each of these cases, the project gets in trouble because of inadequate consistency of focus throughout its duration and an eventual misalignment with reality. Once the target starts to shift, the problem compounds itself: the project lengthens, and longer projects invariably drift as the target continues to shift.

Mismatches Between Functions
While the moving target problem usually reflects a mismatch between an organization and its external environment, mismatches also occur within an organization. What one part of the organization expects or imagines another part can deliver may prove to be unrealistic or even impossible. For instance engineering may design a product that its factories cannot produce, at least not consistently, at low cost and with high quality. Similarly, engineering may design features into the product that marketing's established distribution channels and selling approach cannot utilize fully or existing customers do not need. Or manufacturing may assume a certain mix of new products in planning its requirements, while marketing makes different assumptions, confident that manufacturing can alter its mix dramatically on short notice when, in fact, it cannot. Such mismatches may result from a lack of communication among the functions or from a sequential, over-the-wall approach to project management; in either case, development suffers.

Lack of Product Distinctiveness
Often new product development terminates in disappointment because the new product is not as unique or defensible as the organization thought it was. If the organization gets locked into a concept too quickly, it may lack input from different perspectives in the analysis. The market may dry up, or the critical technologies may be sufficiently widespread that imitators appear overnight.

Unexpected Technical problems
Delays and cost overruns often can be traced to overestimates of the company's technical capabilities or simply to its lack of depth and resources.

Problem-Solving Delays
Every new product development activity involves uncertainty, with regard both to specific problems and conflicts that will inevitably arise during the process, and the resources

required to resolve them. Too often organizations allocate all of their development resources to known project requirements, leaving little or no cushion for the unexpected.

Unresolved policy Issues

A number of very specific choices and decisions must be made during any product or process development project. If major policies have not been articulated clearly and shared, these choices often force a decision on the policy issue for the entire organization. While such forcing is not inherently bad, it inevitably involves more senior levels of management in resolving specific issues. Resolving policy issues during the "heat of the battle" and at senior (more politically oriented) levels of organization inevitably engenders delay and further complications.

3.3 Project Management

Tonchia (2008) defined a project as: "*a set of complex, coordinated activities with a clearly defined objective that can be achieved through synergetic, coordinated efforts within a given time, and with a predetermined amount of human and financial resources. Further, projects always have a beginning and an end, and will sooner or later finish* (Tonchia, 2008)."

Managing a project means dealing with variables that can be more or less influenced within certain predetermined limits. Successful project management is all about making decisions and acting accordingly. A project has three variables that can be managed, which are also linked to its definition (see Figure 3.1). The three project variables are as follows:

1. Quality
2. Time
3. Costs

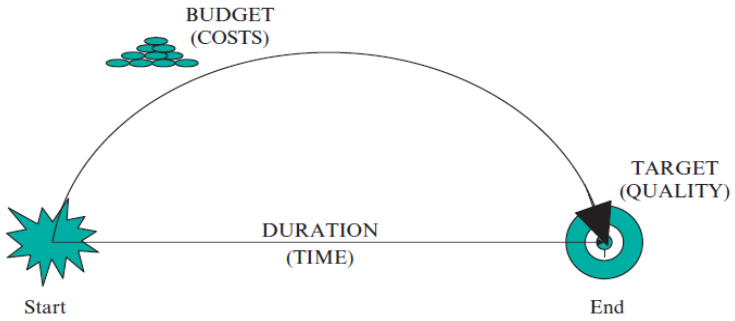


Figure 3.1 Project Variables (Source: Tonchia, 2008).

Project-related risk in NPD concerns mainly the balancing of corporate financial risks vs. speed-to-market. Especially for NPD projects the trade-off between the variables; time, cost and quality are important (see Figure 3.1). Up-front discussion of risks can help determine the appropriate course of action and trade-offs to make in particular circumstances of the project framework (Newman, 2009). Correct risk taking in NPD projects may involve adjusting project cost to gain a time advantage and making use of parallel activities on strategically- and high priority projects and activities. Misunderstanding of the relative value of costs can have impact on making the correct decisions and cycle time reduction, which may end-up in scarifying perceived product quality (Newman, 2009).

Figure 3.2 illustrates the levels of resources and attention required by the various stages of project development, and specifies where it is still possible to make changes. Changing or adjusting the scope of the project in early stages has several advantages; costs are lower

and since the project team is not that extended in the early stages, it costs less effort to realign the project team.

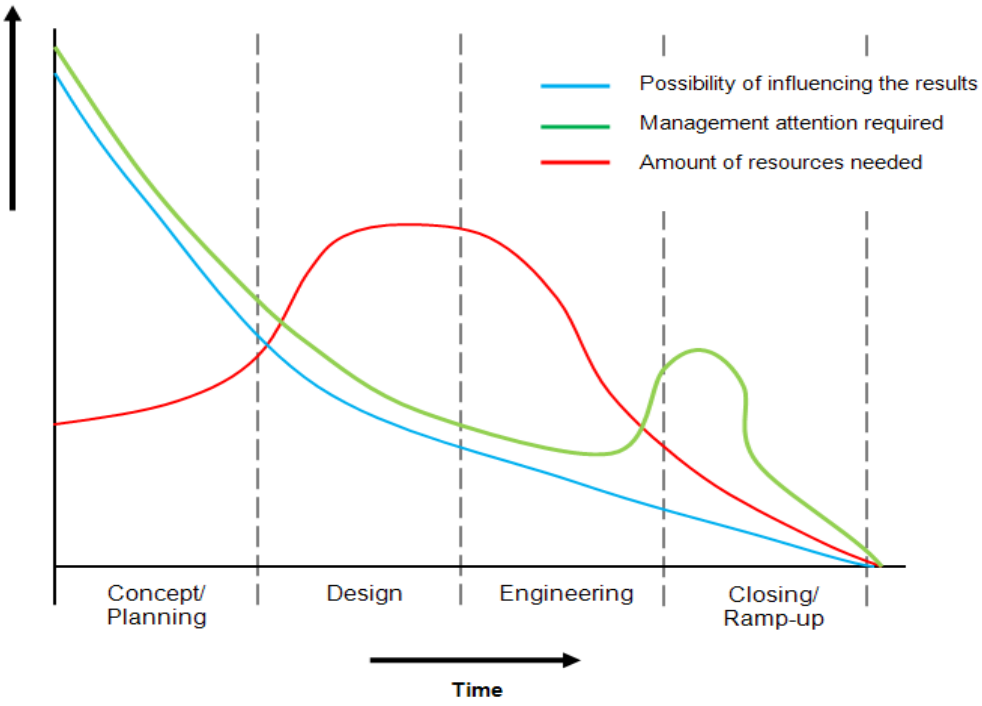


Figure 3.2 Resources and project management (Tonchia, 2008).

The project team must always keep in mind the golden rule of design: *the later the stage at which changes are made, the more expensive they become* (Tonchia, 2008).

3.3.1 Project Management in New Product Development

Managing new product development (NPD) projects is becoming increasingly challenging since development projects are becoming more difficult and complex. A higher degree of complexity can be caused by: new technologies, increasingly sophisticated customers, partnered development projects (Kim & Wilemon, 2003a). Moreover, as a result of intensely competitive global markets it is often required to develop new products that are characterized by a high degree of differentiation and complexity to ensure product survival (Kim & Willemon, 2009).

Results from several studies demonstrate that NPD projects are becoming more complex. Furthermore, Studies confirm the finding that complexity can have a major impact on NPD performance and is regarded as the primary reason for late product introduction, exceed the planned budget, or suffer from performance problems (Griffin, 1997b; Kim & Wilemon, 2003b; Meyer & Utterback, 1995; Smith & Reinertsen, 1992;Tatikonda & Rosenthal, 2000). The consequences of poorly managed complexity can be highly visible and lead to projects with disappointing results (Kim & Willemon, 2009).

In this perspective, the importance of the fuzzy front-end activities in controlling and managing the degree of complexity is high and affects directly new product success (Cooper, 1988; Kim & Wilemon, 2002). Furthermore, results of a study of Cooper (2001) showed that

especially the front-end activities are often underperformed in failure projects (see Figure 3.3).

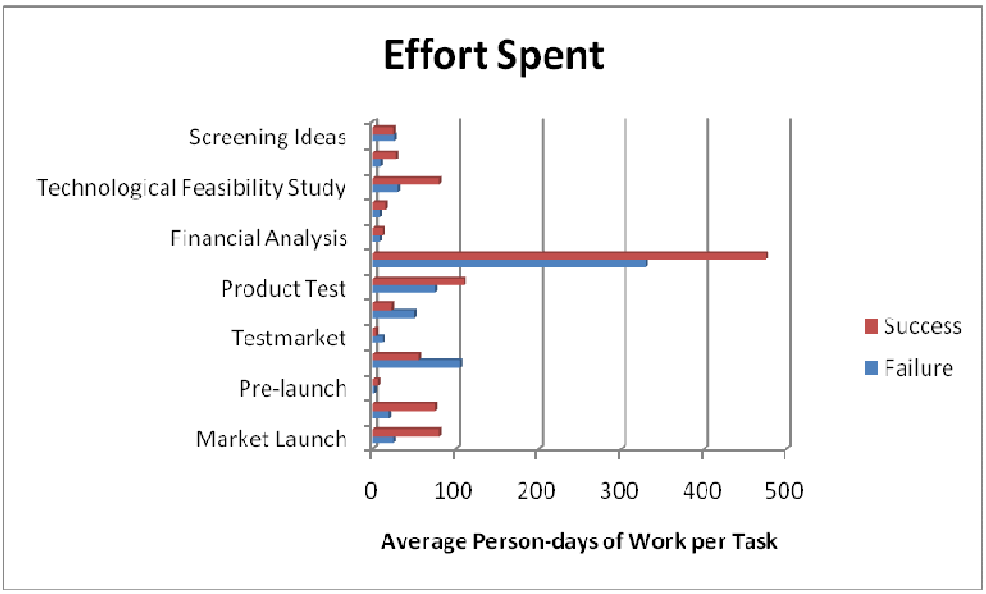


Figure 3.3 Effort spent per activity in the NPD process (Cooper, 2001).

One study showed that clarifying project complexity in the early planning stages is desirable because it helps the team to plan the project more accurately; estimate costs, schedules and resources requirements; and plan for contingencies during the project (Kim & Willemon, 2009).

3.4 Project Organization

Gupta *et al.* (1986) stated that senior management's support, the individual characteristics of the project manager, cross-functional integration, and individual team member participation in planning and decision-making are all important to the product development process (Thieme *et al.,* 2003).

3.4.1 Project Team

Project team members are the people who actually do the work of product development and actually transform vague ideas, concepts, and product specifications into new products. Project team members are the people who actually do the work of product development and actually transform vague ideas, concepts, and product specifications into new products. Team composition, group process, and work organization are variables that affect the way of information sharing, resource utilization, and problem-solving style of the team. A direct consequence of these variables will be on the ultimate process performance, such as speed and productivity of the process.

Team Composition

Cross-functional teams are project groups with members from more than one functional area such as R&D/packaging, manufacturing, or marketing. As a result of the functional diversity of these cross-functional teams, the amount and variety of information available to design products increases, which helps the project team members to understand the design process

more quickly and fully from a variety of perspectives, and finally it improves design process performance (Clark & Fuji-moto, 1991; Brown & Eisenhardt, 1995). Another advantage of the use of cross-functional teams is the ability to tackle problems in an early phase of the project where it is easier and less expensive to fix problems (Tonchia, 2008).

Also an important variable in the project team, is team tenure. Teams with a short history together tend to lack effective patterns of information sharing and working together (Katz, 1982). Therefore, unfamiliar project teams will have limited transfer of both the amount and variety of information among project team members. On the contrary, teams with a long history together tend to become inward focused and neglect external communication (Katz, 1982). In order to optimize project performance within a project team it is desirable to change team composition on a moderate level to ensure sufficient internal and external communication.

Group Process
Results from research indicate that effective group processes, particularly those related to communication, increase information and so are essential for high-performing development processes (Imai *et al.*, 1985; Katz, 1982; Zirger & Maidique, 1990). Further, frequent internal communication increases the amount of information directly in that more communication usually yields more information (Brown & Eisenhardt, 1995). More subtly, frequent communication also builds team cohesion, which then breaks down barriers to communication and so increases the amount of information as well (Keller, 1986). Furthermore, effectively structured communication cuts misunderstandings and barriers to transfer information. This, in turn, improves the speed and productivity of the entire development process (Dougherty, 1992).

Frequent external communication with outsiders such as customers, suppliers, and other organizational personnel opens the project team up to new information and make the team collect and use information more efficiently. Both the efficient collecting and utilization of information should improve the productivity and pace of the development process (Clark & Fujimoto, 1991; Imai *et al.,* 1985; Katz, 1982). Also important is external communication in the form of political activities such as lobbying for resources, engaging in impression management, and seeking senior management support for the project (Ancona & Caldwell, 1992).

3.4.2 Senior Management

Although the team and project leader are critical in the product development process, senior management is important as well. According to several studies senior management support is critical to successful product development processes (Cooper & Kleinschmidt, 1987; Gupta & Wilemon, 1990; Zirger & Maidique, 1990). Senior management support means the provision of resources to the project team, including both financial and political resources. The underlying reasoning is that this support is essential for obtaining the resources necessary to attract team members to the project, to gain project approval to go ahead, and to provide the funding necessary to foster the development effort (Brown & Eisenhardt, 1995).

Also important is the ability of senior management to provide subtle control, which involves having the vision necessary to develop and communicate a distinctive, coherent product concept. Senior management and project leaders often work together to develop a product

concept. At the same time, subtle control also involves delegation by senior management to project teams such that they have enough autonomy to be motivated and creative (Brown & Eisenhardt, 1995).

3.5 R&D-Marketing Interface in New Product Development

Another, important aspect and bottle neck in the NPD process occurs already in the first stages of the NPD process and is known as the R&D-marketing interface. The integration between R&D and marketing in the NPD process is important for setting new product objectives, identifying market opportunities, determining product features or capabilities, resolving product cost-design-performance trade-offs and ensuring speed-to-market (Griffin & Hauser, 1996; Gupta, raj and Wilemon, 1986; Sherman, Berkowitz & Souder, 2005). Gupta *et al*. recognized already in 1986 that the R&D-marketing interface is one of the most critical ones in the multidisciplinary process of NPD. In order to study the R&D-marketing integration and innovation success a model was introduced (see Figure 3.4). The model is based on the following key concepts (Gupta *et al.,* 1986; Griffin, 1997):

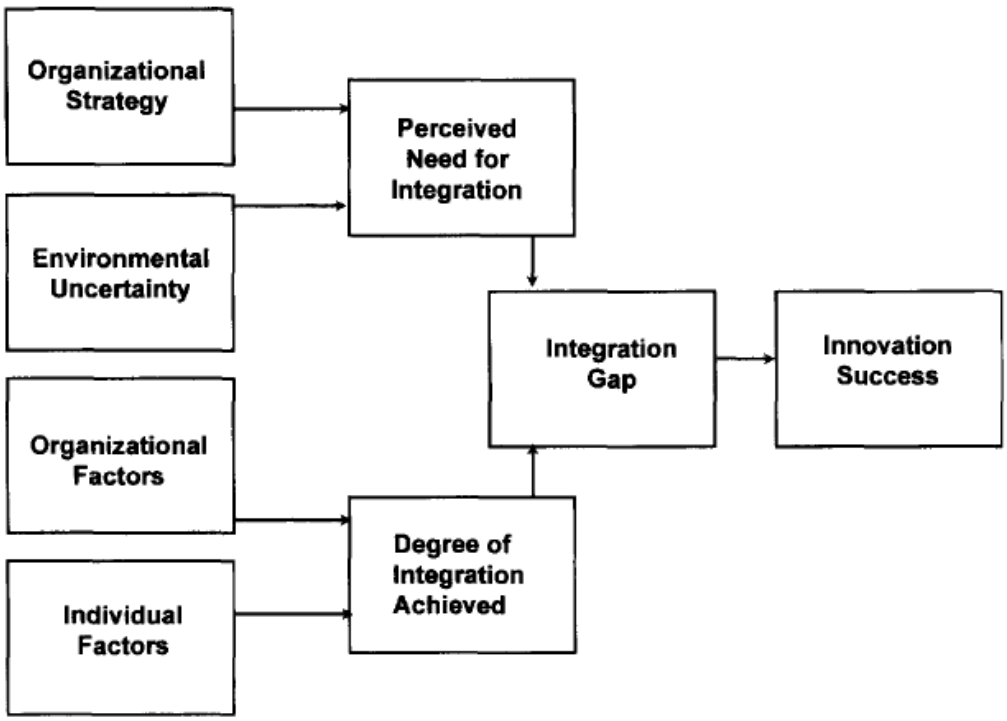


Figure 3.4 Model of the marketing/R&D interface (Gupta *et al*., 1986).

How much integration is required?
The degree of integration required between R&D and marketing depends on two factors:

- Organizational strategy which includes the firm's new product strategy and is categorized into prospectors, analyzers, defenders and reactors.
- Environmental uncertainty

How much integration is achieved?
The model states that the degree of achieved R&D-marketing integration is affected by:

- Organizational factors, such as structure, reward systems, and senior management's attitude to-ward risk-taking and emphasis on the need for R&D-marketing integration.
- Individual differences between R&D and marketing managers on such aspects as their professional orientation, time orientation, types of products/projects preferred, and their tolerance for ambiguity.

Integration and innovation success

- The discrepancy between the degree of integration ideally required and actually achieved is expected to affect the innovation success of the organization (Gupta *et al.,* 1986).

In the past 30 years, many research in the area of R&D-marketing interface identified a number of positive outcomes related to high level integration between both functions. Research on cross functional integration between R&D and marketing showed positive results with regard to prototype development proficiency, R&D commercialization effectiveness, and product launch proficiency (Souder, Sherman, & Davies-Cooper, 1998). The same research demonstrated positive effects on post launch product management performance and market forecast accuracy (Souder, Sherman, & Davies-Cooper, 1998). Further, high level integration also influenced product development cycle time (Sherman, Souder, & Jenssen, 2000), product development process performance (Kahn, 1996), and overall project success and failure rates (Cooper *et al.,* 2001; 2004a).

3.6 Separation Research from Development

Most research on separation between R&D is conducted in the pharmaceutical industry. Five global pharmaceutical companies (i.e. Glaxo and Sandoz) have separated the R from D. (Chiesa, 1996). This industry is a science based sector and therefore R&D has a key function. In the last decade, the Food industry is also becoming more and more a science based industry and subsequently has many similarities with pharmaceutical industry.

According to Chiesa (1996; 2001) there are several reasons for separating R from D:

Research

- Research management must provide support and constructive criticism, reward achievement, and display flexibility in accommodating individual work styles.
- Research needs to be very open and sometimes borders on chaos.

Development

- Development is a process, which needs planning, fixing milestones and putting up structure and organization. For each project, who the manager is, and who the members of the team are, must be clearly defined.
- The development plan and individual tasks assigned within it need to be identified in a detailed manner. Once defined and agreed, the plan should be followed closely; any significant deviation should become the subject of formal discussion.

Table 3.1 shows the characteristics of Research and Development.

Table 3.1 Characteristics of Research and Development (Chiesa, 1996).

Characteristics	Research	Development
Objectives	Discovery	Development
Timing	Unpredictable	Predictable
Formalization	Low	High
Expenditure	Modest	Substantial
End Results	Unpredictable	Planned

Chiesa (1996; 2001) distinguished the following basic differences between research and development:

- The objective in research is effectiveness, i.e. to discover the most promising drug candidates; the objective in development is to bring a new product into the market efficiently and speedily.
- The key factor in research is creativity, which in turn depends on human resources available. Therefore, advantages in research with respect to competitors are based on the scientific/technical knowledge of individuals. The key factor in development is organization. A better organization can provide advantages in terms of time and costs.
- Profiles of human resources involved in R&D differ. Initial stages of the R&D process are conducted by scientists who are specialists in a certain scientific area; later stages are carried out by developers with more general skills.
- Locational criteria differ: whereas the geographical dispersion of research facilities is driven by the internationalization of scientific knowledge sources, the driving force for locating development units abroad is more a need to exploit new products across different markets.

Different organizational cultures, organizational mechanisms and personal skills are therefore required for the two activities. Table 3.2 gives an overview of the most important differences between R&D. Separating R from D helps manage them as different organizations and apply appropriate managerial styles (Chiesa, 1996; 2001).

Table 3.2 Main differences between research and development management (Chiesa, 2001).

Managerial Principles of R Organizations	Managerial Principles of D Organizations
Culture • Creation of a positive environment (freedom to express scientific opinions and flexibility in reviewing projects) • 'Open door' policy • Accept mistakes • Direct communication • Right for initiative for everyone	***Culture*** • Clear cut priority setting • Identify and solve areas of weakness • Play for speed • Formal communication
Organization • Creation of highly specialized core teams • Sharing information among different scientific disciplines and fields of research • Minimum hierarchical levels • Sound patent strategy (the company shares the results of the research department) • Placing pressure not as a deadline but with a sense of urgency ('other groups are in a better position than us') • Long term commitment • Identification of the external technical centres of excellence with whom to co-operate	***Organization*** • Teamwork among different technical specialists • Involvement of a number of highly specialized scientific areas • Hundreds of compounds handled area by area simultaneously • Creation of a structure that integrates business and science perspectives • Definition of hierarchy, and fixing of project milestones • Formal planning • Pressures on deadlines • Strong integration with marketing • Coordination of many outside investigators and clinics in several nations
People • Research is the right place for a 'prima donna' • Reward on qualitative and quantitative output • Company scientists must be integrated and connected to the outside world of science • Opportunities to present their work to peer review committees • The most creative people should not become managers • Look for public recognition, tangible benefits, support scientific efforts (staff increase)	***People*** • Teamwork • Avoidance of people spending much of their time moving process along • Avoidance of people with pure science credentials • Recruitment of people who can manage across corporate functions (marketing, clinical science etc) • People with broad perspective (business implications of scientific results) • People with long term strategic view plus day-to-day activities • People with an entrepreneurial spirit (winning attitude)

3.7 Past Project and Post Launch Evaluation in New Product Development

Although, the effective coordination of current project information between R&D and marketing is a requirement to develop the optimal product design in the firm's NPD process. Also important in optimizing the NPD process is the integration of knowledge from past product development projects (Adams, Day, & Dougherty, 1998; Benner, 2005; Tidd. *et al*., 2005). The integration of knowledge from past projects is also called knowledge management. One of the objectives of knowledge management is to make the company act as intelligently as possible to secure its viability and overall success (Wiig, 1997). Research

on organizational learning and knowledge management in NPD has shown that recording information from past NPD projects influences performance (Lynn, Reilly & Akgun, 2000; Sherman, Berkowitz & Souder, 2005). Sherman *et al.* (2005) suggested that information from past NPD projects, coupled with cross-functional integration, resulted in improved prototype development proficiency and product launch proficiency. Further, past project information and cross-functional integration also tends to ensure technological core competency fit and efficient decision-making. Similarly research in this area also demonstrated that reviewing information from past NPD projects influences performance (Lynn, Skov & Abel, 1999); Lynn, Reilly &Akgun, 2000;Sherman, Berkowitz & Souder, 2005).

3.8 New Development Strategy

Although, most companies are aware of the importance of developing well defined strategies that ensure sustainable growth of the business, it seems in practice that most companies are more concerned with short-term objectives, how to position products and businesses within the existing industry structure than how to create tomorrow's industries (Hamel & Prahalad, 1994). With regard to the short-term versus long-term vision, Hamel & Prahalad (1994) stated in their book 'Competing for the Future' that managers are spending too much time managing the present, and not enough creating the future.

In the case of NPD, which is typically a multi-disciplinary process with many functional boundaries it is of great importance to have synchronized strategies, that are embedded in the entirely organization. However, in practice often these strategies are not synchronized between the involved "main" functions, e.g. R&D and marketing, due to a lack of communication (Cooper, 2001; Talonen & Hakkarainen, 2008). This misalignment of different strategies in the NPD process could lead to non-mutual objectives or deviations in visions between functions (Talonen & Hakkarainen, 2008). In addition, alignment of the different functional strategies will result in clear R&D goals which will pay off. On the other hand, misalignment of strategies will result in wasting scarce resources or the premature ending of potential projects, and even worse, the loss of irrecoverable time (Roussel *et al.,* 1992).

Many companies use a new product or process development approach in which the key elements for developing a successful strategy; a plan for technology and a plan for product-market position, are only connected (and then loosely) in individual projects. This approach has several limitations:

- a failure to bound and focus the individual project sufficiently to guarantee its rapid, productive execution
- a failure to provide sufficient up-front planning to effectively link individual development projects to these two key strategies
- an unreasonable burden on the individual project

3.8.1 New Development Approaches

The three limitations of the NPD approach mentioned in the previous section are the base for many shortcomings in NPD projects that were already discussed in section 3.2. As a direct effect, individual NPD projects are not able to fully utilize the technology and product/market strategy and to capture market position, improve resource allocation (Wheelwright & Clark, 1992).

Figure 3.5 shows the conventional strategy approach to development projects. Traditionally, many companies make only a loose assessment and forecast of technology and market evolution. Furthermore, even the technology and product/market strategies are not explicitly integrated with individual product development projects (Wheelwright & Clark, 1992).

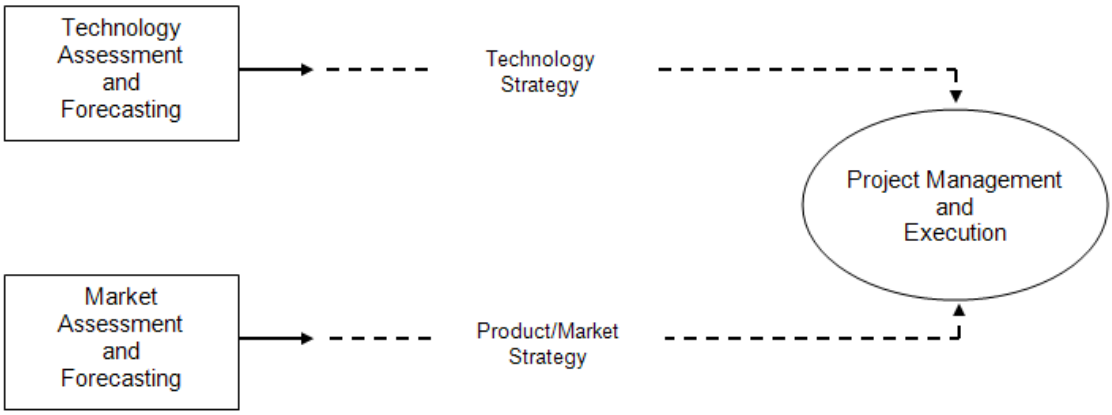


Figure 3.5 Conventional Approach to Development Projects (Wheelright & Clark, 1992).

Wheelwright & Clark (1992) propose a framework that captures both technology and product/market strategy (see Figure 3.6). This framework is based on the four goals of a development strategy:

1. creating, defining, and selecting a set of development projects that will provide superior products and processes. *How will we create value?*
2. Integrating and coordinating functional tasks, technical tasks, and organizational units involved in development activities over time. *How will we deliver value?*
3. Managing development efforts so they converge to achieve business purposes as effectively and efficiently as possible. *How will we deliver value?*
4. Creating and improving the capabilities needed to make development a competitive advantage over the long term. *How will we capture value?*

The framework includes two pre-project activities; development goals and the aggregate project plan, in which technology strategy and product/market strategy can be integrated. Furthermore, these two pre-project activities make it possible for managers to address policy issues and cross-project concerns, and also define a clear project scope. By limiting the scope of individual projects, senior executives make projects more manageable and improve project management procedures. Last step in this framework is implementation of knowledge management, which captures learning points for future projects.

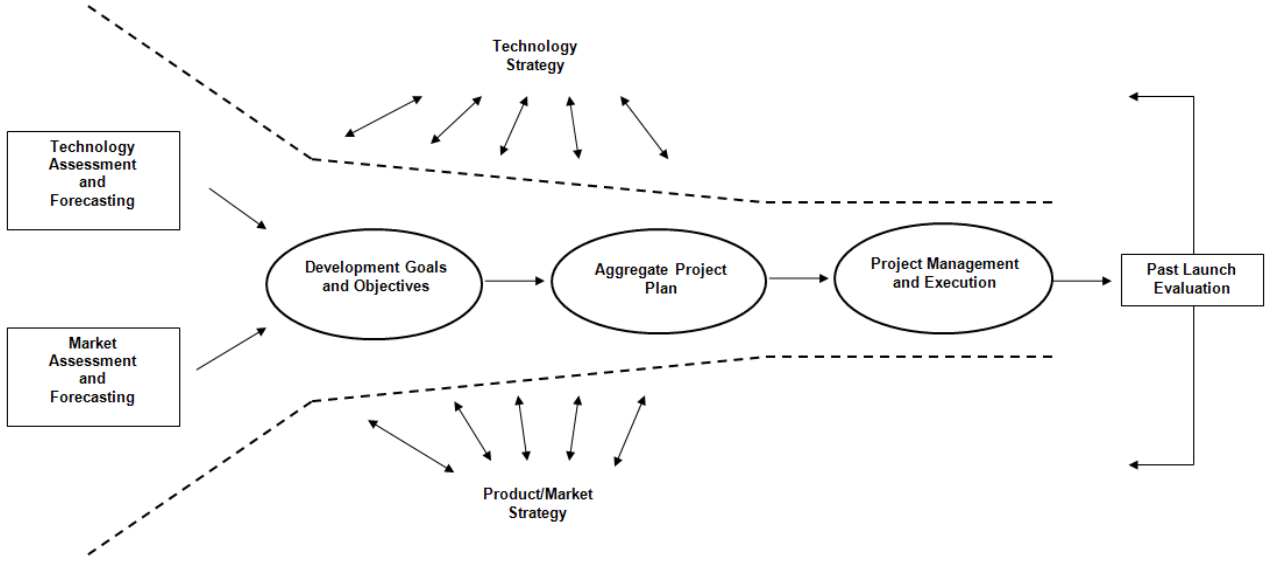


Figure 3.6 New Product Development Strategy Framework (Wheelwright & Clark, 1992).

3.9 Technology Strategy

The role of technology has become so important in today's business world that there are hardly any significant low-tech industries left. In fact, technological forces are restructuring industries and define new ways to compete (Hax & No, 1992). Therefore, best performing businesses put a product innovation and technology strategy in place, driven by the business leadership team and a strategic vision of the business. This product innovation strategy guides the business's NPD and helps to steer resource allocation and project selection. The main objective of a technology strategy is to guide the firm in acquiring, developing, and applying technology for competitive advantage (Wheelwright & Clark, 1992).

Hax and Majluf (1984) and (1991) explain their view on technology strategy by relying upon Porter's framework (Chiesa, 2001). Figure 3.7 illustrates the primary tasks that are relevant in developing a technology strategy.

First, top management has to decide, as part of the corporate strategy, what is the role to be played by technology in creating competitive capabilities, the amount of resources to be allocated to technology and the aggressiveness the firm will use in the innovation process and in imbedding technology into the firm's products and processes. The elements of corporate strategy that communicate more pointedly to the technological requirements are the mission of the firm, particularly the statement of unique competencies and the corporate strategic thrusts, an expression of the primary issues the firm has to address to establish a strong competitive position (Hax & No, 1992).

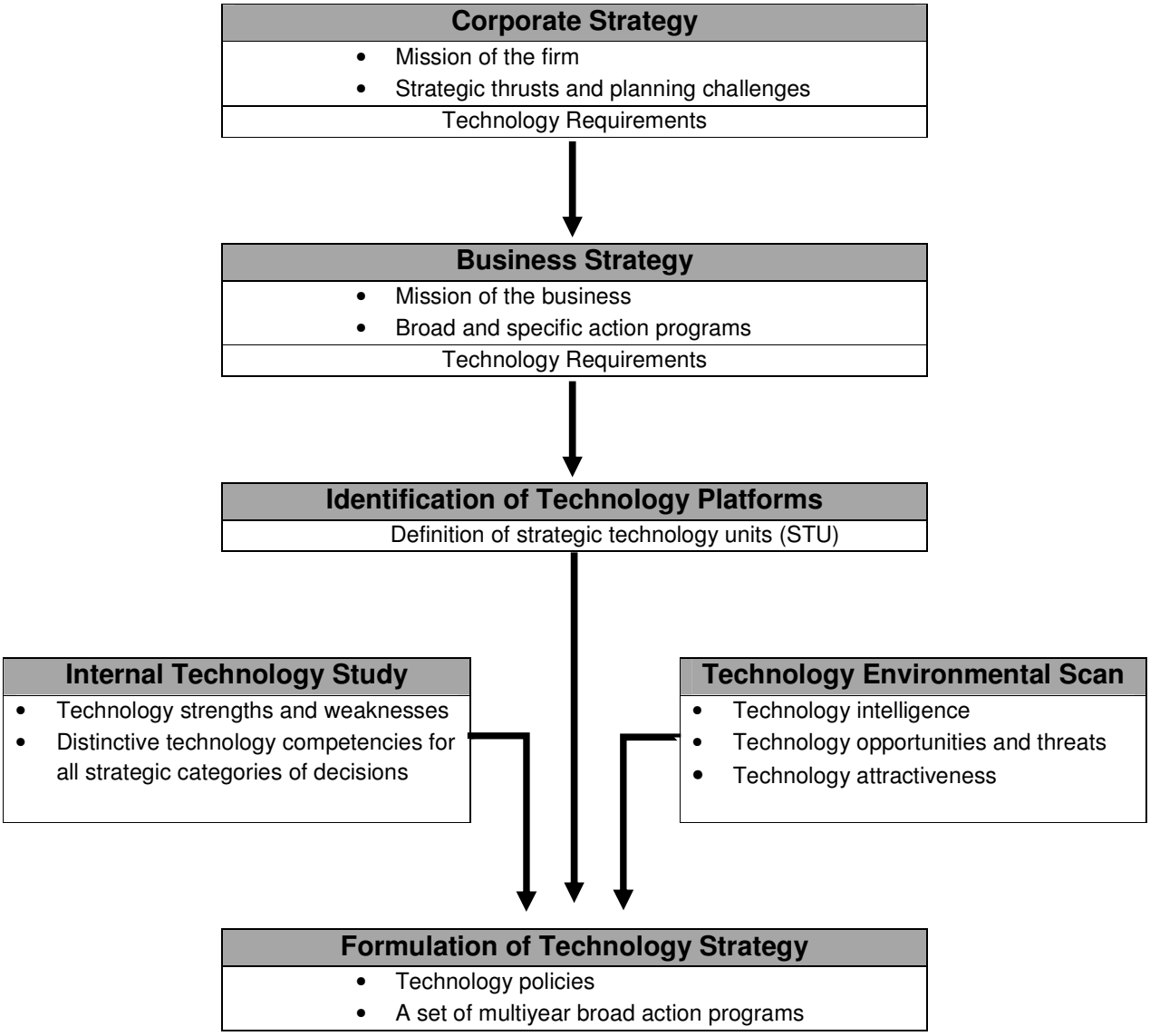


Figure 3.7 A framework for the development of technology strategy (Hax and No, 1992).

Next, the technology strategy is formulated at the business level, where also the technological support required to create or reinforce the competitive advantage sustained by each business unit will be defined (Hax & No, 1992). Obviously, a technology strategy cannot be created in isolation from the corporate objectives and the businesses it is intended to support (Hax & No, 1992).

The third step is the translation of critical business strategy inputs into the technology strategy. Furthermore, in this phase it is also important to identify the portfolio of specific technologies that support these business strategies. Both inputs lead to the definition of the strategic technology unit (STU), the central focus of attention in the development of a technology strategy. A STU identifies the skills or disciplines that are applied to a particular product or process in order to gain technological advantage. The STUs should contain both

the core technologies used now or needed in the future across the whole organization (Hax & No, 1992).

Further, the environmental scan is aimed at obtaining an understanding of the key technology trends, assessing the attractiveness of each STU, and identifying technological opportunities and threats. This form of analysis is also known as technology intelligence. Another important and even more critical action is the recognition of future trends, state-of-the-art developments, and their embodiment in actions by competitors (Hax & No, 1992; Chiesa, 2001). Commonly used tools such as competitive analysis (Consumer-Technology Matrix), portfolio analysis, a skills database, gap analysis, and product-technology roadmapping are specifically designed to help understand a company's strategic and technology needs. Especially, product-technology roadmapping and gap analysis were determined to be most effective when performed at the business-unit level and are even more effective when the business-unit strategies are stated in a way that logically leads to the identification of technology needs (Slowinski *et al.,* 2000).

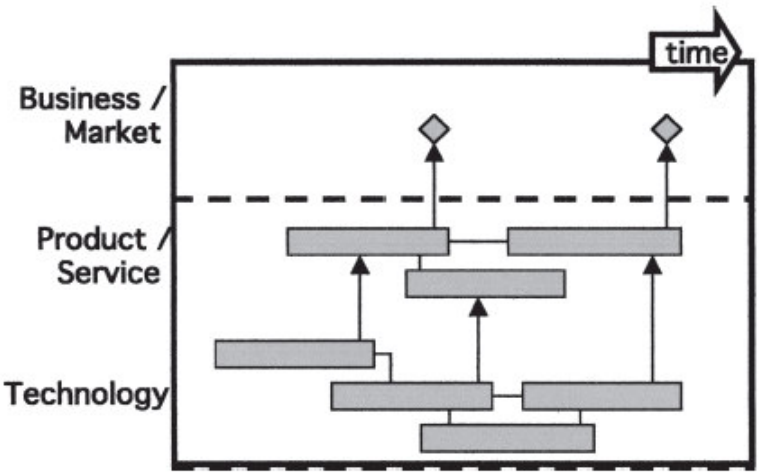


Figure 3.8 Schematic product-technology roadmap (Talonen & Hakkarainen, 2008).

According to DeGregorio (2000) a roadmap is a visualization of a forecast, which can be in a number of key areas, such as technology, capability, platform, system, environment, threat and business opportunity (see Figure 3.8). Furthermore, roadmaps are intended to be living documents, therefore they should be reviewed and updated over time, otherwise they are not useful (Albright, 2003).

The internal technology study aims to recognize strengths and weaknesses associated with each STU and determines the specific technological competencies to be built to gain competitive advantage (Chiesa, 2001).

The final step is the formulation of the technology strategy and is articulated into three major decisions (Hax & No, 1992):

1. **Selection of the technologies to develop**
   It addresses the issue of selecting the technologies in which the firm will specialize, and the ways in which they will be embodied in the firm's products and processes.

2. **Timing of new technology introduction**
   It involves the decision as to whether to lead or to lag behind competitors in process and product innovations. Issues to be addressed are identifying the benefits and risks associated with a leadership and followership strategy, and assuring synergy between the selected technology strategy and the generic business strategy.

3. **Modes of acquisition**
   The extent to which the firm will rely on its own internal efforts in developing internal capabilities, versus outsourcing. The options available for the modes of technology acquisition of products and processes are: internal development, acquisition, licensing, internal ventures, joint ventures or alliances, venture capital, and education acquisition.

After making these decisions it is possible for companies to define multiyear action programs. However, there will be only a good strategy when all the above decisions are consistent with the overall business strategy and are initially driven by the inputs from corporate and business levels (Hax & No, 1992; Chiesa, 2001).

3.10 Strategic Portfolio Management

Roussel *et al.* (1991) stated already in 1991 that new product development portfolio analysis and planning would grow in the 1990s to become the powerful tool that business portfolio planning became in the 1970s and 1980s. Although many introduced methods dealing with portfolio management (e.g. Boston Consulting group and McKinsey), a benchmarking study conducted by Cooper & Kleinschmidt in 1996, mentioned project selection and project prioritization as the weakest facet of new product management. In addition, The benchmarking study of Cooper & Kleinschmidt which included 161 business units acknowledged that management rated themselves very low on:

- Achieving the right balance between the number of active projects and available resources (too many projects) – a poor “proficiency rating” rating of 51 points out of a possible 100.
- Undertaking solid ranking and prioritization of projects – an even poorer rating of 49 points out of 100.

This fact was strongly confirmed by a PDMA study in 2004, the comparative performance assessment study (CPAS). The mix of projects composed by a company has changed significantly during the last decade (Cooper & Edgett, 2008). In the 1990´s companies performed much higher value projects compared to the last few years. *“Businesses today are preoccupied with minor modifications, product tweaks, and minor responses to salespeople's requests, while true product development has taken a back seat.”* (Cooper, 2005) This statement of Cooper was supported by numbers derived from a PDMA study in 2004 (see Table 3.3). ‘New to the world – true innovations’ projects decreased with 44% between 1990 and 2004. Also the project type ‘new product lines to the company declined from 39% in 1990 to a poor 27% in 2004. On the other hand ‘additions to existing product line in the company’ projects and ‘improvements and modifications to existing company products’ projects increased with respectively 21% and 80% over the same period.

Table 3.3 Breakdown of the portfolio by product types- 1990 and 2004 (APQC study, 2004 & PDMA, 2004)

% of Projects in the Development Portfolio				
Development Project Type	Best Performers 2004	Worst Performers 2004	Average Business 2004	Average Business 1990
New-to-the-world	17.05%	8.53%	11.48%	20.4%
New product lines to the company	25.87%	22.99%	27.12%	38.7%
Additions to existing product line in company	26.82%	22.01%	24.66%	20.4%
Improvements & modifications	30.26%	46.47%	36.75%	20.4%

Herfert & Arbige (2008) stated recently that managing a new product portfolio has become a very challenging undertaking and is more complex than before. Factors such as time-to-market and on-time commercial delivery are critical across diverse businesses and within a rapidly changing corporate environment sometimes difficult to manage. This challenge is intensified because business units pursue different strategies, and strive to control their own resources as they attempt to maximize their financial results (Herfert & Arbige, 2008). At the same time, R&D and other corporate supporting functions (e.g. manufacturing, supply, regulatory) are focused on meeting demands across business units and optimizing their performance independently of any single business unit. This may result in misalignment between R&D and business goals, which finally result in less successful new product portfolio management (Herfert & Arbige, 2008; Cooper *et al*., 2001).

Furthermore, Cooper, Edgett & Kleinschmidt (2002) concluded that the underlying goals of having successful NPD portfolio management are:

1 *Selecting high value projects*
A recent benchmarking study revealed that businesses that utilized scorecard methods obtained a higher value portfolio. The lack of data integrity however compromises these tools, it is ineffective if market and technical data are not included or are unreliable.

2 *Achieving the right balance of projects*
Bubble diagrams and pie charts can help to visualize the balance in the portfolio to management on relevant aspects.

3 *Selecting the right number of projects*
In order to shorten time-to-market the number of projects need not to be too large. Projects can be ranked according to criteria as far as resources allow. Projects that exceed this resource limit are either killed or put on hold.

4 *Strategic alignment*
The major goal of good and effective portfolio management is to ensure that the portfolio of projects and where the resources are spent are aligned with the strategic priorities of the business. In addition, the business strategy reflects which types of products, markets and technologies are of importance for the company's survival.

Closely related to portfolio management is the portfolio strategy, which is about guiding a product through the key stages of the NPD process, ensuring that it stays strategically on track – but also being able to react to new and evolving information, for example:

- A competitor brings a similar product to market
- Marketing reduces its estimate of the potential market
- A critical technology will take three months longer to bring to market than forecasted

Literature identified four new product portfolio strategies:

Figure 3.9 New product portfolio strategies (Herfert & Arbige, 2008; Cooper *et al.*, 2001).

Companies nowadays must be able to adapt to a dynamic environment (e.g. environmental varying conditions, react to their competitors and respond adequate to their customers changing requirements (McCrea, 2008). This dynamic environment can have significant influences on a firm's strategy and can induce misalignment with the current new product portfolio. Vice versa an unsuccessful new product portfolio may indicate the need for a change in both R&D and corporate strategy.

3.11 Concluding Remarks

In this chapter a literature review was presented that included all relevant literature topics with regard to the critical factors in the front-end development part. All topics have been

discussed by keeping in mind the value that is delivered in the NPD process. Moreover, the topics discussed in this part of the literature review will form the base for the redesign and recommendations phase of the research. Furthermore, this chapter aimed to answer the following two research questions:

RQ 2.3: What does the literature mention about the critical factors of NPD?

Project Team
Project team members are the people who actually do the work of product development and actually transform vague ideas, concepts, and product specifications into new products. Team composition, group process, and work organization are variables that affect the way of information sharing, resource utilization, and problem-solving style of the team. Important is the use of cross-functional teams that are able to tackle problems in an early phase of the project where it is easier and less expensive to fix problems (Tonchia, 2008). In order to optimize project performance within a project team it is desirable to change team composition on a moderate level to ensure sufficient internal and external communication. However, teams with a short history together tend to lack effective patterns of information sharing and working together (Katz, 1982).

Project management in NPD
Managing new product development (NPD) projects is becoming increasingly challenging since development projects are becoming more difficult and complex. Project-related risk in NPD concerns mainly the balancing of corporate financial risks vs. speed-to-market. Especially for NPD projects the trade-off between the variables; time, cost and quality are important. The project team must always keep in mind the golden rule of design: "*the later the stage at which changes are made, the more expensive they become"* (Tonchia, 2008).

In this perspective, the importance of the fuzzy front-end activities in controlling and managing the degree of complexity is high and affects directly new product success (Cooper, 1988; Kim & Wilemon, 2002).

R&D marketing interface
The integration between R&D and marketing in the NPD process is important for setting new product objectives, identifying market opportunities, determining product features or capabilities, resolving product cost-design-performance trade-offs and ensuring speed-to-market (Griffin & Hauser, 1996; Gupta, raj and Wilemon, 1986; Sherman, Berkowitz & Souder, 2005).

People
Research and Development are two different disciplines and therefore also require different organizational cultures, organizational mechanisms and personal skills. Table 6 gives an overview of the most important differences between Research and Development (Chiesa, 1996; 2001).

Past project evaluation
Research on organizational learning and knowledge management in NPD has shown that recording information from past NPD projects influences performance (Lynn, Reilly and Akgun, 2000;Sherman, Berkowitz & Souder, 2005).

Lack of technology strategy

The role of technology has become so important in today's business world that there are hardly any significant low-tech industries left. In fact, technological forces are restructuring industries and define new ways to compete (Hax & No, 1992). The main objective of a technology strategy is to guide the firm in acquiring, developing, and applying technology for competitive advantage (Wheelwright & Clark, 1992).

Strategic portfolio management

Companies nowadays must be able to adapt to a dynamic environment (e.g. environmental varying conditions, react to their competitors and respond adequate to their customers changing requirements (McCrea, 2008). This dynamic environment can have significant influences on a firm's strategy and can induce misalignment with the current new product portfolio.

RQ 2.5: What is according to literature the importance of strategy in front-end NPD activities?

Best performing businesses put a product innovation and technology strategy in place, driven by the business leadership team and a strategic vision of the business. This product innovation strategy guides the business's NPD and helps to steer resource allocation and project selection. The main objective of a technology strategy is to guide the firm in acquiring, developing, and applying technology for competitive advantage (Wheelwright & Clark, 1992).

In the case of NPD, which is typically a multi-disciplinary process with many functional boundaries it is of great importance to have synchronized strategies, that are embedded in the entirely organization. However, in practice often these strategies are not synchronized between the involved "main" functions, e.g. R&D and marketing, due to a lack of communication (Cooper 2001; Talonen & Hakkarainen, 2008). In addition, alignment of the different functional strategies will result in clear R&D goals. On the other hand, misalignment of strategies will result in wasting scarce resources or the premature ending of potential projects, and even worse, the loss of irrecoverable time (Roussel *et al*., 1992).

In the next chapter, the methodology of the research tools is described.

4. Methodology Empirical Part

4.1 Introduction

This chapter describes the methodology of the research tools that were used during this research project. As already stated in chapter one, this research project can be described as a 'practice-oriented research', which is about intervention in order to change an existing practical situation (Verschuren & Doorewaard, 2005). Additionally, the first three phases of the intervention cycle were used as a method to carry out the research. These phases include; problem finding, diagnosis and design. Verschuren & Doorewaard (2005) distinguished five steps or stages, however, in this research project the 4th and 5th phase will be skipped because of time reasons and the limited scope of the research project. The problem finding phase concerned preliminary interviews within the R&D department with both senior developers and R&D management. Subsequently, the WIAT Company questionnaire was send to both R&D management team, marketing directors and some marketing managers. Furthermore, a literature review was initiated. After identification of the problem the background and the cause of the identified problem were examined in the diagnostic phase. In this phase also the desk research was completed which gives a profound background of the problem. Further activities in this phase include: organizational wide in-depth interviews to gain deeper understanding of the identified problem and a project based survey (WIAT Project) will be used in order to make an analysis of 9 pre-selected NPD projects. The design phase is the third and last step in this research is based on the input and conclusions of the previous two phases. Moreover, a redesign of the front-end stages is the outcome of this phase.

Section 4.2 explains the methodology used during the open interviews. Next, section 4.3 describes the quantitative part of the research and discusses the two questionnaires that were used in this research project. This chapter ends with section 4.4 which discusses the reliability and validity of this research project.

4.2 Open Interviews

Information was collected through in-depth, face-to-face interviews with 36 informants: 14 developers, 7 persons from the R&D management team, 12 marketers and 3 persons from the Marketing management team (see Table 4.1).

Table 4.1 Titles and numbers of informants.

Department	Title of informants	Number of informants
R&D	R&D Management	7
	Developers	13
Marketing	Marketing Directors	3
	Marketing Managers	3
	Brand Managers	9

The developers which include food technologists and packaging, and marketers provided insights into the team members' personal experiences within the current NPD process by

analyzing a past-project. On the other hand, the managers discussed more NPD management related issues such as NPD funnel, brand and technology strategy, gate approval, brand portfolio and organizational structure.

This research project used a standard interview protocol for the developers and marketers to ensure completeness and consensus (see Appendix D). Another interview protocol was developed for persons of the management teams (see Appendix E). Further, interviews were conducted in an unstructured fashion in that we did not follow the protocol to strict, encouraging informants to talk freely. In addition, interviews with persons form the management team were all unstructured without a standard protocol. In addition, individually sessions with persons from the management team were planned in which the mid-term results were presented of the literature study, the two surveys and the interviews. In this way, also management could give their opinion on the outcomes of the surveys and open interviews. Furthermore, interviews were audio recorded and transcribed. Except for the informants that did not agree with recording the interview. For triangulation purposes the data used in this research consist of field notes, transcriptions, confidential company reports, presentations and other archival data on site which provided relevant information on the NPD process under study. In addition, table 4.2 gives an overview of the internal research materials used during the research.

Table 4.2 Overview of the internal research materials.

Internal research material	Summary of content
Workshop on innovation management (Bloom Consultancy, 2010)	One day workshop on strategic portfolio management, innovation management and NPD process
Project Management Review (PMR) report (2010)	NPD performance, NPD funnel, status of each project and KPI's
Marketing Academy Tool book (2010)	Explanation of the complete NPD process from a marketing perspective
NPD Improvement Report (2002)	A description of how the current NPD process should work
NPD document UK (2008)	A detailed description of NPD process UK
NPD document New Zeeland (NZ) (2009)	A Detailed description of NPD process NZ
Presentations (2009-2010)	NPD effectiveness, PMR training, current R&D approach
Documents	Packaging checklist, R&D brief, marketing brief, strategic brief, project briefs, gate documents, project evaluation

4.3 Wageningen Innovation Assessment Tool (WIAT)

Based on earlier research of Cooper (2001), NewProd of Cooper and Kleinschmidt (1990), and the Genesis tool of Hollander (2002), Fortuin *et al.* (2007) recently developed a monitoring assessment tool that detects the key success factors leading to product innovation success for prospector companies in the agrifood business. Moreover, The WIAT can be divided based on the assessment of the drivers and barriers to innovation at company level and on the critical success and failure factors at project level (Tepic *et al.*, 2009).

4.3.1 WIAT Company

The WIAT company questionnaire relies on subjective managerial input on multiple criteria from both marketing and R&D management. The seven respondents (see Table 4.3) were

asked to give their subjective judgment to 42 statements on a seven-point Likert scale, ranging from strongly disagree (1) to strongly agree (7). In addition, the respons rate was 70% for this survey.

Table 4.3 WIAT Company respondents.

Department	Number of persons
Marketing Management	3
R&D Management	4

By gathering input from both disciplines it is possible to identify differences in vision with regard to innovation and NPD. In addition, the outcomes of this survey were compared to the data of the benchmark that included results from eight other A-brand companies in the food industry. The analysis of the results from the questionnaires may point at points for improvement within the organization, which can also be incorporated in discussions, learning and decision making to become more innovative.

Questions of the WIAT company questionnaire can be subdivided into 4 main 'blocks':

Competitive environment

- Opportunities: business opportunities open to all the players within the sector.
- Threats: threat of new entrants and substitutes.
- Competitive forces: power of suppliers, buyers, and rivalry among existing firms.

Competitive strategy

- General business strategy, operationalized as the level of market dominance a firm is aiming at and the importance of innovation in maintaining competitiveness.
- R&D strategy, operationalized as R&D priorities (designing and launching new products; designing and implementing new processes; increasing efficiency of existing processes; or basic research) and the firm's familiarity with the open innovation approach.

Company resources and innovation capabilities

- Management of innovation (questions on the use of key performance indicators; effectiveness of intellectual property protection; the use of incentives to stimulate innovation; and the extent to which the firm codifies the lessons learned from each project).
- Cross-functional communication, (questions on communication of R&D with marketing, manufacturing, and purchasing).
- External communication and open innovation (communication with suppliers and buyers; use of joint ventures and alliances).

Performance

- The concept of performance is split into the sub-concept of innovation performance, operationalized as the respondent's subjective assessment of the company's innovativeness in the fields of marketing, product design, product quality, distribution, and manufacturing;

4.3.2 WIAT Project

The WIAT (Wageningen Innovation Assessment Tool) Project survey was used in the company in order to benchmark 9 pre-screened NPD projects with the purpose of identifying point for improvements. The sample included 8 past projects and 1 running project. The technical brand manager of each category appointed three projects that were worth analyzing. For all 9 projects, both technical project leader (TPL) and commercial project leader (CPL) plus an additional third person from packaging, nutrition or processing were used as respondents of the survey. The 23 respondents were asked to give their subjective judgment to 42 statements on a scale ranging from strongly disagree (1) to strongly agree (10). Additionally, the respondents were asked to answer the questions as if the project was still taking place in order to reduce bias caused by retrospective data collection. For the projects assessed ex post, the same methodology was applied as for the running projects. Although this approach does not eliminate the response bias, it has proven to be effective (Tepic *et al.,* 2009)). Subsequently, to completing the survey 20 out of the 23 respondents also participated in the open interview sessions. Internal reports provided by the informants, such as project briefs, strategic briefs and evaluation forms were also used for the analysis of the 9 projects.

The WIAT project benchmark (see Figure 4.1) includes 21 successful and 11 failed projects of large agri-food companies. In addition, the WIAT database is continuously renewed with recent data of product innovation projects. Large companies are defined as companies with more than 250 employees and an annual turnover of more than €50 million (Tepic *et al.,* 2009). Successful projects are those projects which achieved their objectives, perform well after market introduction and generate profits for the company (Tepic *et al*., 2009). Failed projects are those projects that were killed during the development process or which proved to be a failure in the market (Fortuin *et al*., 2007).

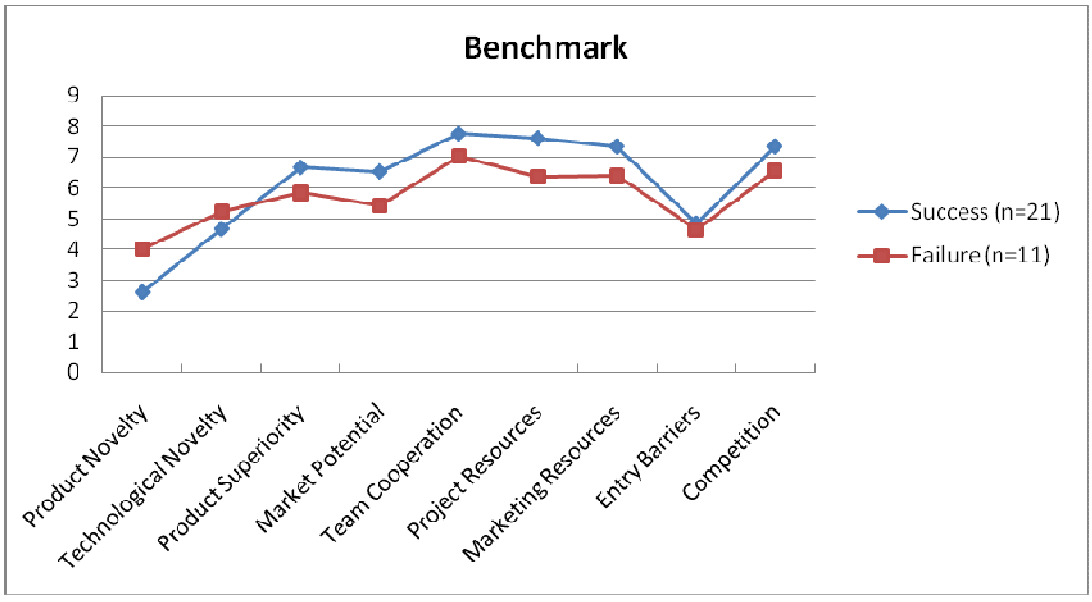


Figure 4.1 Failed and successful projects in the agri-food sector at project level (Tepic *et al.,* 2009).

Table 4.4 shows results from a comparison test of the mean scores between failed and successful projects show significant differences on four dimensions; market potential, team cooperation, project resources and marketing resources. The fact that market potential

scores significantly higher in successful projects is in line with the expectation that both market potential and product superiority are important aspects in the agri-food sector (Tepic *et al.,* 2009). However, product superiority itself did not show a significant difference between success and failure projects. The lower score of superiority is in line with the low score of product novelty and show that food companies are apparently more successful when launching incremental innovations. These results confirm the prevailing view on the food business that the strong focus on customers results in incremental improvements rather than technologically complex or radical product changes. Other aspects such as good communication, clear goals and high commitment are related to the factor team cooperation which is significantly higher in successful projects. Finally, it can be concluded that companies with a higher score on project resources will perform better as a result of more adequate financial, managerial, technical, production and marketing resources (Tepic *et al.,* 2009).

Table 4.4 WIAT project factors.

WIAT Factors	Success		Failure		
Product	Mean	SD	Mean	SD	
Product Novelty	2,62	1,09	4,01	2,37	
Technological Novelty	4,67	1,64	5,22	1,91	
Product Superiority	6,67	1,61	5,84	1,3	
Market Potential	6,53	1,17	5,43	1,22	**
Project					
Team Cooperation	7,76	0,96	7,03	0,99	*
Project Resources	7,61	1,16	6,36	1,17	**
Marketing Resources	7,35	1,16	6,39	1,71	*
Market					
Entry Barriers	4,85	1,59	4,64	1,93	
Competition	7,35	1,37	6,55	1,58	

** p<0.10; ** p<0.05; sd = standard deviation*

The results of the WIAT project survey can be divided into three factors and broken down into 9 dimensions (see Table 4.4).

Product
The product factor has two dimensions of novelty. The first novelty dimension is related to the degree of novelty of the innovation or new product to the company. The technological novelty is related to the degree of novelty of the product aspects. Another dimension related to the product is the product superiority which says something about the product distinctiveness. Potential is the last dimension in the product category and is related to market volume of the product.

Project
The project factor can be divided into 3 dimensions; team cooperation, general resources of the project team and marketing resources for the project.

Market
The last factor takes into consideration the entry barriers of the particular market and also market competition.

4.4 Reliability and Validity

Reliability

The reliability in this research is ensured by making sure research and investigative questions were consistent in meaning across all members of both target groups. Open interviews are based on a standard interview protocol. Further both WIAT questionnaire are developed at Wageningen University and are used in many research studies and therefore may be considered as reliable. In addition, the open interviews and surveys were completed by two different groups within the case which causes some dissimilarity within the case which is positive for the reliability of this research.

Internal Validity

This research analyzed A small number of research units should be analysed in a labour-intensive way – with more depth than breadth – by using several research methods such as: open interviews, two surveys and internal research materials (see table 9). The triangulation of research methods increases the internal validity of this research by eliminating chance as much as possible.

External Validity

Case studies have their advantages, *e.g.* they provide a holistic view of the situation, require less pre-structuring and are therefore more flexible than other research strategies. Moreover, results are slightly less artificial and therefore more likely to be accepted. However, it can also be disadvantageous to use a case study in some situations, *e.g.* the small number of cases often influence the external validity (Verschuren and Doorewaard, 1999). This research project made use of one case which makes it difficult to generalize conclusions.

In the next chapter, the results of the company analysis are discussed.

5. Results: Company Analysis

5.1 Introduction

In this chapter, the outcome of the Wageningen Innovation Assessment Tool (WIAT) Company survey will be compared to the benchmark of the food industry which includes data of eight both global players in the food market with strong A-brands and medium-sized food companies based in the Netherlands (n=12). Moreover, the data set created at the company under study makes it possible to compare the results of marketing (n=3) and R&D (n=4) in order to identify differences in vision with regard to innovation and NPD. In addition, the company results are the mean of marketing and R&D. Section 5.2 discusses the results of this survey. This chapter ends with some concluding remarks based on the results and feedback from the respondents. Finally, chapter 5 aims to answer the first research question:

RQ 1.1: How innovative is the company under study compared to the Dutch food industry?

RQ 1.4: What points for improvement can be identified in The company's NPD process to make it more successful and effective?

RQ 2.6: What are critical points in the company's NPD process?

5.2 Results & Discussion Company Analysis

This section of the research paper will discuss the results of the most interesting outcomes of the WIAT company survey.

Competitive Environment

The bargaining power of buyers was reported to have a strong influence on all participating companies regardless of their size, sector, and type of business. This is in consensus with the CIAA (2008) report that found, that Concentration in the European retail sector has resulted in an imbalance of power between the suppliers (food industry) and the buyers (retail), and that as a result, the pressure on industry suppliers is increasing (Fortuin & Omta, 2009). A direct consequence of this trend is the growing of private label market share in many categories. In order to overcome this high bargaining power of retail, the company and also the other food companies acknowledge the importance of innovation to ensure brand awareness and market share. This vision was also reflected in the answer to the question 'innovation is important to our company in maintaining competitiveness', which showed the highest mean (6.0) of all Likert seven-point scale questions. With regard to the innovation strategy, the company and the other food companies agree that the design and launch of new products has the highest priority (Fortuin & Omta, 2009).

Table 5.1 Characteristics of the competitive environment.

	Food Industry		**Company**		Marketing		R&D	
	Mean	***(SD)***	***Mean***	***(SD)***	*Mean*	*(SD)*	*Mean*	*(SD)*
The business environment is safe and provides little threat for the survival and well being of our company	**3.6**	**(1.6)**	**4.3**	**(1.1)**	5.0	(1.0)	3.8	(1.0)
The sector is rich in investment and marketing opportunities	**4.4**	**(1.8)**	**3.6**	**(1.8)**	2.3	(1.2)	4.5	(1.7)
Actions of competitors are easy to predict	**4.4**	**(0.8)**	**4.4**	**(1.3)**	4.0	(2.0)	4.8	(0.5)
Consumer trends and desires are easy to forecast	**3.7**	**(1.2)**	**3.4**	**(1.4)**	3.0	(1.0)	3.8	(1.7)
The bargaining power of our suppliers has a strong influence on our business results	**3.7**	**(1.5)**	**3.9**	**(1.3)**	4.0	(2.0)	3.8	(1.0)
The bargaining power of our business buyers has a strong influence on our business results	**5.9**	**(0.7)**	**5.4**	**(1.3)**	6.3	(0.6)	4.8	(1.3)
New entrants in our sector have a strong influence on our business results	**3.5**	**(1.6)**	**3.7**	**(1.8)**	4.0	(2.6)	3.5	(1.3)
The number of substitutes for our products is large	**4.8**	**(1.4)**	**5.3**	**(1.3)**	6.3	(0.6)	4.5	(1.0)

Figure 5.1 shows that the company perceives the business environment as safe and little threat for the survival and well being of the company, despite the slightly higher than average threat of new entrants and substitutes. In addition, the business is still growing year after year, which may also explain the high score of marketing with regard to the business environment. Although, R&D is less confident about the business environment, they recognize the food sector as rich in investment and marketing opportunities, which is not in line with marketing's vision. On the contrary, marketing recognizes far less investment and market opportunities compared to the average mean of the food industry (see Figure 5.1). The difference in recognizing investment and marketing opportunities between marketing and R&D may flow from the confidence by marketing with regard to the business environment. "When business is doing well, there is no real need for innovation". Another possible explanation could be that The company is relying and confident on their brand power, which is definitely an important competitive strength for the company.

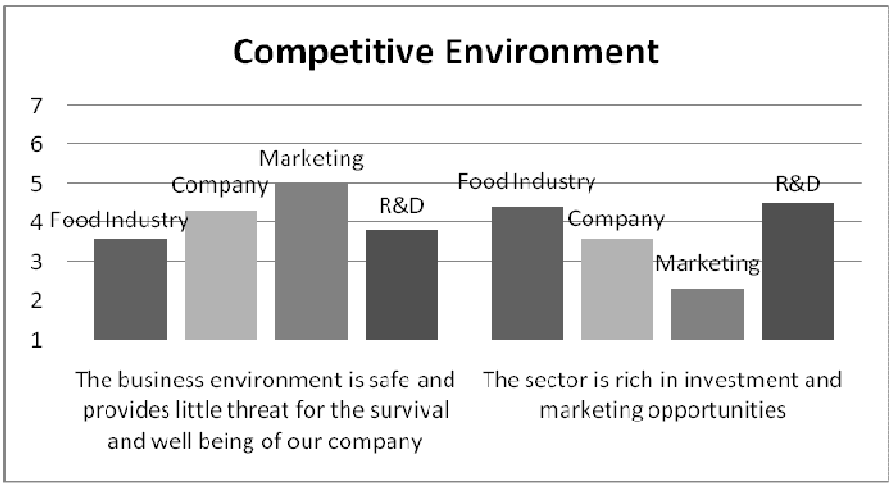


Figure 5.1 Characteristics of the competitive environment.

Management of Innovation

The results of table 5.2 show that food companies in general, including the company under study score low at protection of product and processes by patents or licenses. Furthermore, the food industry and the company state that they have KPI's (Key Performance Indicators) related to the innovation process. Some respondents were not satisfied with the use of current KPI's, they claimed that KPI's were mostly used to illustrate the financial R&D figures related to the outcome of the new products rather than truly monitor the innovation process (Fortuin & Omta, 2009). The company uses currently a set of 10 KPI's to monitor their NPD process. Within the company, KPI's have two goals:

a. Help the product implementation teams to evaluate and learn from new product development projects.
b. Project management review (PMR) members can learn from performance on KPI's

Table 5.2 Characteristics of management of innovation.

	Food Industry		**Company**		Marketing		R&D	
	Mean	***(SD)***	***Mean***	***(SD)***	*Mean*	*(SD)*	*Mean*	*(SD)*
KPIs (Key Performance Indicators) are used to monitor the innovation process	**3.4**	**(1.7)**	**3.6**	**(1.1)**	4.0	(1.0)	3.3	(1.3)
Our company distinguishes positively from our competitors by the protection that our products and processes receive by patents, licenses etc	**2.5**	**(1.2)**	**2.1**	**(1.1)**	2.7	(1.2)	1.8	(1.0)
We consistently codify the 'lessons learned' at the end of innovation projects	**3.0**	**(0.9)**	**2.6**	**(0.8)**	2.7	(1.2)	2.5	(0.6)
There are efficient reward procedures and motivation drivers to stimulate innovation	**3.7**	**(1.3)**	**3.1**	**(1.5)**	3.7	(2.3)	2.8	(0.5)
Few restrictions are imposed on R&D by administrative regulations (e.g. regarding travel, budget, etc)	**4.5**	**(1.3)**	**2.9**	**(1.2)**	2.7	(1.2)	3.0	(1.4)

The results from the question 'we consistently codify the 'lessons learned' at the end of innovation projects', shows that the food industry believes that their sector is not very good in codifying the lessons learned of NPD or innovation projects. This integrating of knowledge from past product development projects is of high importance in optimizing the NPD process (Adams, Day, & Dougherty, 1998; Benner, 2005; Tidd. *et al.*, 2005). Research on organizational learning and knowledge management in NPD has shown that recording information from past NPD projects influences NPD performance positively (Lynn, Reilly & Akgun, 2000; Sherman, Berkowitz & Souder, 2005). Furthermore, the results of our case study on stimulating innovation through reward systems are even below the already low average of the food industry. This low score is mainly caused by R&D, which practically never makes use of a reward system. In addition, these results may suggest that R&D does not feel appreciation for their NPD efforts. This finding was confirmed by several R&D respondents who stated that R&D acts as a 'Service Center.'

The outcome of the question 'Few restrictions are imposed on R&D by administrative regulations (e.g. regarding travel, budget, etc)', indicates with almost 1.5 points under the food industry average of 4.5, that R&D and marketing are quite restricted by administrative regulations. One respondent from R&D rejects this finding by explaining that almost everything is possible if you can convince the management of the added value of your request.

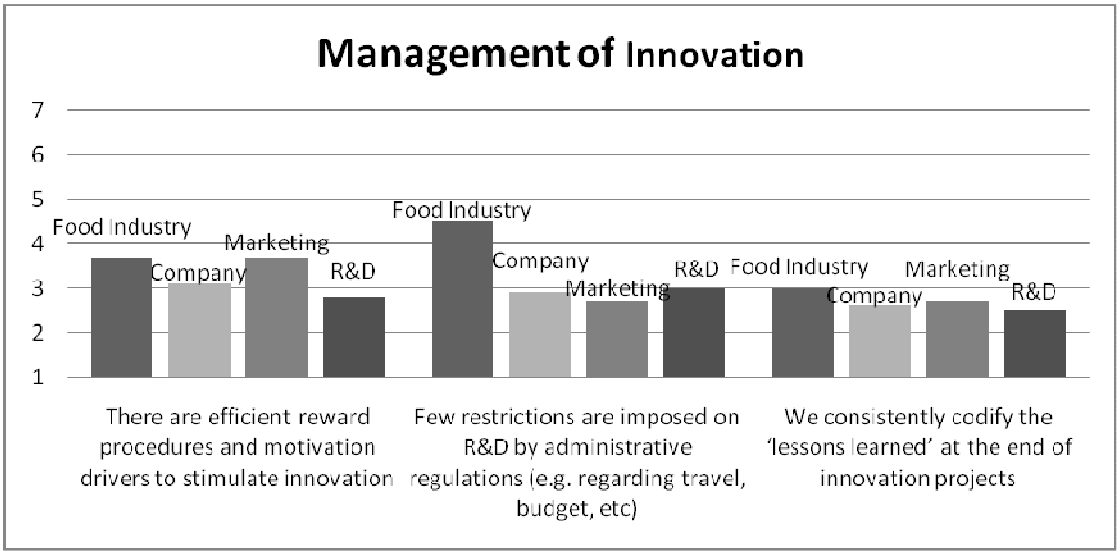


Figure 5.2 Characteristics of management of innovation.

Internal Communication

Table 5.3 demonstrates the results on the use of cross-functional communication in the food industry and within the company understudy. All questions regarding cross-functional communication had means close to four. In general the company understudy has below food industry means on all internal communication areas. Especially, marketing rated internal communication below mean.

Table 5.3 Characteristics of internal communication.

	Food Industry *Mean* *(SD)*	**Company** *Mean* *(SD)*	Marketing *Mean* *(SD)*	R&D *Mean* *(SD)*
Current market information (such as segmentation, trends and feedback on competitors' products and processes) is passed on by marketing to R&D on a regular basis	**4.6 (1.6)**	**3.1 (0.7)**	3.3 (0.6)	3.0 (0.8)
The progress of all R&D projects is communicated regularly to the business units	**4.9 (1.6)**	**3.7 (0.8)**	3.3 (0.6)	4.0 (0.8)
There is an excellent communication between R&D and marketing	**4.0 (1.2)**	**3.7 (1.1)**	3.3 (1.5)	4.0 (0.8)
There is an excellent communication between R&D and manufacturing	**4.5 (1.0)**	**3.9 (0.9)**	3.3 (0.6)	4.3 (1.0)
There is an excellent communication between R&D and purchasing	**3.9 (1.1)**	**3.9 (0.7)**	3.7 (0.6)	4.0 (0.8)

Research on cross functional integration between R&D and marketing showed positive results with regard to prototype development proficiency, R&D commercialization effectiveness, and product launch proficiency (Souder, Sherman & Davies-Cooper, 1998). However, figure 5.3 shows that within the company passing on of market information by marketing and communication of progress of all R&D projects to the business units, scores below the mean average of the food industry. These results indicate that there is still room for improvement between the marketing and R&D department with regard to sharing of knowledge.

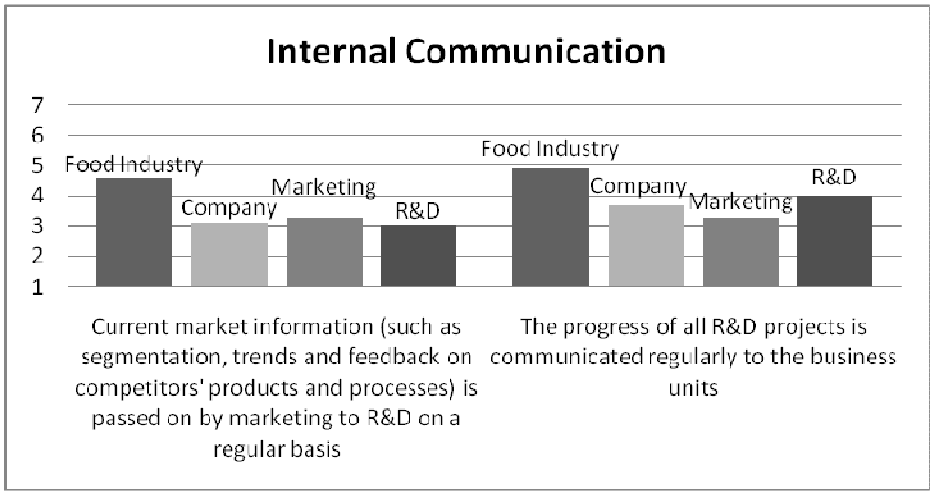


Figure 5.3 Characteristics of internal communication.

External Communication and Open Innovation

Table 5.4 provides the main findings on external communication with suppliers and buyers. The results indicate that for both, the food industry in general and the company in particular, the external communication is moderate and leaves room for improvement.

Table 5.4 Characteristics of external communication and open innovation.

	Food Industry		**Company**		Marketing		R&D	
	Mean	***(SD)***	***Mean***	***(SD)***	*Mean*	*(SD)*	*Mean*	*(SD)*
There is an excellent communication between R&D and our main suppliers	**4.0**	**(1.4)**	**3.9**	**(0.7)**	3.7	(0.6)	4.0	(0.8)
There in an excellent communication between R&D and our main buyers	**3.6**	**(1.4)**	**3.4**	**(1.1)**	3.3	(1.2)	3.5	(1.3)
Our company uses joint ventures and alliances to make full use of our R&D capabilities	**3.0**	**(1.3)**	**4.6**	**(1.3)**	4.0	(1.7)	5.0	(0.8)

However, the results on active R&D collaboration with external partners in the form of open innovation (see Figure 5.4), The company (4.6) scores much higher compared to the average mean of the food industry (3.0). This high score of The company on open innovation is mainly driven by the R&D leadership team, which is supporting open innovation actively through the organization.

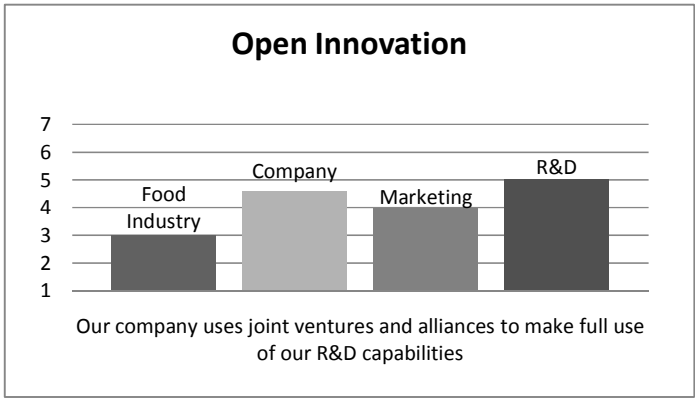


Figure 5.4 Characteristics of open innovation

Business Performance

Table 5.5 provides the findings on the respondents' subjective assessment of their company's business performance. The current position of our company compared to our main competitors is rated below the average mean, which indicates a weak competitive position. However, this is conflicting with previous findings, whereas marketing is confident about the survival and well being of the company.

Table 5.5 Characteristics of business performance.

	Food Industry		**Company**		Marketing		R&D	
	Mean	***(SD)***	***Mean***	***(SD)***	*Mean*	*(SD)*	*Mean*	*(SD)*
We expect the sales volume of our current products in the coming three years to strongly decrease (1) to strongly increase(7)	**3.9**	**(0.9)**	**4.0**	**(0.6)**	4.0	(0.0)	4.0	(0.8)
The current position of our company compared to our main competitors can be characterized as very weak (1) to very strong (7)	**4.3**	**(1.7)**	**2.9**	**(0.9)**	2.7	(1.2)	3.0	(0.8)
Compared to our main competitors our profitability is very low (1) to very high (7)	**4.6**	**(0.5)**	**5.0**	**(1.2)**	5.0	(1.0)	5.0	(1.4)
Compared to our main competitors our sales volume is very low (1) to very high (7)	**5.3**	**(1.3)**	**3.9**	**(0.7)**	4.0	(0.0)	3.8	(1.0)
Compared to our main competitors our growth rate is very low (1) to very high (7)	**4.3**	**(0.8)**	**4.4**	**(1.4)**	4.7	(0.6)	4.3	(1.9)
Our company distinguishes positively from our competitors by a strong financial position	**4.5**	**(1.6)**	**4.9**	**(0.7)**	5.3	(0.6)	4.5	(0.6)
Our company distinguishes positively from our competitors by our good reputation in the market	**5.6**	**(0.7)**	**5.6**	**(1.1)**	5.0	(1.7)	6.0	(0.0)

The company's sales volume is relatively low compared to the mean of the food industry (see Figure 5.5). On the other hand, profitability at the company is high compared to the mean of the food industry, which is probably the result of the strong brands and good market reputation that enables them to have higher margins on their products.

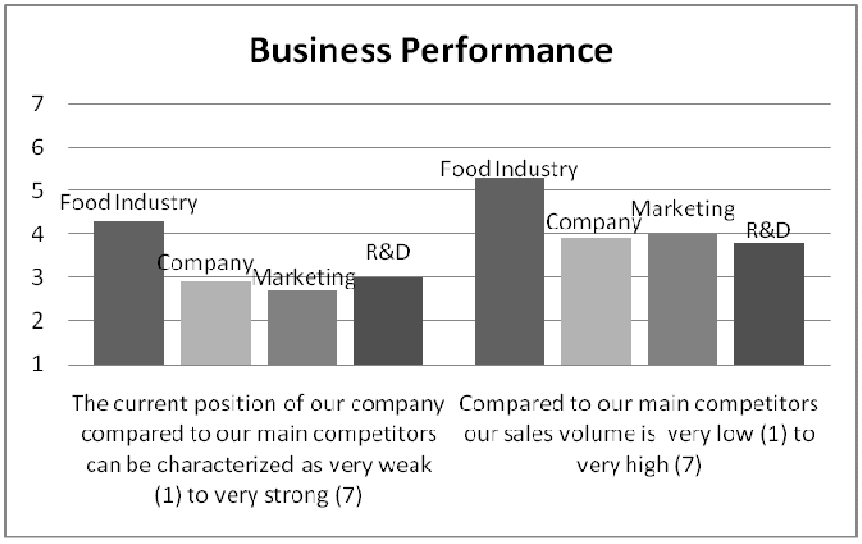


Figure 5.5 Characteristics of business performance.

Innovation Performance

Management considers the company on average less innovative in marketing, distribution and manufacturing processes compared to the average food business. However, remarkable are the differences in perception between marketing and R&D, especially in product design and product quality (see Table 5.6).

Table 5.6 Characteristics of innovation performance.

	Food Industry	**Company**	Marketing	R&D
	Mean (SD)	***Mean (SD)***	*Mean (SD)*	*Mean (SD)*
How innovative would you consider your company to be in marketing (1= not innovative; 7= very innovative)	**4.3 (1.5)**	**3.4 (1.3)**	3.0 (1.0)	3.8 (1.5)
How innovative would you consider your company to be in product design	**4.3 (1.0)**	**4.3 (1.4)**	3.3 (1.5)	5.0 (0.8)
How innovative would you consider your company to be in product quality	**4.3 (1.3)**	**4.3 (1.4)**	3.0 (1.0)	5.3 (0.5)
How innovative would you consider your company to be in distribution	**4.1 (1.4)**	**3.6 (1.4)**	2.7 (0.6)	4.3 (1.5)
How innovative would you consider your company to be in manufacturing processes	**4.6 (0.7)**	**3.3 (0.8)**	3.0 (1.0)	3.5 (0.6)
Our new products enter the market faster compared to our main competitors' products	**3.6 (1.1)**	**3.7 (1.4)**	5.0 (1.0)	2.8 (0.5)
The returns from R&D relative to the R&D investments are very unsatisfactory (1) to very satisfactory (7)	**4.1 (0.8)**	**3.4 (0.8)**	3.3 (1.2)	3.5 (0.6)
Our company distinguishes positively from our competitors by our flexibility of market response	**4.4 (1.0)**	**5.0 (0.9)**	5.7 (0.6)	4.3 (0.6)

Further, management considers their marketing as being not innovative compared to the food industry. Moreover, R&D is less negative with regard to the marketing capabilities of their company compared to marketing's vision. Another point of misconception is about the level of innovativeness of the company's distribution. Results show that R&D is in line with the average food industry, but marketing is less confident about their distribution (see Figure 5.6).

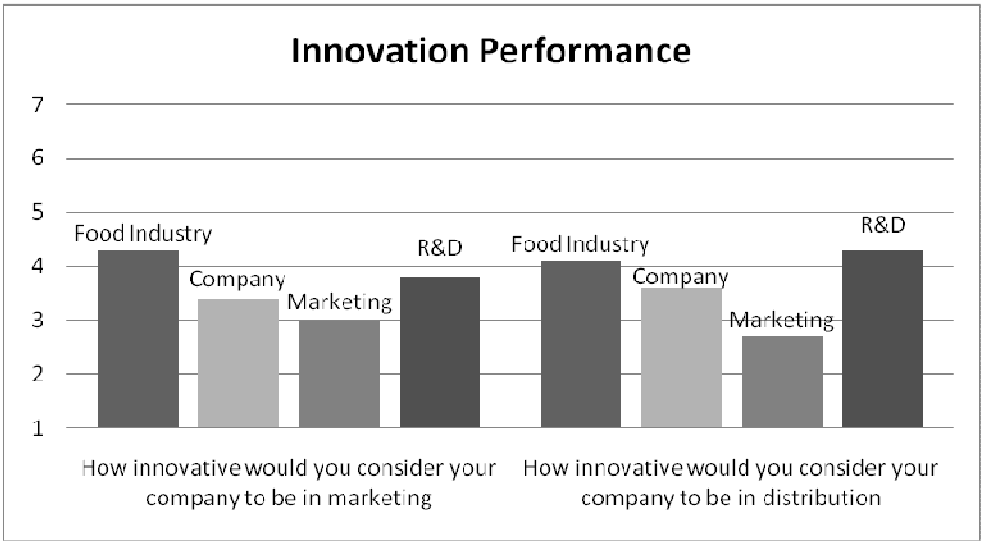


Figure 5.6 Characteristics of innovation performance.

Figure 5.7 shows that R&D is apparently much more satisfied with their product performance than marketing. The low rating of marketing may demonstrate that they are more aware of

the company's external environment, which includes competitor products. Furthermore, marketing seems to be aware that the current new product development approach is heavily influenced by the trade-off between time and quality, which is in their opinion obvious detrimental for the product quality and design compared to the average of the food industry. On the other hand, the results of R&D concerning the launched products show that they are more than average satisfied with product quality and product design, delivered in their limited development time.

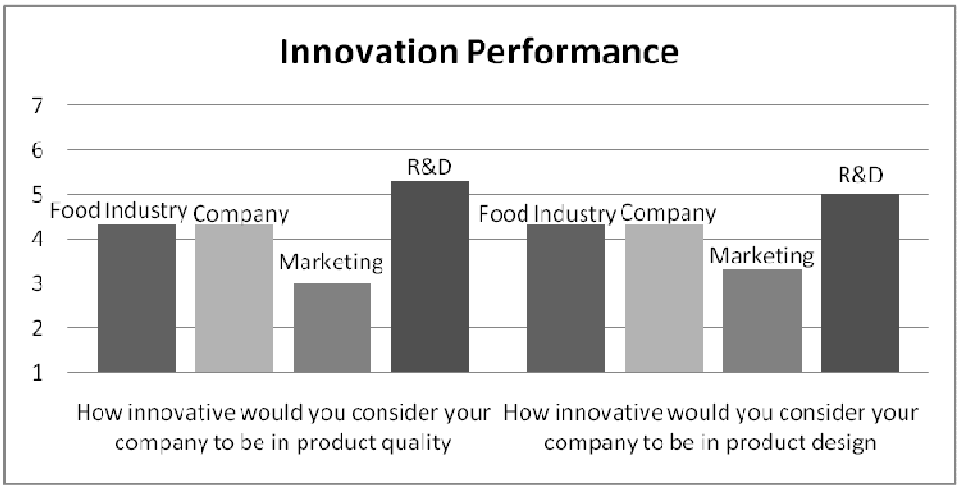


Figure 5.7 Characteristics of innovation performance.

Figure 5.8 shows the results for speed-to-market and flexibility of market response, which are for the company above the relatively low average of the food industry. Remarkable is again the difference between R&D and marketing in both dimensions. Marketing is in line with the company vision that states that ensuring speed-to-market is very important in order to get first-mover advantages. Moreover, marketing perceives the company ahead of its competitors on both dimensions.

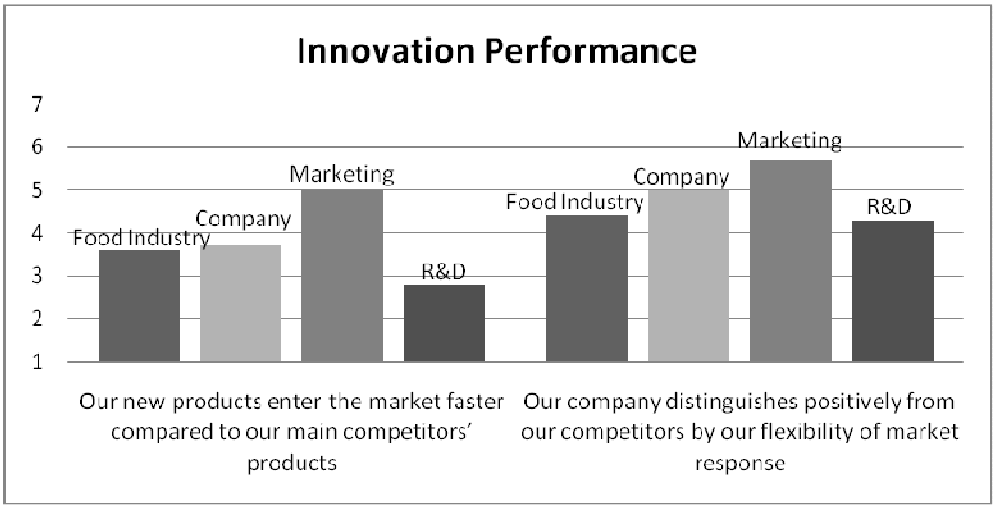


Figure 5.8 Characteristics of innovation performance.

5.3 Concluding Remarks

In this chapter the results, obtained from the WIAT Company survey are presented. First of all, it has to be stated that the outcomes of this questionnaire are based on subjective managerial input from the Marketing and R&D management team. The analysis of the results from the questionnaires may point at points for improvement within the organization, which can also be incorporated in discussions, learning and decision making to become more innovative. Also important to mention is that 6 out of the 7 respondents gave individually feedback on the results of this survey in an open interview setting.

RQ 1.1: How innovative is the company under study compared to the Dutch food industry?

The company under study scored in overall lower than the benchmark. The gap between the two top companies of the benchmark and the company under study is significant. Remarkable is also the significant gap between R&D's and marketing's vision concerning some NPD or innovation management issues. However, the company is not performing weak on all aspects and by creating one common vision within R&D and marketing this could already help in improving some of the current points of difference in the NPD process.

RQ 1.4: What points for improvement can be identified in the company's NPD process to make it more successful and effective?

Past project management
If we look at management of innovation section, one may conclude that the company under study scores low on *'innovation reward systems'* and *'we consistently codify the 'lessons learned'* at the end of innovation projects, which means there are many opportunities for improvement. Moreover, results may suggest that R&D does not feel appreciation for their NPD efforts. This finding was confirmed by several R&D respondents who stated that R&D acts as a 'Service Center'.

Internal communication
Next point for improvement deals with internal communication and is rated low by both R&D but especially marketing. Particularly the sharing of market information between marketing and R&D was rated very poor with a 3 out of 10.

RQ 2.6: What are critical points in the company's NPD process?

Open innovation
The R&D collaboration with external partners in the form of open innovation, the company scores much higher compared to the average mean of the food industry. This high score of the company on open innovation is mainly driven by the R&D leadership team, which is supporting open innovation actively through the entire organization.

Business opportunities
With regard to the competitive environment, the company understudy perceives the business environment as safe and little threat for the survival and well being of the company, despite the slightly higher than average threat of new entrants and substitutes. Remarkable is the

difference in recognizing opportunities, R&D sees many opportunities while marketing is reluctant. This may flow from the (over) confidence by marketing with regard to the business environment. Additionally, we can state that marketing shares the opinion that the company does not invest enough in their brands.

Business position
Remarkable is the outcome on the current position of the company compared to the main competitors is rated below the average mean, which indicates a weak competitive position. However, this is conflicting with previous findings, whereas marketing is confident about the survival and well being of the company.

Speed-to-market
Last point of difference deals with speed-to-market, marketing is in line with the company vision that states that ensuring speed-to-market is very important in order to get first-mover advantages. Moreover, marketing perceives the company ahead of its competitors on both dimensions. On the other hand, R&D does not.

In the next chapter, the results of the NPD project analysis are discussed.

6. Results: New Product Development Projects Analysis

6.1 Introduction

In this chapter we analyze 9 NPD projects of the company under study and compare the outcomes with a benchmark of successful and failure projects in the food industry. In section 6.2 the outcome of the questionnaires will be analyzed and compared with the benchmark of NPD projects from the food industry. This chapter ends with concluding remarks in section 6.3. In addition, the statements of the questionnaire are listed in appendix A. Subsequently, this chapter aims to answer the following research question:

RQ 2.6: What are critical points in the company's NPD process?

6.2 Results and Discussion NPD Project Analysis

Benchmarked to the Wageningen Innovation Assessment Tool (WIAT) database, figure 6.1 shows the aggregated results of the 9 NPD projects. From this figure it can be concluded that project team members indicate many factors close to project failure score rather than project success.

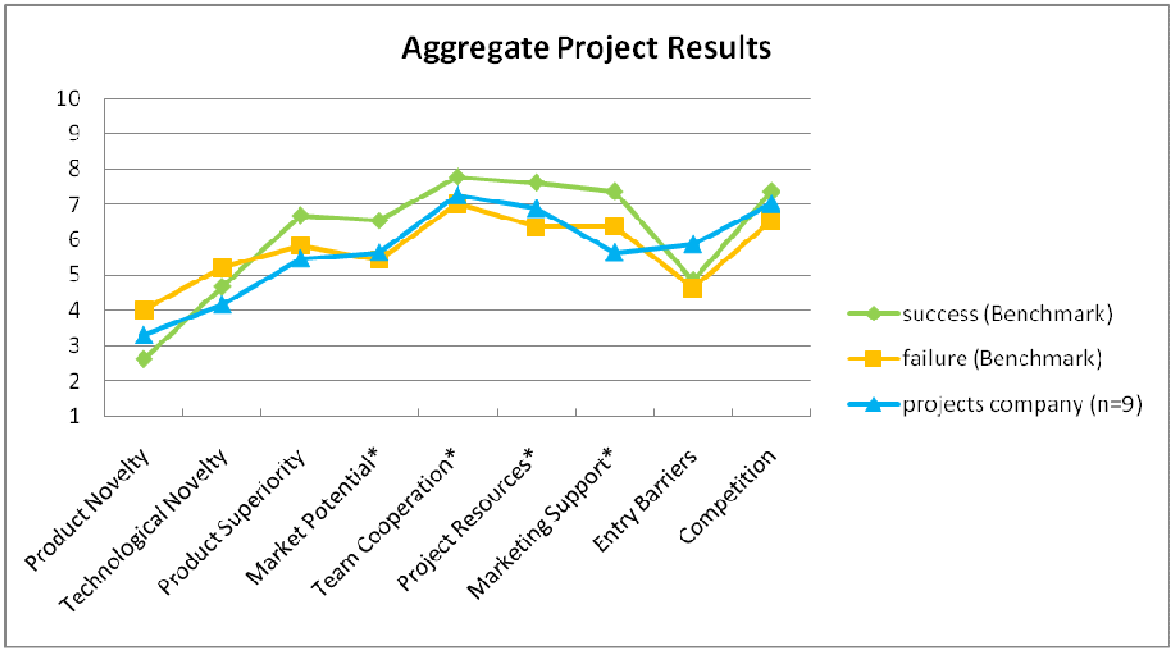


Figure 6.1 Aggregate project results.

Next, each factor of the project analysis is discussed in more detail:

Product Novelty
The factor product novelty scored low on every statement which means that the new developed product was not new to the company. Furthermore, it implies a high level of fit between the product and the company strategy.

Technological Novelty

The technological novelty is related to the degree of novelty of the product aspects. Figure 6.1 shows that technological novelty scored low which can be explained by the low level of technology in new products of the company. By following this approach the company minimizes their risks by using already available technologies that are familiar to the company.

Product Superiority

Product superiority is an important factor and assesses to what extent a product possess distinctive features (a higher quality or unique features) compared to competitors' products, economic advantage, meets certain customer demands, and has a higher probability of achieving success in the market is measured. Especially, the statement "*Our product will permit the customer to do a job he/she cannot presently do with what is available"* had a very poor rating.

Statements concerning offering unique product features and about differentiating from competitors products were also rated below the benchmark of failure projects.

Market Potential

Three factors are measured under market potential, market competition, market volume and market environment. Further, it presents the extent to which a new product has the possibility to be sold at the numbers predicted, the extent to which the new product is able to compete with other products or substitute products in the market. Within the sample of the 9 NPD projects, only 2 projects scored within the range of the success projects of the benchmark, all the other projects were close to the failure scores of the benchmark. Particularly, the following statements were rated below the benchmark of failure projects:

"The monetary value of the market (either existing or potential market) for this product is large."

Potential customers have a great need for this type of product."

This product has a high potential (i.e can additional products, multiple styles, price ranges)."

Team Cooperation

The team construct is indicated by a single factor, team communication. The items under this factor measure the extent to which the team members in the project work in an integrative manner. Part of the latter are good technical and communication skills as well as sufficient decision making authority. Results show that the projects scored average on this factor with 7 out of 10.

There was only one statement that scored lower than the average of the benchmark. This statement dealt with the degree of satisfaction about the NPD process used, "*I am completely satisfied with the product development process used."*

On the other hand, there was also a statement that scored higher than average and also higher than the benchmark score of success projects, "*If I doubt the opinion of a team member I will surely confront this member with it."*

Project Resources
Team members indicated that project resources were in general sufficient for executing projects. This is also confirmed in figure 6.1 by a score of 7 out of 10.

Marketing Support
A factor that scored very low compared to the benchmark was the factor marketing support. As figure 6.1 demonstrates, the aggregate score is lower than the failure projects of the benchmark. Especially, the following statement scored very low, *"Our advertising and promotion resources and skills are more than adequate for this project."*

Entry Barriers
The entry barrier factor takes into consideration the entry barriers of the particular market. Figure 6.1 indicates that the company score on entry barriers is slightly higher than the benchmark. The highest score was given for the following statement: "*There is a strong dominant competitor – with a large market share – in the market."*

Competition
The last factor, competition scored similar to the benchmark. The outcome of this factor indicates that the company is active in highly competitive markets characterized by intense price competition.

6.3 Concluding Remarks

First of all, it has to be stated that respondents of the survey were commercial project leaders (CPL), technical project leaders (TPL), packaging developers and one nutritionist. Therefore, input is pure subjective and results may only point at points for improvement at project level, which can further be incorporated in discussions, learning and decision making in order to deliver more high value projects and process improvements.

RQ 2.6: What are critical points in the company's NPD process?

The outcome from the project analysis indicates that many factors are more pointing towards project failure than towards project success. Particularly, the factors; product superiority, market potential and marketing support, scored low. Furthermore, two other important key success factors 'team cooperation' and 'project resources' scored both average. Overall, based on the 9 NPD projects, the aggregate results indicate three critical points for discussion:

Product Superiority
The lower score of product superiority is in line with the low score of product novelty and shows that food companies are apparently more successful when launching incremental innovations. These results confirm the prevailing view on the food business that the strong focus on customers results in incremental improvements rather than technologically complex or radical product changes. This factor scored low and is even lower than the benchmark of failure projects, which indicates significant room for improvement for this factor.

Market Potential
Market potential which is closely related to product superiority has also a low score. Only 2 out of 9 projects scored within the range of the success projects of the benchmark. However,

feedback from marketing management indicated that the majority of the other 7 projects were strategically important projects which were launched for strategic reasons.

Both product superiority and market potential factors demonstrate that the products introduced have a weak proposition and may also be considered as me-too products.

Marketing Support
A factor that scored very low compared to the benchmark was the factor marketing support. As figure 6.1 demonstrates, the aggregate score is lower than the failure projects of the benchmark. The lack of marketing support after a new product introduction was also confirmed during the open interview sessions and often indicated as cause for product failure by the respondents.

In the next chapter, the results of the NPD process analysis are discussed.

7. Results: New Product Development Process Analysis

7.1 Introduction

This chapter can be subdivided into two parts, the first part deals with the company's NPD performance in the last three years and is mainly based on internal reports and managerial input. Section 7.2 discusses the company's NPD performance and starts with explaining the importance of NPD for the company. Furthermore, section 7.2 elaborates on the categorization of NPD introductions of the last three years and ends with an analysis of the current NPD funnel. In addition, the first part aims to answer the following research questions:

RQ 1.2: How was NPD performance of the company in the past?

The second part, based on open interviews and both surveys, elaborates on the current NPD process and focuses particularly on the first three stages of the process. Section 7.3 discusses the company's NPD process. In addition, it analyzes the process per stage, describes the current funnel shape and elaborates on the research and development activities. This chapter ends with some concluding remarks. Additionally, part two aims to answer three research questions:

RQ 1.3: What points for improvement can be identified in the company's current NPD process to make it more successful and effective?

RQ 2.4: How are NPD activities of the company under study currently organized in the front-end stages, ideation and concept qualification?

RQ 2.5: What critical points can be identified in the company's NPD process?

7.2 New Product Development Performance

The introduction of new products in order to ensure sufficient market share is also for the company of this case study of great importance, while private label is still gaining market share from well established A-brands. Furthermore, market analyses show that private label acts sometimes as first mover in NPD and is even growing some categories with new private label products. The following reasons lists why NPD is crucial for the company (source: internal presentation):

- In order to protect the company's A-status, it is of high importance to have first mover advantages,
- NPD support awareness of total company brand,
- NPD's have prospects for margin recovery, improved shelf placement and distribution,
- NPD's ensure category growth,
- Attract consumers after the recession when growth continues.

7.2.1 New Product Development Portfolio FY07-FY09 Benelux

Internal reports concerning fiscal year (FY) 07-09, show that most successful product introductions, based on penetration, had a 'close to home' concept or were loyal to the concept (internal company report). Additionally, a consumer/technology matrix (CTM) (see Figure 7.1) was used for analyzing the number and mix of NPD projects that the company has launched in the past three years based on an internal new product tracking document. In addition, the position of the products in the CTM are based on input from all technical brand managers (TBM) and two marketing managers. By indicating and categorizing the mix and number of projects based on net sales volume (NSV) and gross profit (GP) as a percentage of NSV, the matrix will show the delivered benefit of each project type in an overall picture. Appendix C explains the classification of both axes; competitive advantage and consumer value perception.

The CTM indicates that the majority of the launched NPD projects, the red spot which represents almost 75%, were variants or improvements with a low competitive advantage. This finding was also confirmed by the WIAT project questionnaire, which was based on the subjective input from project team members and included CPL, TPL and packaging. Moreover, the results from the survey demonstrated that the project team scored low on the statements with regard to product differentiation.

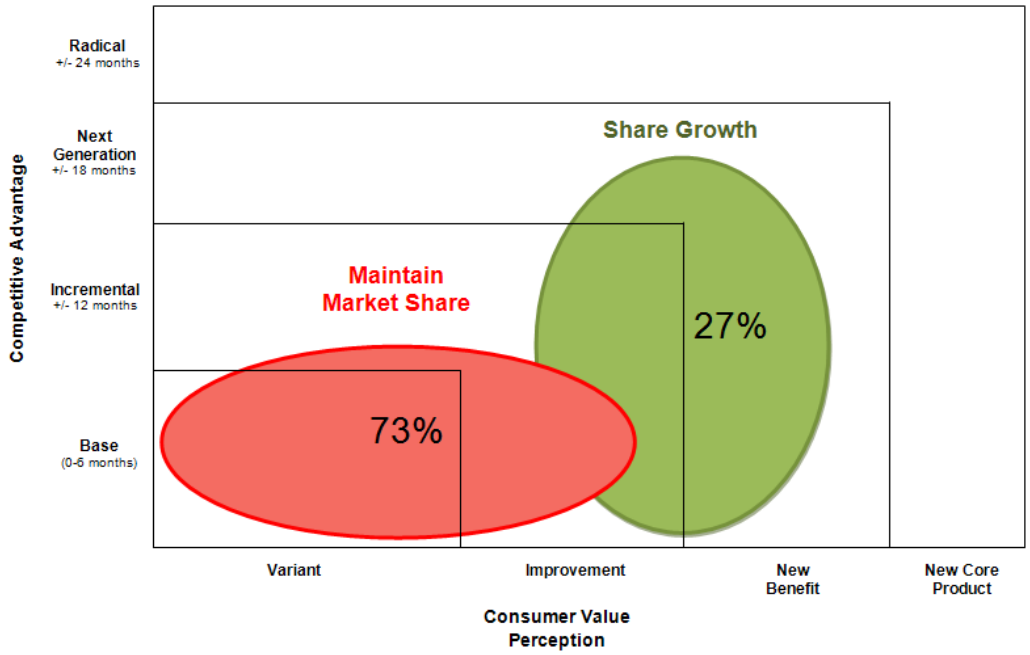


Figure 7.1 The consumer/technology matrix.

7.2.2 New Product Development Funnel

The company's NPD funnel for FY10-FY12 shows in the majority of the categories a well filled ideation stage with many potential ideas. However, the rest of the funnel, stage 2 – 5 is poorly filled and also has some gaps with regard to some development stages. On the other hand, funnels that have a good balance, lack ideas in the ideation stage. Figure 7.2 illustrates latter mentioned funnel filling approaches by the company.

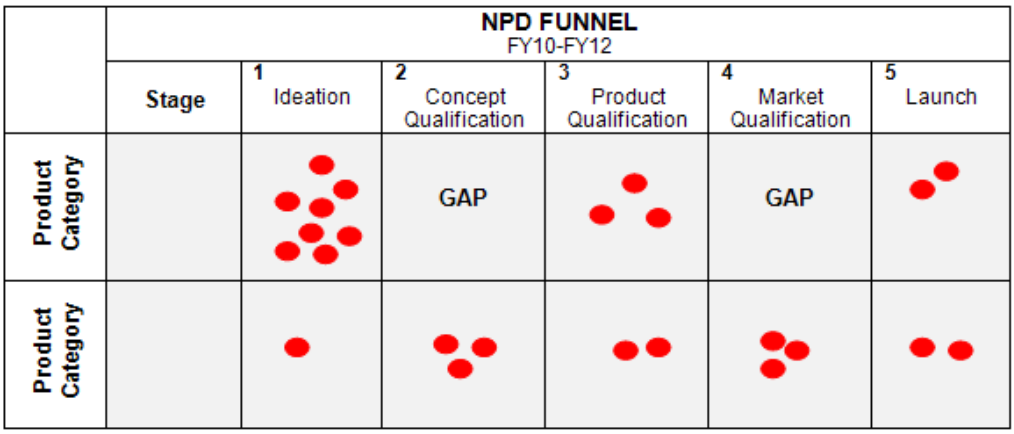


Figure 7.2 The two different funnel filling approaches of the company.

7.3 The Company's Stage-Gate Process

A new product development process that guides projects from idea to launch is a well – recognized key to NPD success (Cooper 2001). According to Cooper et al. (2004b) a NPD process is more than just a flowchart and should include all process elements: the stages, stage activities, gates, deliverables and gate criteria that constitute a well-defined NPD process.

The company introduced the NPD stage gate process for the following reasons:

- Clear process
- Includes risk management
- Resource allocation
- Ensures managment involvement

7.3.1 Front-end Stages

The company is mainly driven by constraints of money. As a direct consequence also the NPD process is mainly cost-driven. Especially stage 1 and 2 are done in relatively short time spans, which result unfortunately in incomplete or not well considered concepts in stage 3. These incomplete concepts are missing technological input and the feasibility part, which is partly caused by the lack of a clear technology strategy. Additionally, marketing is thinking too quickly in product attributes instead of thinking beyond that and also take into consideration the unmet needs and already available technology opportunities of the external environment. Moreover, the current way of working lacks obviously a multi-disciplinary approach in the front-stages which may result in weak and undifferentiated NPD concepts in the current situation.

The company has a *discipline oriented* NPD approach, which looks almost like a *linear* process, in which the project moves from Consumer Insights-to-Marketing-to-R&D/Packaging-to-Manufacturing-to-Sales (see Figure 7.3).

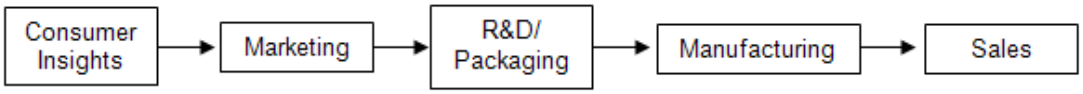


Figure 7.3 Current discipline oriented NPD approach

Several informants both from marketing and R&D acknowledged the problem of having a discipline oriented NPD approach within the company. Within this perspective one of the interviewees stated: *"I think people also have to realize that NPD is not just a one man show from marketing but you have to work with the whole team as a real team on this project."*

In the same context, another striking text was stated more than once by the R&D management: *"We act as a service centre… marketing demands and we deliver."*

7.3.2 Stage 1 Ideation

This is the fuzzy front-end and is all about generating and selecting ideas that may benefit the company. Marketing is highly active in this stage and come up with new ideas based on consumer insights derived from several market studies. Tailor made Marketing studies are used to identify new opportunities in combination with competitor analyses and market knowledge, in order to find the most potential unmet opportunities. However, the use of these studies is not always correct, since the company focuses strongly on consumer acceptance of products, which may result in missing the true expressed and unexpressed needs of both current and potential customers. In this case these marketing studies are used as concept validation tools instead of the start point for creating a new concept. Further, the marketing manager is responsible to ensure a continuous flow of new ideas into the funnel and create a balance. For example, one category plans twice a year a funnel "day" , which is a full day brain storm meeting with cross-functional departments in order to develop and co-create new ideas and concepts. However, this is not the standard and often these ideation and funnel-filling activities are conducted solely by marketing.

Furthermore, an important activity in this first stage is the development of a long-term brand strategy for NPD. However, in reality marketing's vision is often limited and short-term oriented. As a direct result of a not clearly defined or the lack of a longer term brand strategy in some categories, makes it for R&D hard to develop a clear technology strategy which could support current and more importantly future business opportunities.

Two persons of R&D management made statements that stress the need for a long-term vision: *"We define our own goals and decide what we think will be important for the future consumer."*

And, *"A long-term vision of 3 years would make things less complicated and gives us the opportunity to develop a well-filled NPD funnel."*

Another important role in the ideation phase is that of the technical brand manager (TBM), which is supposed to actively participate in these first ideation sessions. However, due to many changes in the marketing department, it is difficult to establish one clear way of working. These new people also need some time to find their way in the organization, which results in a very unstable working environment and unclear roles in this stage. Furthermore, all informants from both R&D and marketing management agreed that internal communication is often lacking between marketing and R&D. In addition, this finding was also confirmed in the results of the company analysis where the company scored very low at this point. Especially, the input of the TBM with regard to technological knowledge is important in this phase. However, in the current situation the technological input is often missing. This technological knowledge should make clear what is possible and what are the

limits within the available technology and how much added value can certain technologies bring to the idea. One of the marketing directors also mentioned an important and often underperformed activity is analyzing competitors and external opportunities in this phase.

Probably the most important but often most underperformed activity in the ideation stage is the development of a feasible project definition. Within the company there is almost never sufficient time to deliver or develop a complete and well defined concept or product brief at once. Subsequently, this leads to scope changes later in the process, the moving target. Although, in a project it is often unavoidable to change goals and objectives during the process to a certain extend after acquiring more detailed information. However, within the company this seems often to be the standard rather than some exceptions. At least 5 out of the 9 projects had some considerable scope changes in the development phase or later stages. Both marketing directors and one of the marketing managers indicated that project briefs have often a vague and too broad scope which easily leads to (avoidable) scope changes and waste of costly time in later stages. The root cause for this problem can be further divided into two sub-causes:

1. Lack of higher management attention.
2. Lack of project management skills.

This problem of lack of management attention in the NPD process is visualized in figure 7.4 and was confirmed by 9 out of 10 interviewees of both R&D and Marketing management. One marketing director describes a problem that is crucial in the first stages of the NPD process: *"Important responsibilities and decisions concerning NPD are transferred towards lower organizational levels instead of top management."*

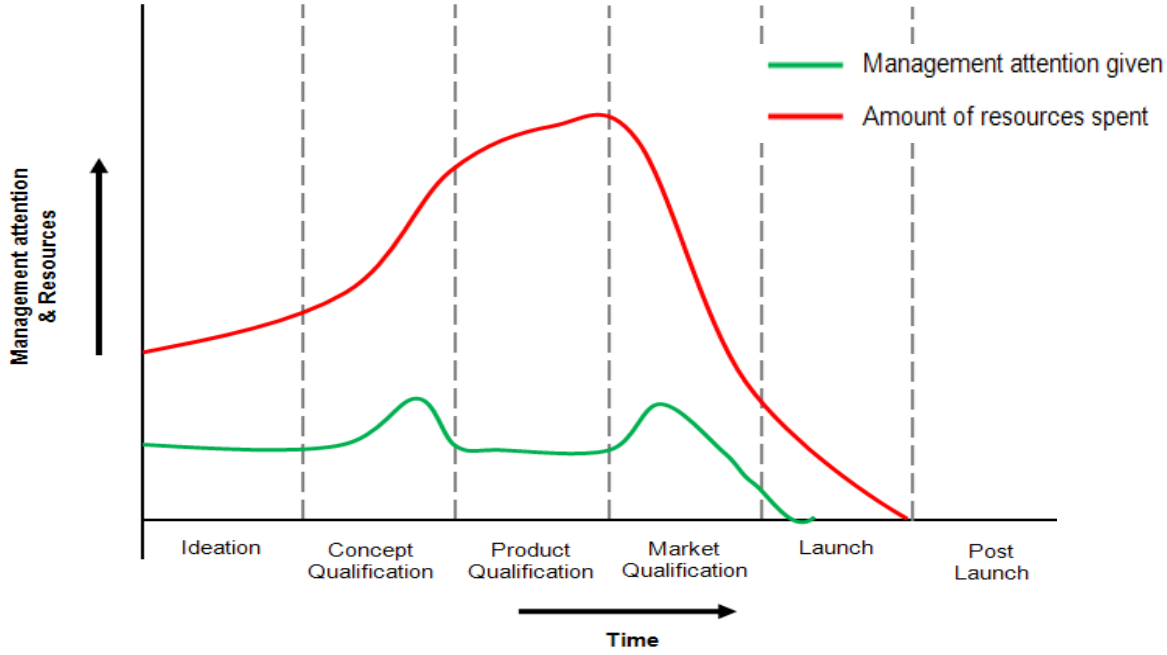


Figure 7.4 Current situation management attention and amount of resources spend.

A mistake that is common within many stages of the NPD process is mainly caused by a time-driven mentality. *Time is leading*. For example, project time lines are build up by first

setting the launch date and thereby fixing and limiting development time. However, project management is also about managing the quality and cost variables of the project. Moreover, it is only possible to fix two variables. Project teams often try to fix all three variables which is impossible! The result of this approach is that people in later stages, most often in stage 3 have to spend more effort and more costly resources in order to solve these inconsistencies and set a "*workable and realistic*" project definition. One marketing manager and marketing director recognized "project management" as one of the major factors for NPD failure within the company: *"We never have time to do things right in the first time… but always have plenty of time to repair our mistakes."*

7.3.3 Stage 2 Concept Qualification

After stage 1, the validation of the concept takes place in the concept qualification phase. Marketing determines the product attributes and prepares the consumer research without much, often technological input from R&D. This is comparable to the situation in stage 1 and with regard to stage 2 there is not sufficient R&D involvement that deals with the following key issues in the NPD process:

- Technical feasibility of the concept
- Making time schedules

In the current process there is supposed to be feasibility check. This is a responsibility of the CPL and the technical brand manager (TBM). However, since there are many scope changes in later stages or the product performance is not matching expectations, one may conclude that these informal feasibility checks are not covering all the issues or are not performed correct. One of the reasons for lacking a proper feasibility check may be the confusing situation about the allocation of R&D resources in stage 2. Moreover, none of the 9 analyzed NPD projects conducted a project risk assessment.

One of the marketing managers recognized "*Speed"* as one of the major factors for NPD failure within the company: *"Speed, we are really focused on getting the product to the market. that we don't really take time for the pre-homework and really think rigorously about the product. It is really time- driven and also a risk analysis is often not included in the business case that is evaluated in the PMR. It is always time driven instead of quality driven."*

In addition, as a result of the focus on speed, upfront-homework activities that should take place in stage 1 and 2 are not complete and miss significant information in order to make well funded decisions. This finding was confirmed by the interviewees of both the R&D and Marketing management team.

Ideas that feed the NPD funnel are often created by marketing in order to support their brands. However, it is also possible that an existing product group or product will be improved. An example of these improvement projects is enhancing flavours, although the effect is not always immediately recognizable for the consumer. These improvement projects are the so called value engineering projects. Value engineering projects are always initiated by R&D or supply and often enter the NPD funnel at the end of stage 2. As a result of weak internal communication not all involved stakeholders are always aware of these value engineering projects and the total project overview is lost. As a result, most management decision making takes place within the organizational silos and based on the objectives and

priorities of that function. Thus the different disciplines involved in the front-end of the NPD process, Marketing, Consumer Insights and R&D, can become misaligned. The example with the value engineering projects vs. new brand ideas may even suggest that the company understudy in some cases also lacks strategic control, trade-offs between projects also happen within the functional organizations.

7.3.4 Stage 3 Product Qualification

The official kick-off of the project takes place at the beginning of stage 3 right after approval of the PMR. Ideally, after the kick-off, the development phase starts. Furthermore, there is no pre-defined moment for completion of the final marketing project brief which should be used as starting point for the set up of the R&D project brief. This R&D project brief is seldom created. As a result the product developers use the final marketing project brief as guidance through the NPD process. The marketing project brief is made by the CPL and input is requested by the TPL. However, things are changing and often the product brief is made in cooperation with both CPL and TPL. In this perspective R&D acts as a service center that is actually waiting for orders at the beginning of stage 3.

14 out of 18 team members, including the CPL and TPL, shared the opinion that there were too many unnecessary scope changes in stage 3. In addition, after assigning a TPL to the project, things get more clear with respect to the project definition and timelines.

7.3.5 New Product Development Funnel

The current NPD funnel (see Figure 7.5) consists of two tunnels and a short-steep funnel phase in which proportional many ideas are killed compared to benchmark figures of 2004. In stage 0 (innovation platform) and stage 1 (ideation) many ideas are generated and screened without sufficient R&D input. Moreover, this front-end is characterized by a strong internal focus; insight-out, which limits the business opportunities and input for true innovative new ideas. In The company most senior managers are used to think in terms of developing a particular product to beat competition instead of to truly satisfy the unmet consumer needs. Within this perspective we can state that the company often acts as a fast follower and has a reactive attitude for introducing new NPD's into the market.

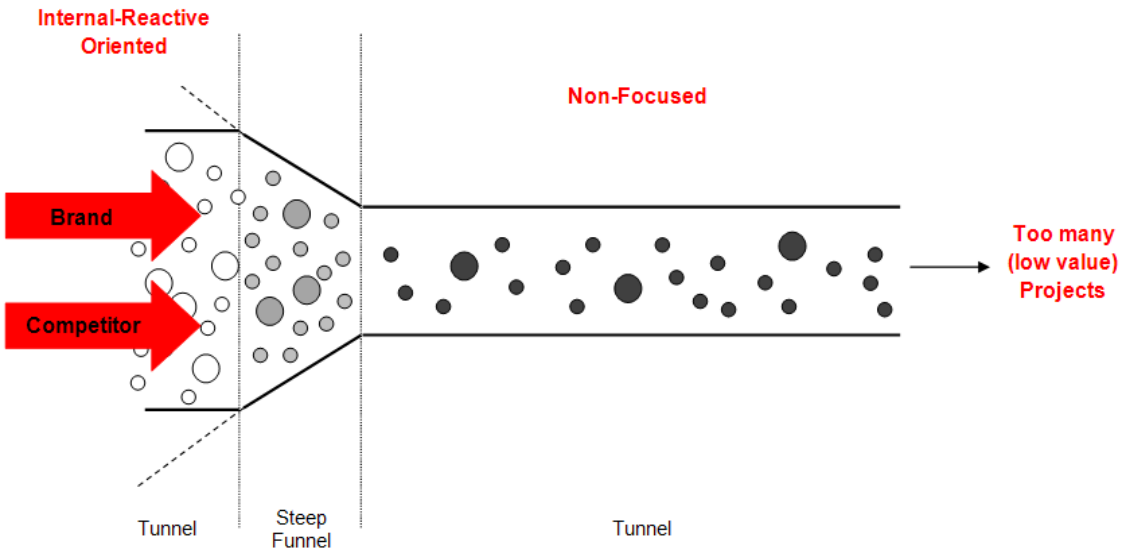


Figure 7.5 The current new product development funnel

One of the marketing directors confirmed this strong internal focus by a quote: *"I almost never see a competitor analysis."*

The steep funnel part is characterized by a high killing rate of new ideas. However, after the PMR (gate 2), almost all projects continue their way for launch and only few are killed in the product qualification stage. Further, there is no focus or prioritization in this tunnel part which also explains the large output of projects with the majority representing low value projects. A direct consequence of this large amount of projects is difficult decision making with regard to allocation of sufficient marketing support in the launch phase. Especially, marketing support was recognized by all informants from marketing as a critical point. Also the WIAT project survey, based on subjective input from project team members indicates marketing support as critical.

7.3.6 People at the R&D centre

Activities at the company are mainly development (D) related, the research part (R) is outsourced to external parties which also act as a co-innovation or co-development partner. The technology development manager stated the following: *"We don't do research ourselves, only development."*

Furthermore, mostly students are used for developing knowledge and expertise in several research projects. These research projects vary from exploitation of existing technologies to fundamental research activities. The research projects belong to technology platforms and will eventually become available for implementation into commercial products/projects.

7.4 Concluding Remarks

In this chapter an analysis of the current NPD process was presented including an analysis of NPD performance over the period FY07-FY09. The process and performance analysis were based on open interviews, the two surveys, internal documentation and the literature study. The content of this chapter will also be incorporated in the redesign phase of the research and the recommendations.

RQ 1.2: How was NPD performance of the company in the past?

The CTM indicates that the majority of the launched NPD projects (75%), the red spot, were variants or improvements with a low competitive advantage. This finding was also confirmed by the WIAT project questionnaire in chapter 6, which was based on the subjective input from project team members and included CPL, TPL and packaging. Furthermore, the red spot in the CTM represents maintenance of current market share. However, this does not mean immediately that the company is doing a bad job at all. According to literature, success in mature markets, is often affected by how often the firms introduce important incremental innovations. Additionally, businesses that regularly are among the first to introduce important incremental product innovations or frequently adopt important innovations introduced by their competitors will tend to maintain and improve their position in the market (Freeman, 1982; Foster, 1986).

It has to be stated that this strategy of bringing almost 75% variants and improvements to the market does still pay off for the company under study, since the business is still growing at

reasonable to good growth rates. Moreover, in times of financial crisis one may conclude that this is the most suitable strategy for delivering good short-term results. However, for the long-term survival of the company such a conservative NPD approach has also its drawbacks and may block the way for “better and bigger”, more value NPD in the future.

RQ 1.3: What points for improvement can be identified in the company’s current NPD process to make it more successful and effective?

More management attention
In the front-end of the process, some important responsibilities and decisions are often made by people lower in the organization, such as setting strategy and developing a long-term vision.

Create Synergy between Brand and Technology Strategy
Integrating brand strategy and technology strategy (see Figure 7.6) is crucial In order to make full use of the potential of current available and emerging technologies which is important for the development of new products that meet current and future consumer demands. In order to integrate successfully technology and the brand strategy it is important to make a clear technology strategy. In this way also other disciplines know which way R&D is going and know what R&D can bring them. Moreover, integration of a technology strategy also increases R&D involvement in the front-end stages.

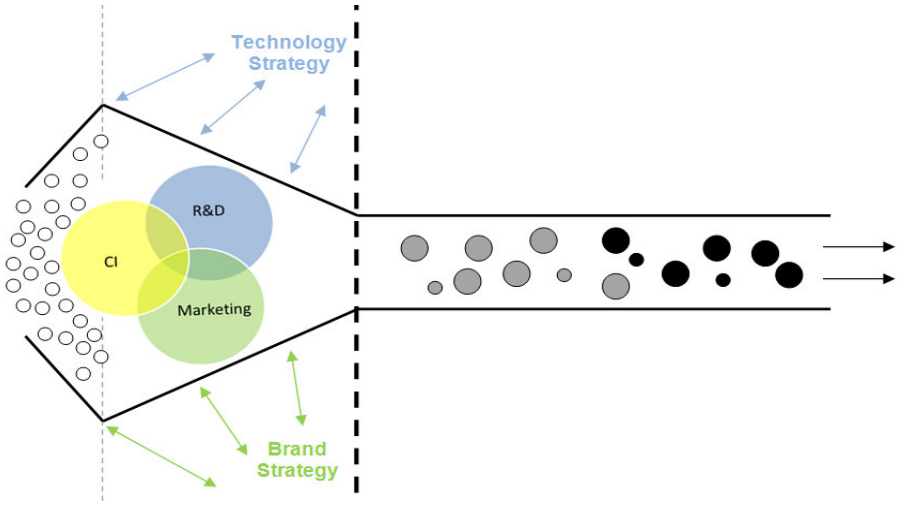


Figure 7.6 Create synergy in the front-end stages between brand and technology strategy.

Internal Communication
R&D has to know what direction the business wants to go and which markets/brands will be the point of focus for the coming years. Within this perspective it is important to realize that also brand management in general – and certainly brand portfolio management – is not solely a brand issue or even a marketing issue; it is an organizational issue. Without interest and involvement form all key stakeholders in the front-end – consumer insights, marketing and R&D - starting at the very top, it is very difficult to create synergy between brand and technology strategy in order to build competitive strong concepts and meet business

objectives. Figure 7.6 visualizes the synergy between both strategies and the necessary cooperation between R&D, marketing and consumer insights.

More Consumer-centric Innovation
Managers hardly ever look at their capabilities with a view to creating a whole new family of products that meet customer needs that the company has never before addressed. Within the company under study, most senior managers are used to think in terms of developing a particular product to beat competition instead of satisfying the unmet consumer needs. Especially, this creating of a new family of products is the key difference that makes high growth companies.

NPD Funnel Creation
The "forced" continuation of projects might be the lack of better alternative projects. If we look at the NPD funnels in figure 7.2, it can be stated that some categories have poorly filled NPD funnels. As a direct consequence, since there are no back-up projects, it is often strategically necessary to continue and launch some low value projects to avoid gaps in the company's annual operating plan. A solution to avoid gap-filling could be more investments in funnel creation and new idea generation. Another way to prevent gaps in the annual plan can be established by conducting a gap analysis which is based on success rates per type of project in a particular stage of the NPD process.

people
The company understudy has separated research form development by outsourcing most or all research activities to external parties such as co-packers and suppliers. Therefore, we can state that the company only has a development centre. However, according to the literature there are some crucial differences between development (D) and research (R) organizations that also includes important differences in people (Chiesa, 2001). Additionally, table 3.2 in section 3.6 provides an overview of these differences.

RQ 2.5: How are NPD activities of the company under study currently organized in the front-end stages, ideation and concept qualification?

The company has a *discipline oriented* NPD approach, which looks almost like a *linear* process, in which the project moves from Consumer Insights–to–Marketing–to-R&D/Packaging-to-Manufacturing-to-Sales (see Figure 7.3). Furthermore, the input from R&D is minimal in the front-end stages and is often limited to some informal feasibility activities.

RQ 2.6: What critical points can be identified in the company's NPD process?

Technology Strategy
In the current situation there is no technology strategy in place that link the technology projects to commercial projects.

Project Management
Good project management is about ensuring that NPD projects are on time, on budget and deliver the expected quality. Team members should Effective implementation of project management requires good cross functional cooperation, sharing of information and project status of the projects. Project Status information and scope changes must be collected

frequently and reported quickly, allowing management to see all aspects of a project at one time. By constantly sharing and updating project information and status, it is easier to make well funded project trade-offs and prevent disappointments afterwards. However, the R&D department shares the opinion that team members, especially marketing are switching too often between categories, which is detrimental for good cooperation and communication. Both R&D and marketing management shared the opinion that the sharing of knowledge and information could and should improve.

Internal focus
he start of the current funnel has a strong internal focus and is also more reactive oriented without sufficient taking into consideration of the external environment. In addition, in order to limit the tunnel effect in the beginning of the current funnel, the company should also take more into consideration the external environment, other industries and the accompanying opportunities.

No focus and weak gates
The company lacks the discipline and mechanisms to prioritize and significantly reduce the numbers of development projects in the funnel. A direct consequence is too many (low value) projects in the end of the funnel that are ready for launch. Subsequently, this situation causes problems with allocating scarce resources, especially marketing support.

In the next chapter, the redesign of the front-end stages is described.

8. Redesign Front-end Stages

8.1 Introduction

This chapter deals with the redesign of the front-end stages of the NPD process and is based on the concluding remark sections . The redesign is based on the input from the two surveys, open interviews and scientific literature. Further, the redesign is limited to R&D key activities, which are visualized in figure 8.1. Additionally, an explanation of the process symbols is given in Appendix F. Section 8.2 discusses the activities that belong to the ideation stage; technology assessment and the individual new development idea. In section 8.3 the redesign for stage 2, concept qualification is discussed and will describe in detail the technical translation and feasibility check activities. Section 8.4 presents the redesign for stage 3, product qualification and describes the project start up. The chapter ends with some concluding remarks. Furthermore, the three following research questions will be answered in this chapter:

RQ 3.1: How to organize NPD activities in an efficiently and transparent way?

RQ 3.2: What steps are necessary in the NPD process from project brief into R&D brief, "the technical translation", in order to make the NPD process more effective?

RQ 3.3: How to design a feasibility study for the front-end NPD process to ensure project viability in later stages?

The structure of each section is similar and starts with an introduction of the particular phase and activity under discussion. Next, necessary input, expected output, mandatory activities and a way of working are worked out in detail. After elaboration of the R&D key activities each section closes with a flowchart that gives an illustrated overview of the particular phase and activity in the NPD process.

The redesign
The proposed redesign for the front-end stages of the NPD process in the following sections is derived from scientific literature sources (Cooper *et al*., 2001; Slowinski *et al.,* 2000; Tonchia, 2008; Wheelwright & Clark, 1992; Roussel *et al*., 1991), discussions with external experts from the food business (Bloom consultancy workshop on innovation management, 2009) and internal experts of the company. In addition, the redesign also takes into consideration the NPD process of Procter & Gamble, a company that is famous for introducing several million dollars brands into the fast moving consumer goods market during the last decade and Sara Lee which is also a big multinational player in the food business Moskowitz *et al.,* 2009. Both companies spend much effort in designing their NPD process in order to meet consumer demand and introducing successful NPD's by being innovative. Furthermore, based on the literature this redesign implements all identified critical factors in the front-end stages that were not yet in place in the current process (see Figure 8.1). Finally, many discussions with the management from both marketing and R&D ensured that this redesign has also significant practical value.

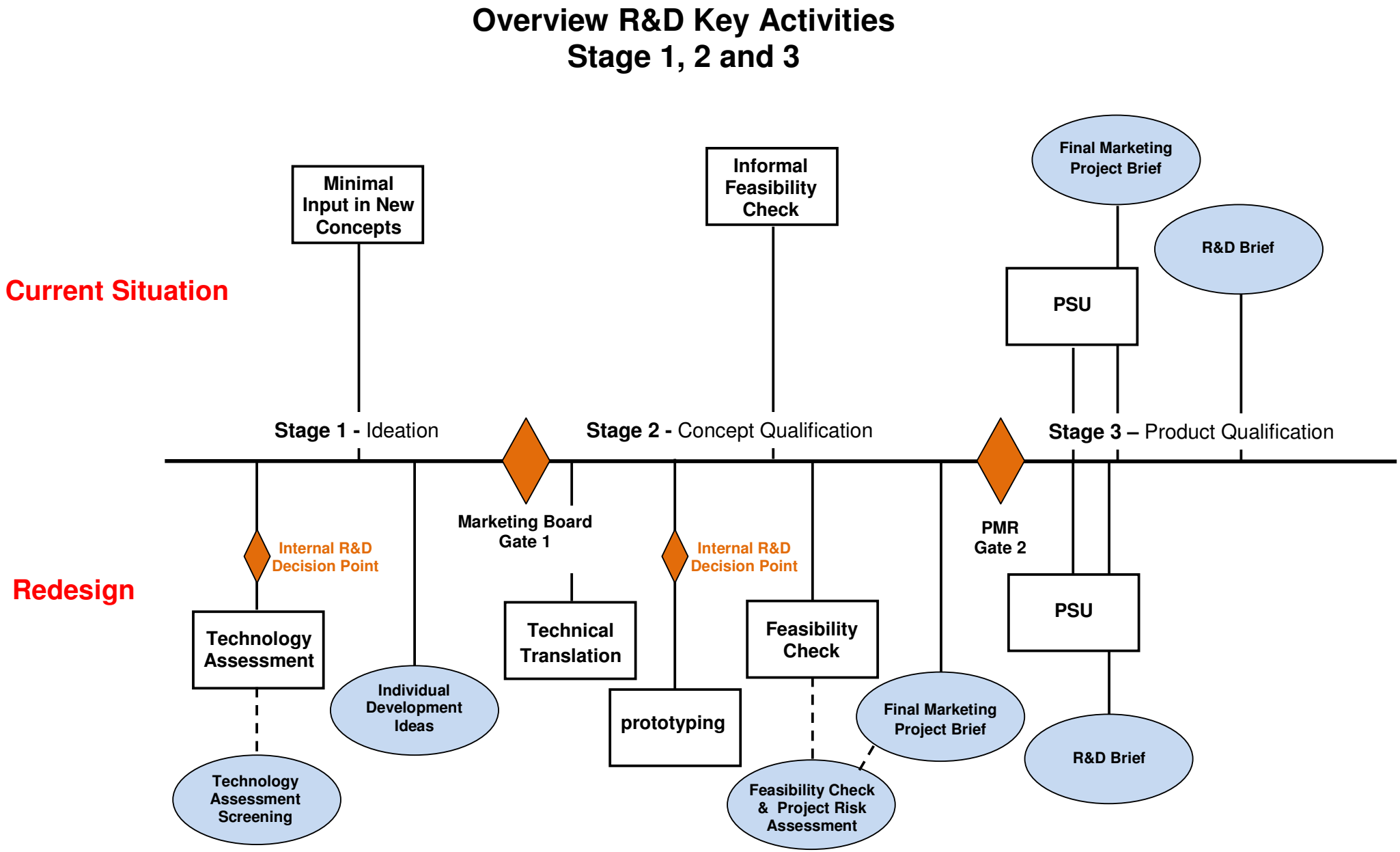


Figure 8.1 An overview R&D key activities stage 1, 2 and 3.

8.2 Stage 1 – Ideation

The ideation stage includes two important key activities that should be carry out by R&D. The first activity is the technology assessment which concerns the technology needs of The company in order to create stronger concepts. Next activity, the individual new development idea enables people from the R&D centre to hand over their ideas to the marketing board.

8.2.1 Technology Assessment

In order to focus on the right external technologies there are some important inputs needed form different disciplines.

Input

- **New Potential Consumer Trends**
  Identify and share potential consumer insights and trends.

- **Strategic intent Brand Strategy**
  Share brand strategy plan, long-term vision and competitor analyses.

- **Technology Trends & Internal Study**
  - Identify potential technologies.
  - Overview internal available technologies.
  - Technology gap analysis.

Output

- Technology strategy.
- Formation technology platforms.
- Product-Technology roadmap that link the technology projects to current NPD projects and business drivers.

Activities

Nowadays, acquiring the right external technology plays an important role in many companies and enables them to create sustainable growth and gain competitive advantage. The foundation for successfully implementing external technologies is a clear understanding of each category/brand strategy and technology needs (Slowinski *et al.,* 2000). Therefore, a technology assessment plays a vital role when R&D spending is increasing, competitive advantage are narrowing and life cycles are getting shorter (Viskari, 2006). In addition, many research directors use terms like developing a core competency, and pathway to the future, to describe the importance of integrating external technology into their technology portfolio. Doering & Parayre (2000) describe four steps of a dynamic technology assessment process:

1. **Scoping**
   The company has to decide boundaries for technology assessment and define the technology needs. Limits are based upon the firm's capabilities, strategic intent, brand strategy, potential new markets and technologies. The R&D management team has to define in which strategic technology arenas they want to 'play'. After setting the strategic arenas, the TDM briefs external partners on the technology needs in order to increase the number of possible solutions.

2. **Screening**
   The company can look for new technologies and opportunities from inside the firm, from the public sensor of technology and from literature. This step includes sensing strong and weak signals from the environment and developing a "group mind" by capturing and gathering both technology knowledge and information.

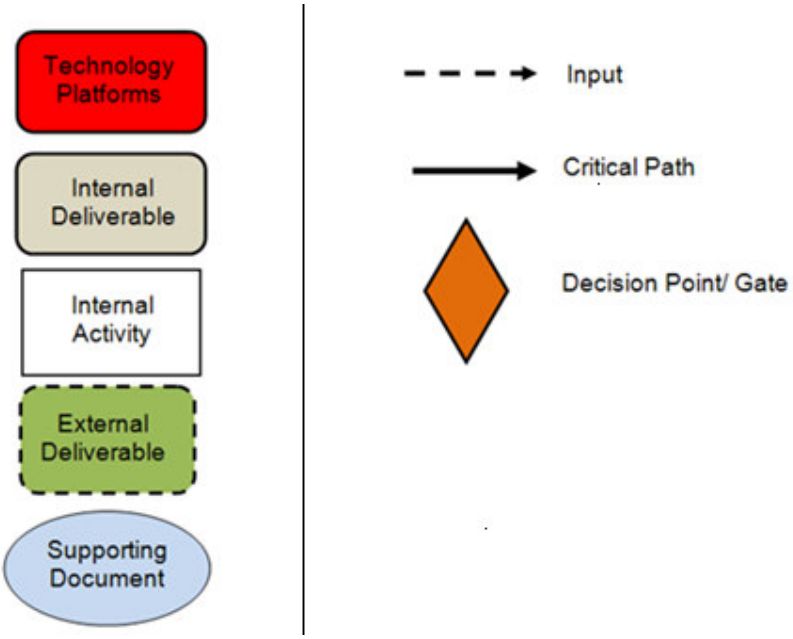
3. **Evaluating**
   For the evaluation of a technology it is important to take into consideration the firm's strategic position, the environment and the different types of risks involved. In order to make a proper evaluation, The company should make use of a technology screen scorecard, which is easy to use and provide an overview of the factors involved for evaluation of the external technology.

4. **Acquiring**
   After the internal decision is made to pursue a new technology, the formation of technology platforms is realized. Next step is the development of the technology strategy, which is visualized in the product-technology roadmap.

Way of working

Consumer insights has to analyze and identify some major consumer trends that will become important in the near future. Similarly, marketing has to establish a long term (2-3 years) brand strategy which acts as a guidance for the development of the technology strategy and technology acquiring process. This required market information is often referred to as 'Market, Forces & Dynamics' and should also be the starting point and input for making important brand portfolio strategy decisions. Therefore, this information should already be in place in the organization.

Explanation of the process flow symbols



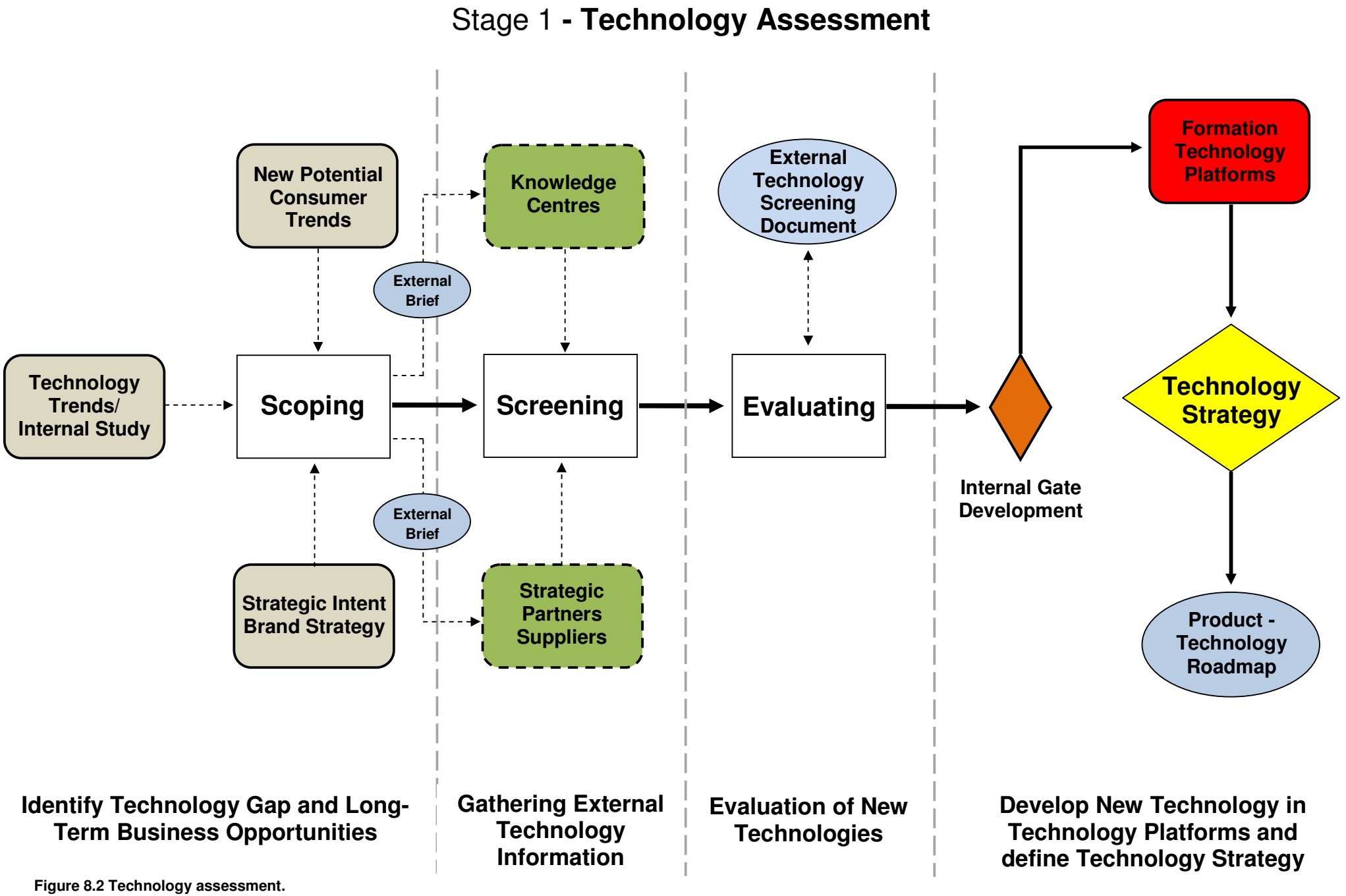


Figure 8.2 Technology assessment.

8.2.2 Individual New Development Ideas

The input for new ideas into the NPD process can flow from many internal and external sources. However, in the current situation most ideas originate from the marketing department. Although, R&D has many ideas that are never assessed or evaluated for further development. Next is a description for creating and handing in new development ideas.

Input

- **Consumer Insights & Trends**
  Identify and share potential consumer insights and trends.

- **Brand Value Proposition**
  The Brand value proposition is derived from the brand strategy.

- **Technology Platforms**
  Outcomes of the technology platforms can also be a source for new product ideas or value engineering projects.

- **Food Business Trends & Ideas**
  Identify potential food trends and ideas from the external environment. Focus should be at ideas and trends in the following areas: Product, Packaging, Processing and Nutrition development. Sources can be conferences, literature, seminars, foreign markets, etc.

- **Other Business Trends & Ideas**
  R&D should not limited their new business opportunity or idea efforts to the food business only, but should also explore trends and ideas from other businesses.

- **External Ideas from Strategic partners**
  External partners are often specialized in a specific product area and therefore have access to valuable market and application knowledge which could be interesting for future innovations.

Output

- **Development New Idea Document**

Activities

- **New Idea**
  R&D creates a new idea and prepares the ‘Development New Idea Document’.

Way of working

R&D has to create ideas that fit with current or potential consumer trends and meet the value proposition of a particular brand. In addition, R&D can access several external ideation sources such as, strategic partners, conferences and literature. After capturing a potential idea, the developer and TBM should complete the ‘Development New Idea document’. Next step is handing in the document into the marketing board in gate 1.

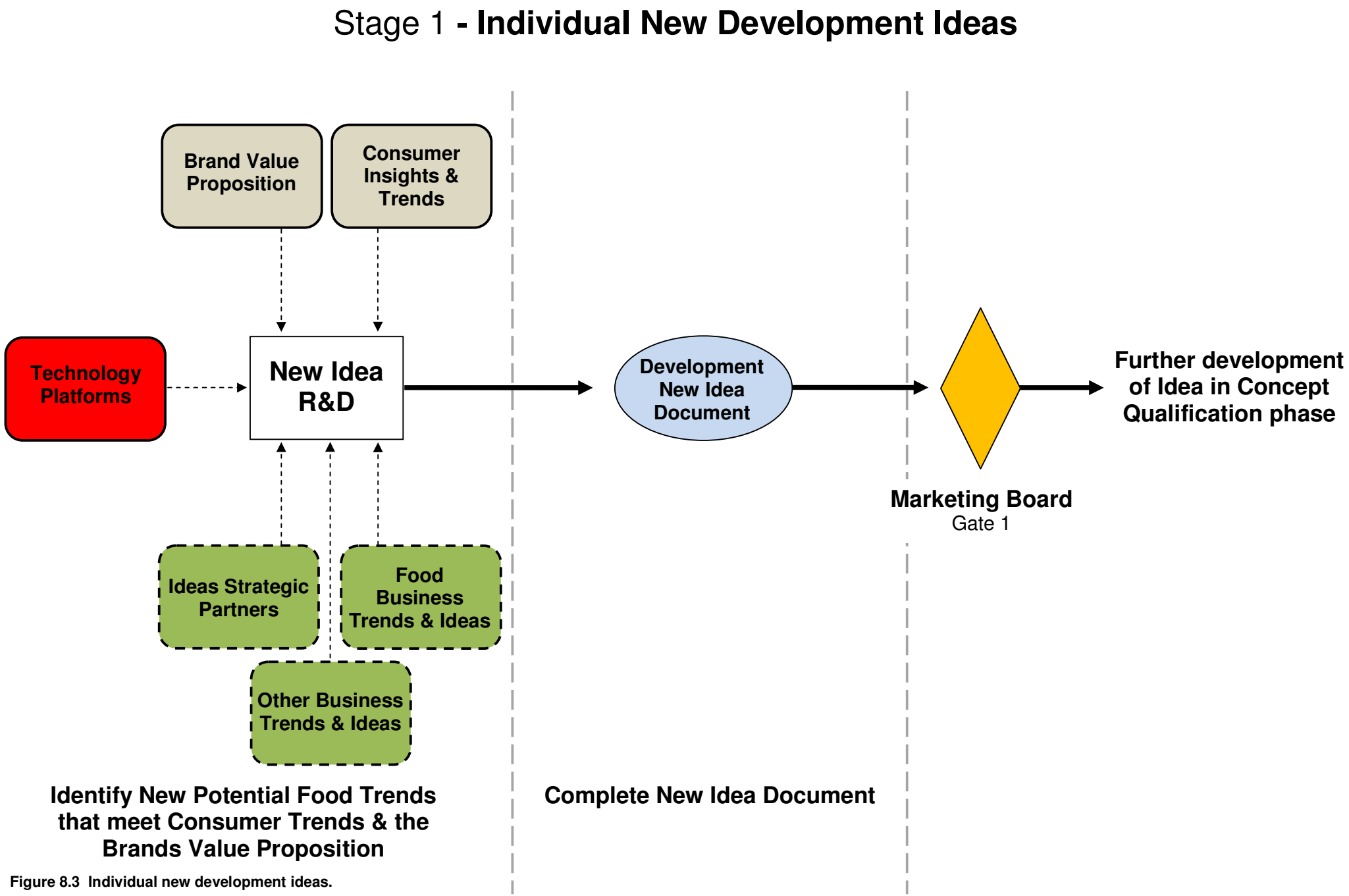


Figure 8.3 Individual new development ideas.

8.3 Stage 2 - Concept Qualification

The concept qualification phase is the last 'hurdle' before entering the big spending phase of the process. Therefore, it is of high importance that the outcome of this phase provides the management team with sufficient and clear information about the project in order to base their Go or No-Go decision. Three main questions should be answered by R&D in the concept qualification phase:

1. How can Development make the concept better?
2. Can we make it?
3. What is the project risk?

8.3.1 Technical Translation & Feasibility Check

The technical translation deals with the development of product, packaging, process or nutritional options that meet consumer demands. In parallel, prototyping of the 'lite' concepts takes place. The next step in the process is a consumer research and a feasibility check which both contribute in gathering important information for completion of the final project brief.

Input

- **Preliminary Marketing Project Brief**
  This document should describe the project definition and set the project frame work.

- **Technology Platforms**
  Technology projects can deliver a technology input which may add unique competitive advantage to the initial concept.

- **External Partners**
  The TDM briefs the strategic suppliers and knowledge centers based on the preliminary project brief written by marketing. Next, these external parties communicate what knowledge and expertise they can deliver for this concept.

- **Desk Research**
  - Desk research and store checks (Innova database).
  - Benchmarking.
  - Competitor analysis.
  - Food business and market trends.

- **Product & Packaging, Processing and Nutritional Options**
  Develop several options ('lite' concepts) that match the requirements stated in the project brief and fit within the project scope.

- **Product Feasibility**
  Product feasibility is an assessment of the overall appeal of the product being proposed. Important input for the product feasibility is derived from the prototype and consumer research.

- **Market Feasibility**
  Market feasibility is an assessment of the overall appeal of the market for the product being proposed. At this stage, there are two primary issues that a proposed project should consider:

  1. Market attractiveness.
  2. The total potential market size.

- **Organizational Feasibility**
  Organizational feasibility is conducted to determine whether a proposed project has sufficient management support (in case strategically important and complex projects), organizational competence, and non-financial resources to successfully launch its business.

- **Financial Feasibility**
  An evaluation of the financial feasibility of a proposed project is the final stage of a full feasibility check.

Output

- Feasibility Check & Project Risk document.
- The Final Marketing Project Brief that acts as a description of final concept including feasibility check and risk analysis. Next, this brief will be progressed into the development stage after approval in the PMR.

Activities

- **Technical Translation**
  - Create product & packaging, processing and nutritional options that:

  1. Match consumer insights and fulfill the 'Job To Do'.
  2. Make the concept stronger.
  3. Ensure product/packaging differentiation.

- **Prototyping**
  - Check if product, packaging, processing and nutritional options ('lite' concepts) match with consumer insights and initial project requirements stated in the project brief.
  - Screen all options in a multi-disciplinary brain storm session. Next, work out the best options ('lite' concepts) for input consumer research.
  - The development of prototypes can be used as input for the feasibility check and helps in indicating:

  1. Product feasibility.
  2. Organizational feasibility.
  3. Financial feasibility.

- **Internal Decision Point**
  R&D management has to approve prototypes before handing them over to the consumer research.

- **Consumer Research**
  - The full project team has to decide which are the best options that create a winning concept.
  - The consumer research will be used to gather important information about the concept, potential consumers and key product attributes. Therefore, the consumer research gives input for the following feasibility check dimensions:

    1. Market feasibility.
    2. Product feasibility.
    3. Financial feasibility.

- **Feasibility Check & Project Risk Assessment**
  - A feasibility check is the assessment of the possibility that a concept can be developed into a product within the boundaries set in the initial project brief and meet business objectives.
  - The allocation of the project risk is also included in the design of the feasibility study and consists of; risk identification, classifying and assessing the importance of project risks by using a risk-spider diagram.

Way of working Feasibility Check

In order to conduct a successful feasibility study it is important to appoint a project manager with sufficient authority and project experience. Within the, this role will be for the TPL, who is responsible for completing the feasibility check document. Therefore, not only the CPL, but also the TPL should be informed and understand the objectives of the project, possible managerial strategies to execute the feasibility study and the potential implementation strategies in next stages of the development process. Besides giving more responsibility to the TPL, this will also create more ownership for R&D.

Way of working Technical Translation

CPL briefs the TPL about the preliminary project brief created in stage 1. Subsequently, the TDM is also briefed about the project requirements. The TPL will check both internally and externally for options or opportunities that could add extra value to the concept. On the other hand, the TDM will brief the strategic suppliers and knowledge centres in his network that can bring in their knowledge, new products or ingredients or expertise in a certain technology area. Next step, screening of the Product & Packaging, Processing and Nutritional Options developed by R&D internally and external partners. This screening of the options or ‘lite’ concepts should be conducted by a multi-disciplinary team that includes at least persons from: consumer insights, marketing and R&D. The most promising options or ‘lite’ concepts will be further developed in the prototyping activity and will be used as input for the consumer research and the product and financial feasibility check.

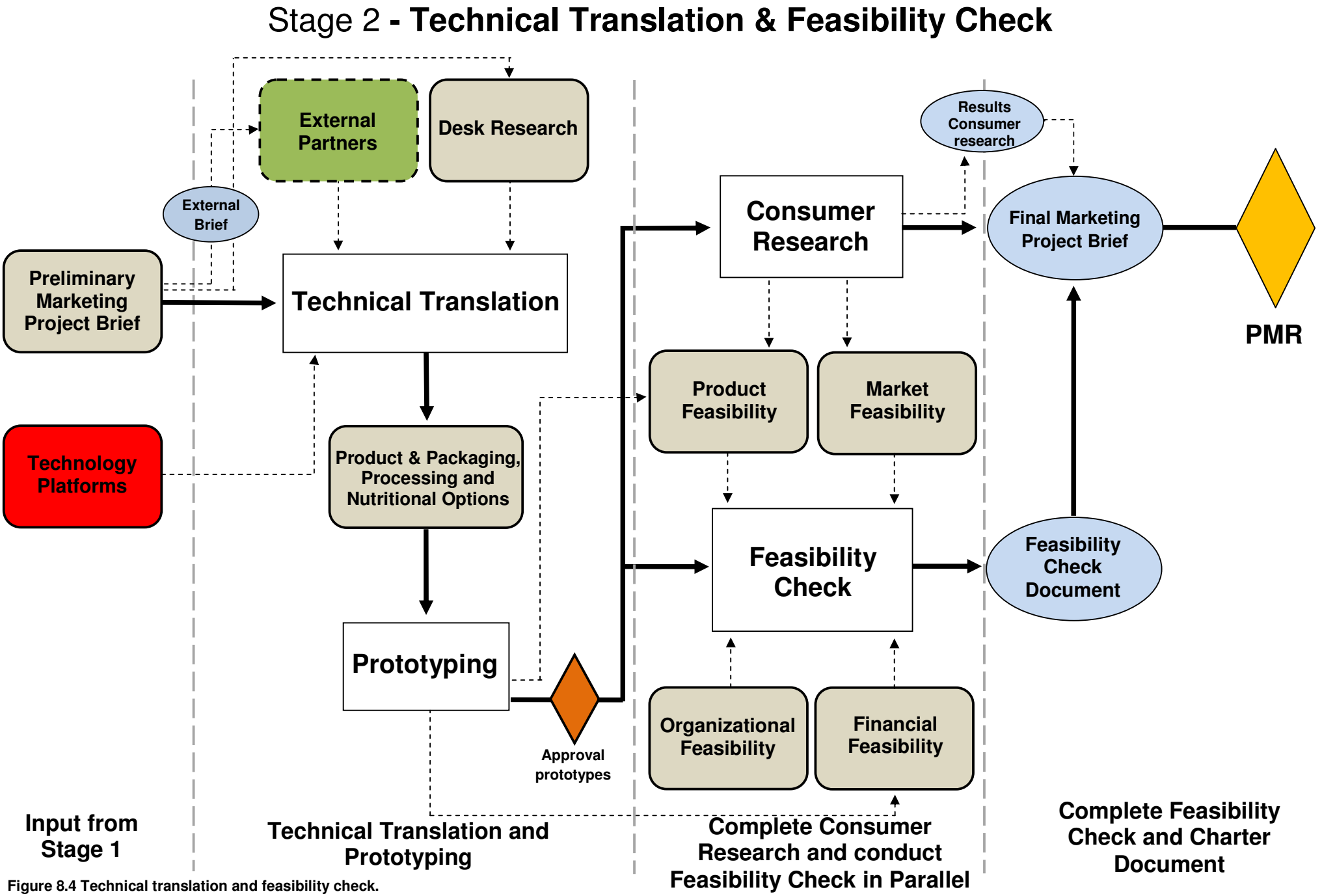


Figure 8.4 Technical translation and feasibility check.

8.4 Stage 3 - Product Qualification

The start of activities in stage 3 means also the commitment to the heavy spending phase. As shown in the flowchart (see Figure 8.5), planned activities in stage 3 should only start after the full project kick-off meeting, also known as the project start up (PSU).

8.4.1 Project Start Up

The PSU should ideally be organized by both CPL and TPL in order to gather a complete as possible project team.

Input

- **Final Marketing Project Brief**
  The Final Marketing Project Brief that acts as a description of final concept including feasibility check and risk analysis. Next, this brief will be progressed into the development stage after approval in the PMR.

Output

- **R&D brief**

Activities

- **Project start up**
  - Ensure commitment and participation of all needed disciplines in this session.
  - Agree on time lines and risks.

Way of working

Both the CPL and TPL should prepare the PSU and determine what disciplines should be invited. Besides team composition also preparation of the project time lines and project resources are tasks for the CPL and TPL in order to make the PSU successfully.

After the PSU it is the task and responsibility for the TPL to set up a proper R&D brief which includes the latest updates made during the PSU.

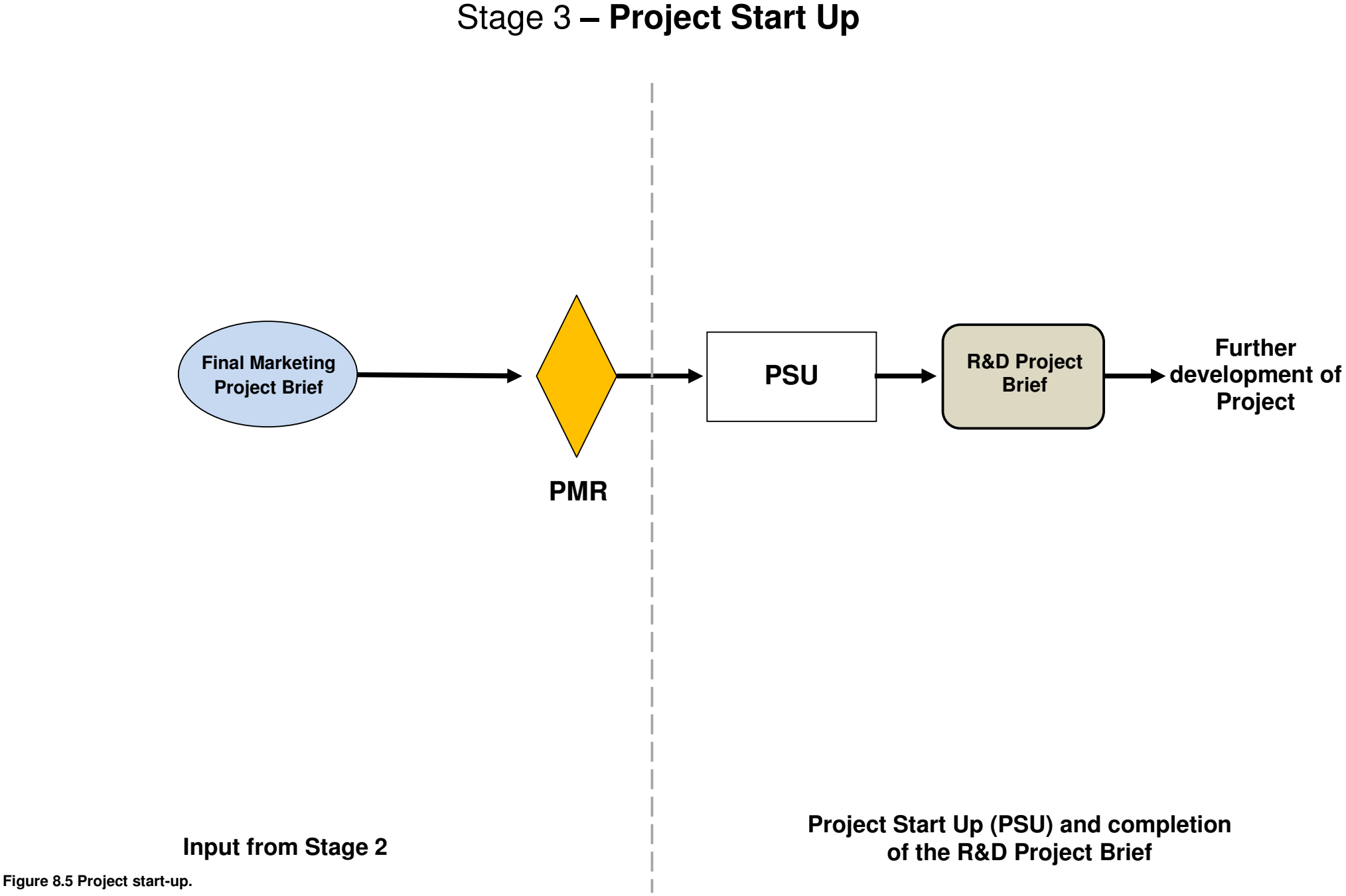


Figure 8.5 Project start-up.

8.5 Concluding Remarks

This chapter proposes a redesign for the front-end stages of the NPD process of the company under study. Activities and the needed inputs form different disciplines are formalized and visualized in several flowcharts. Additionally, the proposed redesign in this chapter aims to answer the following research questions:

RQ 3.1 How to organize NPD activities in an efficiently and transparent way?

- The technology assessment is added to the NPD process and is based on input from the three involved disciplines in the front-end; consumer insights, marketing and R&D.
- Ideas initiated from R&D are also included into this redesign and is also based on multiple input from both marketing and consumer insights.

RQ 3.2 What steps are necessary in the NPD process from marketing brief into R&D brief, "the technical translation", in order to make the NPD process more effective?

- The redesign proposes a way of translating the marketing brief into several product, process, packaging or nutritional options which will be used as input for both the feasibility check and consumer research.
- Important for this step is the pre-homework phase that is conducted before the translation into options. This pre-homework phase includes; desk research, benchmarking of competitor products and store checks. Important before this step is a clear project definition. Furthermore, clear product objectives in which the consumer preferences are clearly stated (consumer-centric) are essential for a good translation into feasible options.

RQ 3.3 How to design and implement a feasibility study for the front-end NPD process to ensure project viability in later stages?

- After the development of prototypes, the R&D management team assesses the prototypes and determines which prototype will continue into the consumer research and feasibility check phase. In addition, the feasibility check focuses on four important feasibility aspects: financial, organizational, market and product.

9. Conclusions & Recommendations

9.1 Introduction

In this final chapter the central research question is addressed and the three main research questions per research phase are re-addressed in section 9.2, by summarizing findings in the previous chapters and coming to conclusions. Section 9.3 discusses the general conclusion and addresses the central research question. In section 9.4 some recommendations are stated for improving the NPD process. In section 9.5 a number of problems and limitations that have been faced during the writing of this research paper are described. Section 9.5 gives some suggestions for future research.

9.2 Conclusions

In this section, the main research questions per research phase are re-addressed. The three main research questions were answered by several sub-questions which focused on the information needed to answer the main research question of the particular phase.

9.2.1 Problem Finding Phase

1. How innovative is the company under study and what points for improvement can be identified?

The company under study scored in overall lower than the benchmark. The gap between the two top companies of the benchmark and the company under study is significant. Remarkable is also the significant gap between R&D's and marketing's vision concerning some NPD and innovation management issues. Two important points of interest are internal communication and recognizing of business opportunities. The lack of sufficient Internal communication may be caused by (too) many changes in the marketing department which results in sub-optimal communication within the project team (Katz, 1982). Secondly, a low score on recognizing new business opportunities is in line with the overall view on the food industry, that can be characterized by a low rate of innovation and coupled to the high failure rates of new products launched into the market there is without doubt room for improvement. This finding was also confirmed by a study of Ernst & Young (1999) that showed that more than 75% of the new product introductions were mainly me-too products. An explanation is given by Costa & Jongen (2006) and Linneman *et al.* (2006) which are actively supporting the view of implementing and effective integrating of consumer-led food product development. Linneman *et al.* (2006) state that a successful food product nowadays requires a consumer-orientated approach; "*only if a product satisfies the demand of a consumer, a product can be successful in the market"* (Linneman *et al.,* 2006). In addition, the company under study is internal and competitor oriented with regard to recognizing new business opportunities or generating new ideas. The majority of the NPD's are reactions to competitor moves or incremental innovations. There is nothing wrong with this strategy, except that following a strategy like this will not create sustainable growth at the long-term (Miles & Snow, 1978; Pandrangi *et. al.,* 2009). However, according to other literature, success in mature markets, is often affected by how often the firms introduce important incremental innovations. Additionally, businesses that regularly are among the first to introduce important incremental product innovations or frequently adopt important innovations introduced by their

competitors will tend to maintain and improve their position in the market (Freeman, 1982; Foster, 1986). Within the company under study it can be concluded that NPD in the last three years did not deliver a significant amount of important incremental innovations that would support the current business strategy, but rather launched me-too products (see Figure 7.1). Furthermore, the results of the questionnaire and open interviews indicate that management attention during the NPD process is not optimal and should be increased (see Figure 7.4 and 9.1). Particularly in the front-end of the process is significant room for improvement in order to set new product objectives, identifying new market opportunities, determining new product features and capabilities and resolving product trade-offs ensuring speed to market (Tonchia, 2008; Brown & Eisenhardt, 1995).

9.2.2 Diagnosis Phase

2. How are NPD activities currently organized at the company under study?

The company has a *discipline oriented* NPD approach, which looks almost like a *linear* process, in which the project moves from Consumer Insights–to–Marketing–to-R&D/Packaging-to-Manufacturing-to-Sales (see Figure 7.3). Furthermore, the input from R&D is minimal in the front-end stages and is often limited to some informal feasibility activities, in other words marketing is (almost) always in the lead. Additionally, in the front-end of the process, some important responsibilities and decisions are often made by people lower in the organization. An explanation for the origin of the discipline oriented NPD approach may be the result of a not transparent organization or black box approach (Moskowitz *et al.,* 2009). The differences between both approaches are listed in table 9.1. A transparent organization could create better NPD since sharing information about the size and nature of the market opportunity, the activities of competitors, the progress of product development, or the readiness of the supply chain and manufacturing organizations are improved. Also in this phase, it can be concluded that the company under study lacks intra- and inter-organizational coordination and integration of R&D and marketing's research activities and know-how, which is a critical factor in bringing innovative products into the market (Costa & Jongen, 2006; Batterink *et al*., 2006; (Moskowitz *et al.,* 2009).

Table 9.1 Advantages of a black box approach versus the transparency approach (Moskowitz *et al.,* 2009).

Black Box Approach	Transparency Approach
• Elite functions driven	• Opens the door for everyone
• Emotions and subjectivity	• Built from bottom up
• Lack of buy-in by all functions	• Objective numbers
• Less efficient prioritization	• Multi-functionality aligned
	• Early and efficient prioritization
	• Ongoing project quality improvement
	• Broadens innovation participation
	• Improves motivation to participate
	• Financials play key driver role

Also related to the discipline oriented NPD approach is the management of NPD from within organizational silos. Due to the lack of good internal communication between R&D, marketing and consumer insights many management decision making takes place within the organizational silos and are based on the objectives and priorities of that function. A direct

consequence of working in silos is the misalignment between functions and business goals. An important step for improvement within this case study is probably the alignment of marketing and R&D in the ideation and concept qualification stages of the NPD process (SAP 2004; Newman, 2009; Moskowitz *et al.,* 2009).

Table 9.2 shows the advantages of a common process versus working in organizational silos. Furthermore, a realigned organization without overlap to pursue focused consumer groups, need states or business opportunities will also establish one team, one vision and common goals for all the functions (Newman, 2009).

Table 9.2 Advantages of a common resource/process versus separate resources (Moskowitz *et al.,* 2009).

Separate Silos	Common Process
• Traditional with direct line structure • Expensive with duplications • Inefficient due to absence of center of excellence • Contradictory projects in the portfolio • Nonaligned when assessed in a portfolio • Longer communication and reporting with cross-functional involvement	• Cost less at in the long run • Efficient • Aligned with strategic portfolio • Early and efficient prioritization • Creates a strategic portfolio • Takes full advantage of marketplace gaps and trends at higher level

In a common process all the ideas and projects are strategically aligned with platforms and business objectives, resources are allocated efficient, financial goals and innovation hurdles are transparent, more employees will understand the business needs and become more motivated to be part of the NPD process.

Besides this discipline oriented NPD approach the company also has a new product approach that is based on ideas instead of consumer, market or technological insights. Companies such as Sara Lee and Procter & Gamble make both use of a platform approach that is based on significant insights-driven up-front learning in order to create a solid basis for innovation (Lafley, 2008; Moskowitz *et al.,* 2009). This platform approach fits in theory perfectly with the marketing studies that are developed at the consumer Insights group of the company. However, these studies are used for validation of new ideas and not for the creation of new ideas. Additionally, all learning in the platform stage focuses on improving knowledge of the target market, frame of reference (=project framework), and point of difference for ideas and business propositions in order to build stronger concepts. Table 9.3 shows the advantages of the platform approach versus the product approach.

Table 9.3 Advantages of the platform approach versus the product approach (Moskowitz *et al.,* 2009).

Product Approach	Platform Approach
• Easier but costs a lot • Tactical solutions • Stops after investments • Less efficient prioritization	• Difficult but cost less at in the long run • Strategic and holistic approach • Management buy-in from early stage • Minimal waste • Early, efficient, and strategic prioritization • Bigger ideas versus many smaller ideas • Portfolio research costs less than many individual research projects

9.2.3 Design Phase

3. How to re-design and formalize the front-end stages in the NPD process?

The redesign of the front-end stages of the company's NPD process (see chapter 8) has been developed for creating new product concepts that will deliver sustainable growth by ensuring consumer insights based and differentiated concepts. In addition, the redesign is based on close multi-disciplinary cooperation and the synergy between marketing and R&D inputs. The implementation of a technology assessment which requires also multiple input from both marketing and consumer insights can be a tool for improving and aligning R&D and Marketing goals and strategies (Slowinski *et al.,* 2000).

Another important phase in the redesign is the flow of new ideas initiated by R&D into the NPD process. In the current process new idea flow almost solely from the marketing department into the NPD process, with the exception for some value engineering projects that are set up by a few people from the R&D management team.

The third phase of the redesign concerns the technical translation of the marketing brief that includes consumer insights and a well defined project definition, into several product, process, packaging or nutritional options. Important for this phase is the pre-homework that is conducted before the translation into options. This pre-homework includes; desk research, benchmarking of competitor products and store checks. Furthermore, clear product objectives in which the consumer preferences are clearly stated (consumer-centric) are essential for a good translation into feasible options. These options form the basis for the development of prototypes. Subsequently, these prototypes will be assessed by R&D management and the best prototypes will be used as input for both the feasibility check and consumer research. In addition, the feasibility check focuses on four important feasibility aspects: financial, organizational, market and product.

The last phase of the redesign deals with the project start up (PSU), which includes the finalization of time lines, planning and the R&D brief.

9.3 General Conclusion

Combining the findings of the case study and literature review enables us to provide an answer to the central research question:

How to coordinate and formalize NPD activities in the front-end stages of the NPD stage-gate process of a multinational food company in order to deliver sustainable products to the market?

From the literature review it can be concluded that despite the enormous amount of literature on NPD structures and processes (Kleinschmidt & Cooper, 1991; Cooper & Kleinschmidt, 1994; Cooper, 2001; Filippini *et al*., 2004; Troy *et al.,* 2006; Cooper & Edgett, 1995a; 1995b; 2008) companies are still struggling with the implementation of an effective NPD process that ensures sustainable growth by introducing innovative products into the market. Moreover, the majority of the food companies use an 'Organizational and Discipline Oriented' approach in which the project moves from Consumer Insights-to-Marketing-to-R&D/Packaging-to-

Engineering-to-Manufacturing-to-Sales. This finding is in line with the results from this case study and is also confirmed by other studies from Costa & Jongen (2006) and Batterink *et al*. (2006) who also stated that the lack of intra- and inter-organizational coordination and integration of R&D and marketing's research activities and know-how is considered to be a major barrier in the quest of food companies to become more innovative.

Furthermore, Cooper *et al*. (2004) stated that much of the product success is determined in the front-end stages and the level of multi-disciplinary input. Therefore, (higher) management attention and support is vital in these front-end stages in order to set and align both marketing and technology strategies (Wheelwright & Clark, 1992). Additionally, management support for making important decisions is often needed in complex NPD projects. The consequences of poorly managed complexity can be highly visible and lead to projects with disappointing results (Kim & Willemon, 2009).

Research findings from this case study concerning project team confirm that team tenure is a critical factor in NPD. It seems to be important to change team composition on a moderate level to ensure sufficient internal and external communication in order to optimize project performance (Katz, 1982).

When talking about NPD it is also important to distinguish between research (R) and development (D) activities. Relevant is to be aware that research and development are two complete different disciplines and therefore also need different management and people (Chiesa 2001). Additionally, an important characteristic of development is project management skills which is concerned with managing time, costs and quality of a project. Moreover, managing NPD projects is becoming increasingly challenging since development projects are becoming more difficult and complex. A higher degree of complexity can be caused by: new technologies, increasingly sophisticated customers, partnered development projects (Kim & Wilemon, 2003a). In addition, the redesign's activities and inputs are based upon these specific development characteristics (see Table 3.2).

The redesign of the front-end stages is based on the critical factors that were identified in the literature review and both qualitative and quantitative data obtained during the case study. The R&D-marketing integration is one of the key factors for making the redesign successful since many activities need input from either marketing, R&D or consumer insights.

9.4 Discussion

In the this section, a number of limitations that have been faced are discussed.

The initial scope of this research project was limited to R&D, therefore preliminary interviews in the first phase of the research were only conducted with informants from R&D. Furthermore, the researcher was also based at the R&D centre. Both factors could lead to a limited view from a R&D perspective in the beginning of the research project. However, In order to have a more complete view on the current NPD process, it was decided to also conduct interviews and involve the marketing department in the research since they are also a key stakeholder in the front-end stages of the NPD process.

The NPD project analysis was based on the input from the TBM's and the technology development manager. Therefore, again the choice is based on a R&D's perspective which did not take into consideration deeper strategic business intentions.

The results of the company analysis were benchmarked against data from a survey conducted in 2007. Therefore, differences between the benchmark and the company under study may even be larger, since three years past.

9.5 Recommendations

The most important recommendation is to implement the proposed redesign of chapter 8, for the front-end stages of the NPD process. Besides this redesign, the research also identified 7 critical factors that could be improved in the current NPD process in order to make the NPD process more effective. Additionally, improving these critical factors is also vital for the implementation of the redesign. The following critical factors were identified:

1. Better portfolio management.
2. More management attention
3. Optimize current funnel.
4. Create synergy between brand and technology strategy.
5. Better project management.
6. Create organizational wide transparency.
7. People.

1. Better Portfolio Management

- Figure 7.1 in chapter 7 shows an analysis of the introduced NPD projects of the company by using a consumer-technology matrix (CTM) over the period FY07-FY09. The CTM indicates that the majority of the launched NPD projects, the red spot, were variants or improvements with a low competitive advantage which only maintain or defend current market share. In order to create business growth it is for the company important to launch more projects in the green area of the CTM.

2. More management attention

- The green line in figure 9.1 shows the ideal degree of management attention given during the process (Wheelwright & Clark, 1992). On the other hand, the green dotted line illustrates the management attention given in the current situation. Crucial in the ideation and concept qualification is vision from both R&D and marketing that helps in setting better and clearer project definitions. Another interesting point for improvement is the after-care of launched products, higher management should also be more involved compared to the current situation.

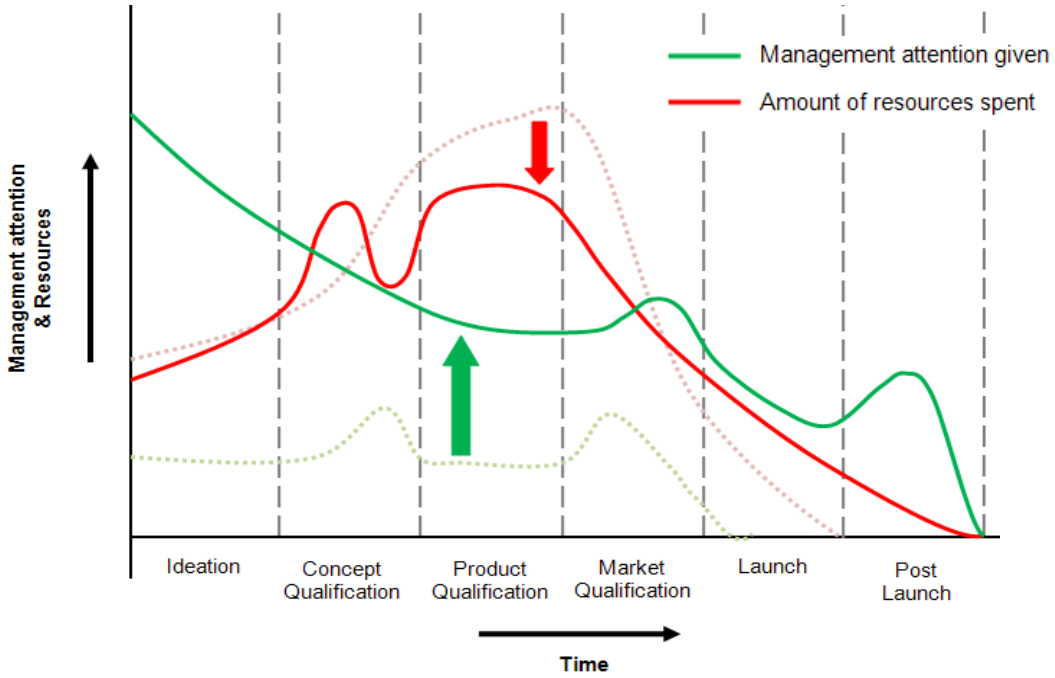


Figure 9.1. The ideal situation vs. current situation management attention and amount.

3. Optimize Current Funnel

- Limiting the tunnel effect in the beginning of the current NPD funnel, the company should also take more into consideration the external environment, other industries and the accompanying opportunities (see Figure 9.2).
- Create innovation platforms based on consumer insights and external environment input.
- Make optimal use of the external environment for building stronger concepts.
- Less projects but more focus.
- Execution of bigger and better projects, high value projects.

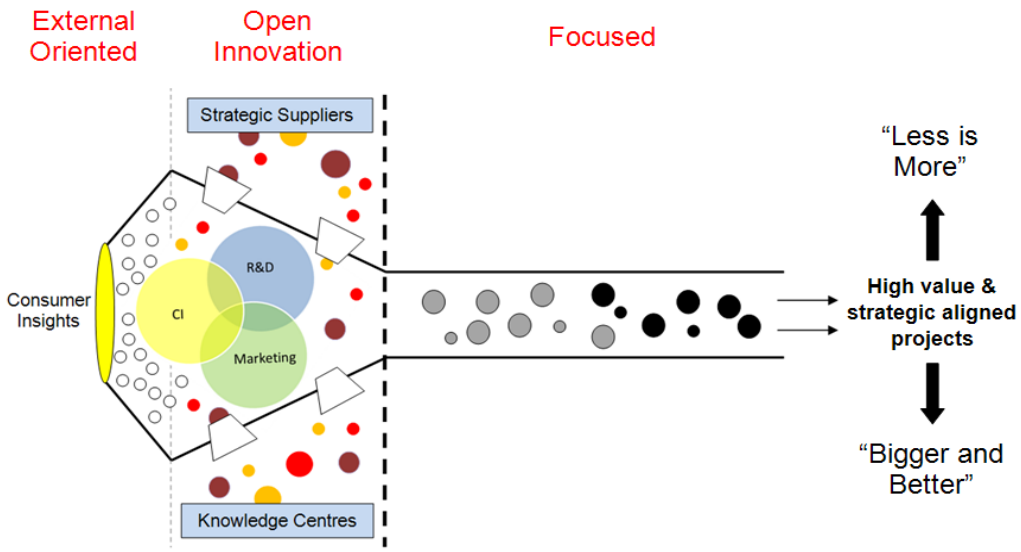


Figure 9.2 The optimized NPD funnel.

4. Create Synergy between Brand and Technology Strategy

- Closer cooperation of marketing, consumer insights and R&D in front-end stages for developing appropriate strategies that create synergy.
- Make use of the technology assessment to integrate both brand and technology strategy.

5. Better Project Management

- Improve project management skills.
- Improve internal communication.
- Increase cross-functionality.

6. Create Organizational Transparency

- Create a companywide understanding of the NPD process and make sure that there is only one way of executing and the process. No space for misinterpretation about activities and responsibilities.
- Make sure people understand each department's value — and how they can complement one another.
- Prevent one group for dominating the company's new product development process.
- Avoid people staying strictly in their silos.
- Make consumer insights present their market research also to R&D.
- Stay focused on the customer.

7. people

- Improve project management skills.
- Offer business related courses/ trainings for R&D people.

9.6 Future Research

This research project identified some critical factors in the front-end stages of the company's NPD process that could be improved. Furthermore, it was the aim to redesign the front-end stages in order to formalize and coordinate tasks and responsibilities. However, there were also some critical factors that were out of scope of this research project that could lead to significant improvements in the company's NPD process. The project team structure for NPD projects or the organizational structure for NPD could be interesting from a company perspective.

Project team structure for NPD projects

In the company under study the project team approach is based on a "Lightweight team structure." The weakness in this structure is the "lightweight" project manager, who actually does not have enough power to make decisions or choices. In the company managing a project is the task of both commercial project leader (CPL) and technical project leader (TPL), however, many times these persons are new to the company or have limited experience in managing projects. Furthermore, tasks and responsibilities of the CPL and TPL are not always clear. A deeper dive into the team structure and the encountered problems could result in important improvements for future NPD projects.

The Dark-Side of Open Innovation

Open Innovation and supplier collaboration in front-end stages has many advantages (Batterink, 2009). However, studies on outsourcing all research activities to co-packers and suppliers also demonstrated the danger of such an approach for the long term prosperity and the level of innovation of the company. According to Cohen & Levinthal (1989) organizations need to develop absorptive capacity in order to be innovative. More research on this topic could give insights concerning a good balance between outsourcing research activities and developing the company's absorptive capacity.

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Appendices

Appendix A - Wageningen Innovation Assessment Tool (Company)

Each of the following items consists of a statement related to aspects of the industry sector, your company and its main competitors. Please circle the number that best fits your judgment

1. The business environment is safe and provides little threat for the survival and well being of our company

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

2. The sector is rich in investments and marketing opportunities

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

3. Actions of competitors are easy to predict

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

4. Consumer trends and desires are easy to forecast

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

5. We expect the sales volume of our current products in the coming three years to

Strongly decrease 1 2 3 4 5 6 7 Strongly increase

6. The current position of our company compared to our main competitors can be characterized as

Follower 1 2 3 4 5 6 7 Ahead of competition

7. Our firm fights the competition and is directed to market dominance

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

8. The bargaining power of our suppliers has a strong influence on the business results of our company

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

9. The bargaining power of our business buyers has a strong influence on the business results of our company

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

10. New entrants in our sector have a strong influence on the business results of our company

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

11. The number of substitutes for our products is

Small	1	2	3	4	5	6	7	Large

12. Compared to our main competitors our profitability is

Much lower	1	2	3	4	5	6	7	Much higher

13. Compared to our main competitors our sales volume is

Much lower	1	2	3	4	5	6	7	Much higher

14. Compared to our main competitors our growth rate is

Much lower	1	2	3	4	5	6	7	Much higher

15. How many important competitors are active on your main market?

1 to 5	[ ]
6 to 25	[ ]
Over 25	[ ]
Unknown	[ ]

Our company distinguishes itself positively compared to our main competitors by:

16. A strong financial position

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

17. An effective R&D process

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

18. Our good reputation in the market

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

19. Our flexibility of market response

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

20. The protection that our products and processes receive by patents, licenses etc

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

21. The educational level of our employees

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

22. How innovative would you consider your company to be in the following?

Marketing

Not innovative	1	2	3	4	5	6	7	Very innovative

Product design

Not innovative	1	2	3	4	5	6	7	Very innovative

Product quality

Not innovative	1	2	3	4	5	6	7	Very innovative

Distribution

Not innovative	1	2	3	4	5	6	7	Very innovative

Manufacturing processes

Not innovative	1	2	3	4	5	6	7	Very innovative

23. The main competitive strength(s) of our company are (you may tick more than one of the boxes)

Price [ ]

Quality [ ]

Delivery time [ ]

Uniqueness of products [ ]

Product assortment [ ]

Technical excellence [ ]

Customer relationships [ ]

Other, namely _____

Each of the following items consists of a statement related to the situation in your company. Please circle the number that best fits your judgment

24. Innovation is important to our company in maintaining competitiveness

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

25. There are efficient reward procedures and motivation drivers to stimulate innovation

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

26. Our new products enter the market faster compared to our main competitors' products

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

27. The returns from R&D relative to the R&D investments are

Very unsatisfactory 1 2 3 4 5 6 7 Very satisfactory

28. There are regular cross-functional screening processes (including for instance, marketing, purchasing, and manufacturing) to identify and select new product/technology opportunities

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

29. Current market information (such as segmentation, trends and feedback on competitors' products and processes) is passed on by marketing to R&D on a regular basis

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

30. The progress of all R&D projects is communicated regularly to the Business Units clients

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

31. Few restrictions are imposed on R&D by administrative regulations (e.g. regarding travel, budget, etc)

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

32. KPIs (Key Performance Indicators) are used to monitor the innovation process

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

33. Our company uses joint ventures and alliances to make full use of our R&D capabilities

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

34. We consistently codify the 'lessons learned' at the end of innovation projects

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

35. We monitor on a regular basis the extent to which our products and processes align to our customers' needs

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

36. Corporate managers and BU managers actively participate in the selection of R&D projects

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

37. There is an excellent communication between R&D and marketing

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

38. There is an excellent communication between R&D and manufacturing.

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

39. There is an excellent communication between R&D and purchasing

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

40. There is an excellent communication between R&D and our main suppliers

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

41. There in an excellent communication between R&D and our main buyers

Strongly disagree	1	2	3	4	5	6	7	Strongly agree

42. What are the main priorities for your company's R&D investment?

Designing and launching new products [ ]

Increasing efficiency of existing processes [ ]

Designing and implementing new processes [ ]

Basic research [ ]

This is the end of the survey. Thank you very much for your cooperation.

Appendix B – Wageningen Innovation Assessment Tool (Project)

Name company:
Name project/product:
Name employee:
Department:
E-mail:
Date:

Your position / function

O Management	O Marketing	O Sales
O Finances	O Engineering	O Something else:
O Production	O Operational	……
O Product development	O ICT	

The statements

Agreement
Do these characteristics describe the project? Indicate your degree of agreement or disagreement by entering a number on a 1 to 10 scale in the column **"Answer"**. Here 1 means strongly disagree and 10 means strongly agree. Numbers between 1 and 10 indicate various degrees of agreement or disagreement.

Certainty
You are also asked to indicate how certain or confident you are about each of your responses by entering a number on a 1 to 10 scale in the column **"Confidence"**. Here 1 means very low confidence in your answer, highly uncertain and 10 means total confidence in your answer, highly certain. Numbers between 1 and 10 indicate varying degrees of confidence.

Example

Nr.	Statements	**Answer** 1… 10	**Certainty** 1… 10
9	Our financial resources are more than adequate for this project.	***8***	***5***

In this example an "8" is given as **answer**. This would mean that you agree quite strongly with this statement. You filled in a "5" for **certainty.** This means you are not very confident about your answer, for example because you are not involved in the project finances.

Advice
Don't think too long for each answer, most of the times your first thought is the right one. Completing this part will take approximately 20 minutes. Please answer for all the statements, even if it is difficult to make an indication.

The Statements

Nr.	Statements	Answer 1… 10	Certainty 1… 10
Product			
Novelty			
1	The potential customers for this product are totally new for the company.		
2	The nature of the production process is totally new for our company.		
3	The distribution system and/or type of sales-force for this product is totally new to our company.		
4	The type of advertising and promotion required is totally new to our company.		
5	The competitors we face in the market for this product are totally new to our company.		
Technological novelty			
6	The technology required to develop this product is totally new to our company.		
7	Our product is highly innovative and totally new to the market.		
8	Our product is a very high technology one.		
9	Our product is mechanically and/or technically very complex.		
Superiority			
10	Our product will be clearly superior to competing products in terms of meeting customers' needs.		
11	Our product will be of higher quality than competing products.		
12	Compared to competitive products, our product will offer a number of unique features or attributes to the customer.		
13	Our product will permit the customer to do a job he/she cannot presently do with what is available.		
14	Our product will be first into the market.		
Potential			
15	The monetary value of the market (either existing or potential market) for this product is large.		
16	The market for this product is growing very quickly.		
17	Potential customers have a great need for this type of product.		
18	The customer will definitely use the product.		
19	This product has a high potential (i.e can additional products, multiple styles, price ranges).		
20	This project will contribute to the competitive advantage of the company		
Project			
Team cooperation			
21	I have enough communication with my team members to do my work efficiently and in an effective way.		
22	The portfolio management has explicitly expressed its commitment to the project team.		
23	The performance requirements for this project are clear for me.		
24	In a new project I surely want to participate in the current team again.		
25	I completely understand the potential problems of the project.		
26	If I doubt the opinion of a team member I will surely confront this member with it.		
27	All our team members are focused on "collecting" knowledge for our project.		
28	I am completely satisfied with the product development process used.		

		Answer 1… 10	Certainty 1… 10
Resources			
29	Our financial resources are more than adequate for this project.		
30	Our management skills are more than adequate for this project.		
31	Our engineering skills and people are more than adequate for this project.		
32	Our production resources or skills are more than adequate for this project.		
Marketing resources			
33	Our marketing research skills and people are more than adequate for this project.		
34	Our advertising and promotion resources and skills are more than adequate for this project.		
35	Our sales and/or distribution resources and skills are more than adequate for this project.		
Market			
Entry barriers			
36	There is a strong dominant competitor – with a large market share – in the market.		
37	There is a high degree of loyalty to existing (competitors') products in this market.		
38	New product introductions by competitors are frequent in this market.		
Competition			
39	The market is a highly competitive one.		
40	There are many competitors in this market.		
41	The market is characterized by intense price competition.		

Thank you very much for filling in this questionnaire!

Appendix C – Classification Consumer/Technology Matrix

Classification Competitive Advantage axis

- **Radical**

First implementation of a technology in an industry. Offers sustainable competitive advantage based on functional benefits that are proprietary and difficult to replace. The company will gain a competitive advantage of two years on average.

- **Next Generation**

May lead to dominating patents. A significant technological change, leading to a major product or process performance enhancement. Can be derived from cross-industry technology transfer and may lead to a competitive advantage of approximately 18 months.

- **Incremental**

Improvements on currently available technology base and a competitive advantage of approximately one year.

- **Base**

Exploitation of enabling technologies widely available to the industry. Competitors are able copy the technology within 6 months.

Classification Consumer value axis

- Previously unknown, unmet need	- Previously unmet need	- Existing need, better way	- Existing need, different way	- Existing need, existing way
- A new product form or function which stimulates new consumer usage and/or purchase habits to create a new market segment	- A significant qualitative change that delivers new concepts or benefits which fulfill consumers needs that are otherwise unmet by any products in the market place	- Incremental product change which yields consumer discernable enhancements relative to existing product benefits	- Offers parity with competitors products relative to performance, claims, features or market positioning	- Project that does not result in any market activity that the customer sees, but improves internal processes resulting in cost reductions, better product quality or other improvement
- Scope for new brand creation	- Scope for new brand, major repositioning or major extension of the product family	- Scope for minor relaunches or small/single additions to product family	- Scope for minor relaunches or small/single additions to product family	- May include regulatory initiatives
New Core Product	**New Benefit**	**Improvement**	**Variant**	**No Change**

Appendix D - Standard interview protocol for NPD project team members

Product concept
How does the product concept look like?
What time did it take from idea to market introduction?

Idea generation
How did the idea arise for this project and when was R&D/you involved?
Who decided that the idea could be developed?
Was the TBM involved and did he already communicate in early stages about the project?

NPD Process (stage 1,2,3)
1. Was the concept defined in the project brief and how was this done? Was it clear?
2. Did you make an R&D brief?
3. How did you translate the project brief into R&D brief? (together with marketing and/or packaging?)
4. Would it be better for you if marketing states also the functionalities of the product?
5. Could you define your role in the process per stage? And the cooperation with other departments?
6. How did the development process proceed? Where there any difficulties?
7. What phase was the most difficult/unclear stage of the process?
8. How was the cooperation between different disciplines? Mostly phone/mail contact or also face to face?
9. How did you determine what knowledge is needed and necessary in order to cover all relevant project issues/risks?
10. Was the input for the PMR (NOP) based on the input from both TPL and CPL?
11. Did you make use of benchmarking with competitive products? Do you ask marketing for this info?
12. Did the TPL and CPL share knowledge in order to create better project insights and finally a successful product?
13. Were there many changes in team composition and which positions change too often according you?
14. Were there scope changes during the process?
    - In which phase scope changes normally occur?
    - And what were the reasons for the scope changes?

Feasibility
1. What kinds of tests have been executed in the feasibility phase?
2. Who was responsible for the feasibility check in stage 2?

Risks
1. What kinds of risks have been taken during the process?
2. How did the risk assessment take place?

End Questions
1. What were the main reasons for this good/bad development process?
2. What caused these issues?
3. Is the current process suitable for solving complex project issues that arise during the process
4. What were the reasons for failure of the product/short life time/ on-hold status?

Appendix E - Questions Marketing Managers

- What is your role in the NPD process? Define activities per stage. Also make clear when cooperation with other disciplines is needed in particular activities and does this work out well in practice?

- What are the roles and responsibilities of the CPL and TPL?
  Can you define these per stage?

- What do you expect from R&D in stage 1, 2 and 3?
  Think of input into concepts, new ideas…

- If you look at the first stages of the NPD process what are points for improvement to make it more effective?

- What is your opinion on the current organizational structure for the NPD process?
  - Do you think this NPD process is suitable for dealing and solving complex NPD issues?
  - The role of the TPL and CPL

Appendix F – Explanation of the process flow symbols