

PART III

Analysis Model

The analysis model part defines and elaborate the contents of the framework model for evaluating HS in NB PD. The analysis model finds the elements which the NB HS PD framework model must take into consideration. The analysis model also delimitates the focus of the research on network based high speed product development. This includes which main questions and main hypotheses for network based high speed product development should be finally verified.

This part sets the framework fundament for the empirical research.

8

Analysis Model of NB HS NPD

As demonstrated in the previous chapter, Network based HS in NPD processes is multi-dimensional and can be made operative in many different ways. A framework model for a Network Based HS NPD process must allow for this.

The first objective of this chapter is to create such a framework model for evaluating HS in NPD.

The chapter begins by drawing a picture of the elements which a framework model must take into consideration when discussing NB HS NPD.

From this point of view the elaboration of the framework model for NB HS NPD that can include the above-mentioned aspects will be made.

8.1 Elaborating Network Based HS to NPD

8.1.1 Introduction

The research takes its starting point in the analytical foundation of “the four Ps”. According to this model the Process is defined, the Procedure is defined which means that the manual of the partial processes is uncovered. Subsequently, the People are described. This means that the actors taking part are described. Thirdly, Project management is described to determine who is actually leading or managing the process. Finally, the Point of entry is laid down in order to determine the player/players who initiate the partial process (Plat, 1999).

My hypothesis in 2003 continued to claim that the achievement of goals during PD processes and partial PD processes is only effective provided that decisions made during the process have been defined as depending on right speed, perceived value, cost both direct and alternative cost and thereby create the right performance.

As we have seen, the network based HS framework model had therefore to be defined and related to a number of main elements.

1. The product development task
2. The main components on the field of product development
3. The management of the product development project
4. The success criteria of the NB HS NPD
5. The product development model and process
6. The HS enablers to NB NPD

My proposal to the decision or analysis model for NB HS NPD was as follows:

The first two elements are generic and can be defined by different tools already known. The last four items are more dynamic and have to be defined and classified carefully to the specific situation. Different tools and frameworks can be chosen by product development management. It was my hypothesis that this choice would define and decide the speed of a product development project and would consequently define the top speed of a product development project. When PD management carefully choose the above, they would “hit” the right speed of PD.

The last four elements are elements which the management could choose to use and define differently from one product development project to another. The management could also choose to use the four elements in different combinations to different PD task.

For each element, the management could also choose to use sub-elements e.g. the HS enabler either alone or in combinations. This meant that the management of product development face the challenge of analysing the task and “the field of PD” and combine both the four main elements and also single sub-elements in different combinations.

The product development management thereby became more complex and must take into account factors as prevailing nature of NPD work (incremental/radical NPD), time, cost, performance, culture, personnel, history, organisation, network etc.

The PD management became central to the definition the right architecture on behalf of the PD analysis of the PD task and the field of product development.

8.1.2 Framework Model for NB HS NPD

On behalf of the above-mentioned the overall framework model for NB HS NPD was elaborated as shown in Figure 8.1.

First, the manager must analyse and understand which type of product development task the business is facing. Secondly, managers must understand the position and characteristics of “the field of product development”. Thirdly, the managers must decide on the success criteria for the specific product

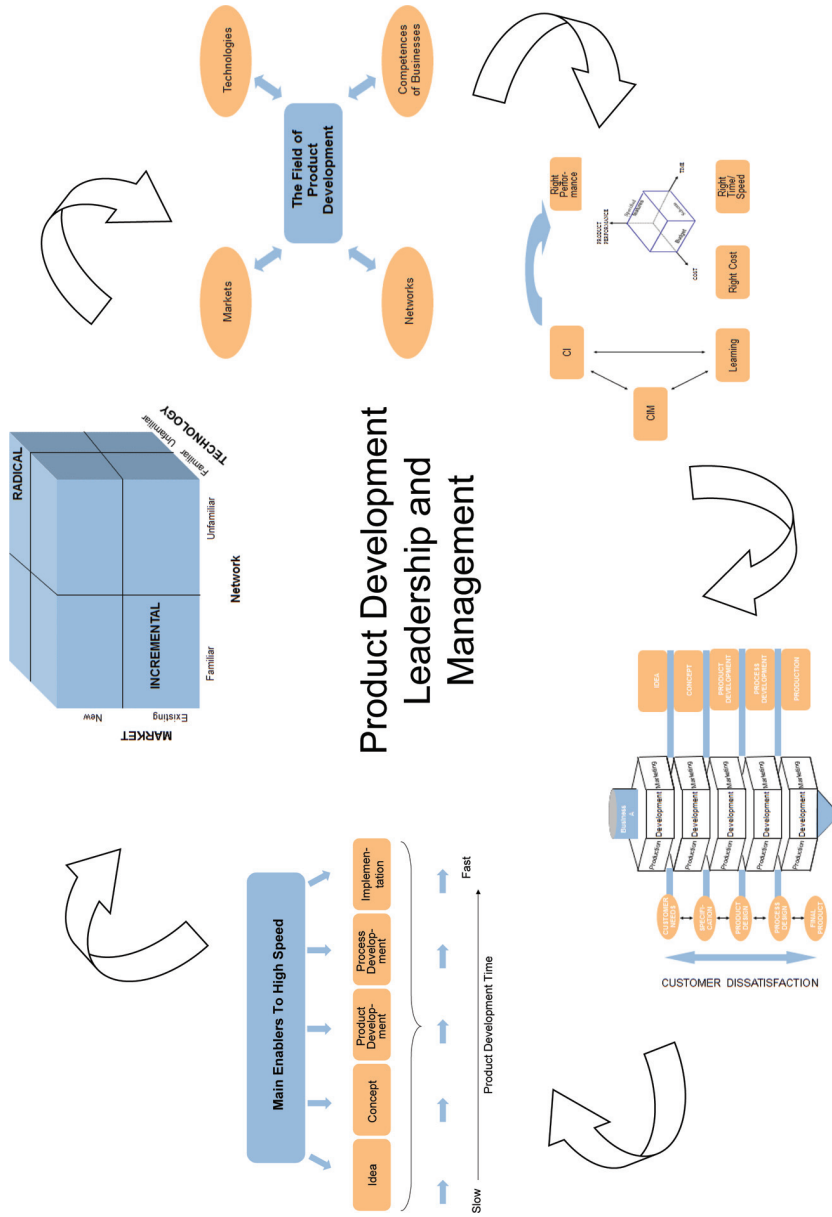


Figure 8.1 Decision model.

development task. Fourthly, the manager must decide according to which product development model the product development projects should be developed. Finally, the manager must chose among the different product development high speed enablers and mix of HS enablers and in the end implement the product development activity.

However, the management of the business involved must realise that this is not a one-time product development project. Once implemented, the product development process has begun and will seldom find an end.

8.1.3 Product Development Task

The first thing the management of product development must consider is the task of the product development project. The task can be defined as either radical or incremental as shown in Figure 8.2.

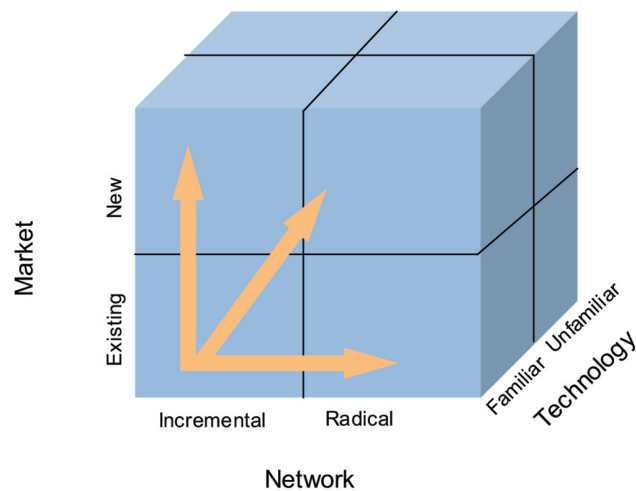


Figure 8.2 PD task model.

The empirical data will try to verify where to place the product development task.

The next thing the framework model tries to define is the field of product development explained in the following paragraph.

8.2 “The Field of Product Development”

The different main elements were considered as the basic minimum set-up to a PD project and require a careful analysis if network based HS is to be

successfully managed, developed, and sustained to the extent where it can confer strategic competitive advantage to the business. “The field of product development” has to be analysed carefully by the management level. In the research a verification of the following questions will be done.

On the basis of the previous chapters I claimed that the main context and components in “product development game” up to 2003 could be characterised by the following “interactive picture” as shown in Figure 8.3 of the four main components on “the field of product development” – markets, technology, networks, and competences of the businesses playing in “the field”.

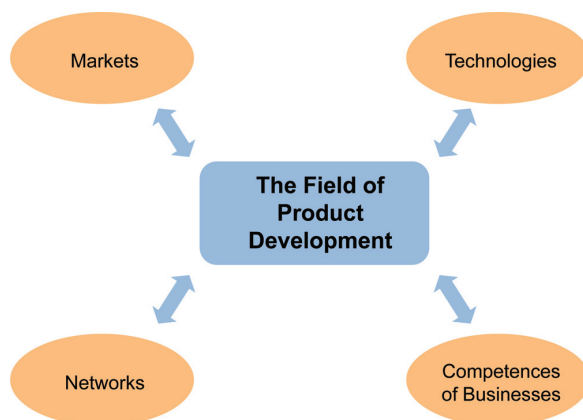


Figure 8.3 The field of product development.

Each of the main components can be of different shapes both prior to the product development project and during the product development project when “the field of product development” is being analysed. The main components interact continuously in the field of product development. In the empirical research verification were made in accordance with the following dimensions as shown in Table 8.1:

Table 8.1 The shape of the main components in the product development game

The Main Components Context	Characteristics	Analysis Tools
Market – (Sanchez 1996)		
Stable markets	Stable market preferences	Market analysis on behalf of Sanchez’ characteristics
Evolving markets	Evolving market preferences	
Dynamic markets	Dynamic market preferences	

(Continued)

Table 8.1 Continued

The Main Components Context	Characteristics	Analysis Tools
Technology (Sanchez1996)		
Stable technology	Stable and known technologies	Technology analysis on behalf of Sanchez' characteristics
Evolving technologies	Evolving technologies	
Dynamic technologies	Dynamic and mixed technologies	
Network (Håkonson & Håkonson; Child and Faulkner, 1999)		
Stable networks	Networks mainly based on physical and stable networks often internal and dominated network	Network analysis on behalf of Håkonson and Håkonson and Child and Faulkner's characteristics.
Evolving networks	Networks based on a mix and evolving system of networks – Physical networks, ICT – networks, virtual networks	
Dynamic network	Networks based on a mix of dynamic networks with high degree of dynamic where network partners constantly comes in and goes out. Often there is no formal network leader.	
Business competence context (Prahalad and Hammel 1990)	Support competences Complementary competences Core competences	Analysis on behalf of Prahalad and Hammels characteristics

8.2.1 Success Criteria for PD Project

Successful businesses will have to decide on both short-term and long-term success criteria in their product development activities.

The research wanted to look into what was going on in businesses and gain a clear view on which short- and long-term success criteria businesses used. The results verified by my research are presented in the next part of this book.

As a minimum long-term success criteria and short-term success criteria as shown in Table 8.2 must be:

1. hierarchically
2. quantitatively
3. realistic
4. consistent

Table 8.2 Success criteria

NB HS NPD Success Criteria Short-Term Perspective	NB HS NPD Success Criteria Long-Term Perspective
High Speed – Time	Right Time – “Right Speed”
Costs	“Right Costs”
Performance	“Right Performance”
	Continuous Improvement
	Learning
	Continuous Innovation

Firstly, when businesses have analysed and decided which criteria should be in force, I assert that the product development model can be chosen.

8.2.2 NB HS NPD Framework Model

The NB HS NPD framework model was “built up” with different elements:

1. The point of entry
2. The core of the NB HS product development framework model
3. The internal framework model for NB HS NPD
4. Functions involved in the framework PD – model
5. The process in the NB HS NPD.

Point of Entry

In the framework model it was important to verify the point of entry for new ideas. Moreover, it should be determined how optimal this point of entry was to support the businesses and the markets’ goals of speed of product development. Table 8.3 shows the different points of entry which the product development framework of a business can have.

Core of Product Development Task

The (ideal) specific NB HS PD project will consist of a PD core which in ideal situations and at the point of departure (t_0) defines the overall strategic and tactical framework for the object of the product development.

The core also defines the strategic limits, the costs, the product architecture, the expected performance of the product, and the initial framework of the product development project. It must be realised that the core can be changed because of changes in the field of product development. The core of the product development project or task must therefore have a somewhat flexible design

Table 8.3 Points of entry

Sources to Product Development Ideas in General	In Per Cent Point of Entry
Customers	
Suppliers	
Marketing	
Finance	
Sales	
Leadership/Management	
Production	
Product Development	
Human Resources	
Competition	
Others	
Do not know	
Total	

but a strong product architecture to match the interaction, demands and change from all other main components in the field of product development.

It was the hypothesis of this research project that in the course of time, the core of the product development task will progress from c0 to c1. Consequently, my hypothesis was that the core of an NB HS PD was not necessarily static but can have a dynamic character which was influenced by all other elements in the frame work model; especially the elements on the “field of product development”.

Furthermore, it was the hypothesis of this research project that the separate components of the core will develop differently over time so that some parts may at a given time be much developed whereas others were less developed or not at all developed at the beginning of the product development. It was also the hypothesis that occasionally, the core of the product development project cannot be defined because the product development project was so radical that the major part of the core could only be defined later in the project. Consequently, my hypothesis was that in some cases the mission of the product development project could be developed initially whereas in other cases it could not.

The strategic limits of the core define the limits to which the product development is subjected. Such limits are the limits of the business, the product, the technology, the market, the customers, and the competition. Additionally, the internal strategic and tactical limits as e.g. financial, organisational, and technical limits were defined. The network boundaries also define the boundaries allowed for the business’s actors in the product development

project. Such limits also determine the internal involvement and possibilities of the product development group as well as the external cooperation with network partners.

As previously mentioned my hypothesis was that the core of the product development project was often dynamic as e.g. resources can be drawn out or put in depending on developments in mission, goals, and strategy.

In this connection it was the hypothesis that it was crucial for the speed in NB PD:

- To carefully define the core of the pencil (mission, goals, strategy, resources, access to network partners) initially to the PD project
- To maintain, if possible, the main architecture of the core throughout the course of the development process
- To adapt the core to the specific situational position and characteristics in “the field of product development”
- To communicate and agree upon the core with all network actors; both internal and external actors should take part in the development of the product development
- To explain the core to all actors of the product development process. My hypothesis is that this is an important activity which will secure motivation, high involvement and thereby high speed in product development
- To “tailor” the core to suit the specific product development success criteria – in terms of time and right time

In the case of network based high speed product development it was my hypothesis that the core of NB HS NPD was crucial because it would decide how fast a product development process could go. The core will, however, also be influenced by the different cores of the network partners.

Subsequently, a common network core will have to be formulated in a product development project of NB PD. This core will be a common core to the network actors of the specific development project.

The formulation of the core may give synergic effects or conflicts as the network core can clash with the product development core of the individual network actors or businesses. Such clashes may be due to conflicts of:

- Mission
- Objectives
- Strategy
- Business resources
- Other actors or boundaries to network actors

It was the hypothesis that this was one of the major reasons to why it was difficult to perform high speed in network based product development.

This was tested by case, focus group, survey and by joining other research and product development projects. The following questions was central as listed in Table 8.4:

Table 8.4 Elements of core

Elements of the Core in NB HS NPD	Hypothesis to Be Tested
1. Mission	Does the core in HS NB NPD consist of the elements mentioned 1 to 5?
2. Objectives	
3. Strategy	When is the elements formulated in relation to the product development process?
4. Business resources	
5. Other actors boundaries to network actors	Can businesses which have formulated or formulate the core of NB HS NPD run with higher speed in PD than businesses with out a formulated core?

Furthermore, my hypothesis was that it was very important that each business has fully decided on their individual and their common core before they joined a NB HS NPD. It was also important that the network partners trust each other in this process and elaborate the core with trust, fullness, openness, and real input to the core. My hypothesis was that otherwise the product development project would face problems at a later moment, and speed will be diminished. However, this aspect was not of primary interest to this research project.

Internal Framework Model for PD

The framework model for NB HS NPD took its starting point in the assumption that a product development project inside a business consists of various stages and gates. This hypothesis was supported and confirmed by both theory and by the majority of the secondary business cases analysed and examined. My hypothesis was that most businesses until 2003 had not adapted other types of models such as flexible models or rapid prototype models. The secondary case research of several authors confirmed this product development picture (Wind, 1973) (Clark and Wheelwright, 1992) (Myrup and Hein, 1986) (Cooper, 1993) (Eppinger, 2000). I wanted to verify this hypothesis empirically to verify the conditions of NB HS PD.

The hypothetical model for the NB HS NPD model and the analytical framework for the empirical research were therefore outlined in detail in the following Figure 8.4 and paragraph.

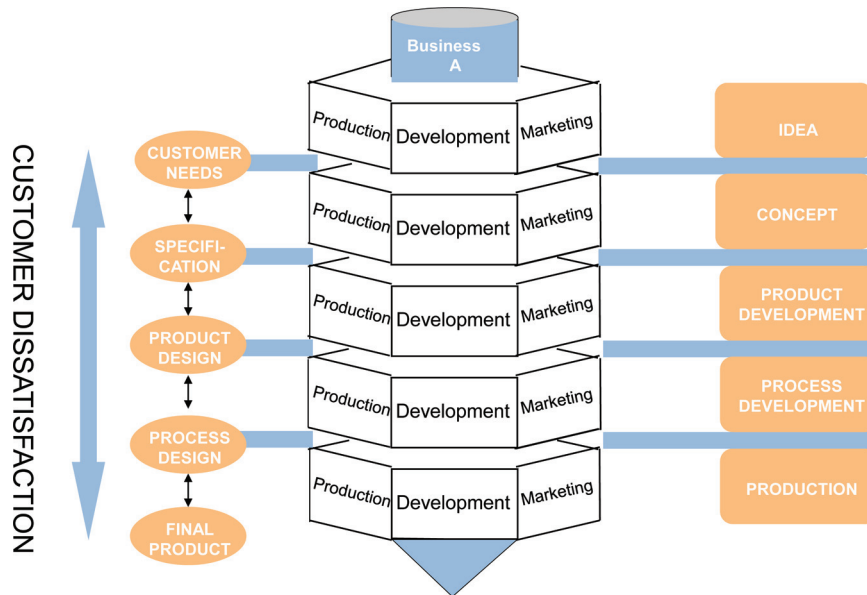


Figure 8.4 Product development pencil model.

Source: Bohn & Lindgren, 2000.

The PD framework model consists of a core surrounded by the potential functional areas which can be represented in the different stage and gates of the product development process. The product development model is shaped as a pencil and is called “the pencil model”. The PD model consists of a process from before the formal idea stage to “on the market” stage. The PDD model consist of 7 stages and 6 gates.

The various stages and gates were defined as shown in Table 8.5.

Table 8.5 Definition of stages and gates

Stage and Gates	Definition	Activity
The pre idea stage	Actors network, discuss on an often informal basis	Networking
The idea stage	Actors find an idea and define it	Idea generation
The Idea gate	Actors screen the ideas	Idea Screening
The concept stage	The ideas are conceptualised	Concept generation
The concept gate	Actors screen the concepts	Concept screening
The Product development stage or the “prototype stage”	The concepts are transformed into prototypes	Prototyping

(Continued)

Table 8.5 Continued

Stage and Gates	Definition	Activity
The Prototype gate	Actors screen the prototypes	Proto type screening
The Process stage	The process for production of the new product is developed	Process development
The Process gate	The final product is tested against quality standards and the process is screened against success criteria	Process screening and quality screening
The Market implementation stage	The new product is introduced to the market	Market implementation
The Market evaluation and control gate	The market evaluate the product. The business control the performance of the product. Proposals for adjustments turns up.	Market evaluation and control

As previously mentioned one of the primary points of criticism of the stage and gate models up to 2003 was that such models give the impression that product development passes from one phase to another, and that product development cannot proceed until the previous phase has been completed. Several examinations had shown that when the businesses conform to the above-described principle, the speed of product development will be dramatically reduced.

The secondary case examinations showed that the businesses apparently operate in their formal NPD models with different stages and gates. However, several cases indicated that the stage-gate models were framework models which were merely used when the businesses presented their product development models to an audience. Therefore I proposed a more agile and flexible product development model with a structure that gave possibilities of dynamic and free choice of stages and gates related to the characteristics on the field of product development and the product development task. Yet, the above-mentioned scenario had the recurrent characteristic of the product development models found in the literature as well as in the case examinations which formed the basis of my hypothesis model.

This meant that all elements were variables and businesses can choose to:

- Attract ideas from all stage- and gates in the framework model
- diminish the product development model – jump stage and gates
- increase or diminish the stage and gates
- choose to develop through all phases or solely do “on the market” product development

- do network product development in all stage in the product development process

The above was a hypothetical model to NB HS product development. In my empirical research I wanted to verify the shape of this product development model.

Functions Involved in Framework PD Model

The framework model intended to establish an analytical framework which could identify the departments and functional areas which participate in the various stages and gates.

The framework model outlined above linked the classic stage-gate model by including several departments or functions of the business in the stages and gates. In this way the stage-gate model was combined with the department-stage model perception in terms of an analysis framework which took into account the identification of the participation of various departments/functional areas in the various stages and gates.

In the framework of the PD model marketing and sales were divided into two separate departments. The theoretical study verified that there was considerable difference between the sales and the marketing approach. Furthermore, it was the hypothesis that the marketing function becomes involved in the product development process at an earlier stage than the sales function.

Additionally, I had included three additional departmental and functional areas; namely finance and economy, and HR. These departments or functions had been included because my initial study of cases and literature emphasized the importance of addressing the involvement of such functions and departments at an early stage of the product development phase in order to achieve high speed in the course of the product development.

On the face of it, the management of the business was not represented in any of the above models. However, we had observed via the case analysis that management was a function which was represented either directly or indirectly via e.g. the core function or together with other functions. Consequently, the management function had been singled out as an independent function the result of which was that a total of seven functions were represented.

This meant that the analysis framework model contained seven potential functional areas which had been included in the analysis framework outlined in Figure 8.5.

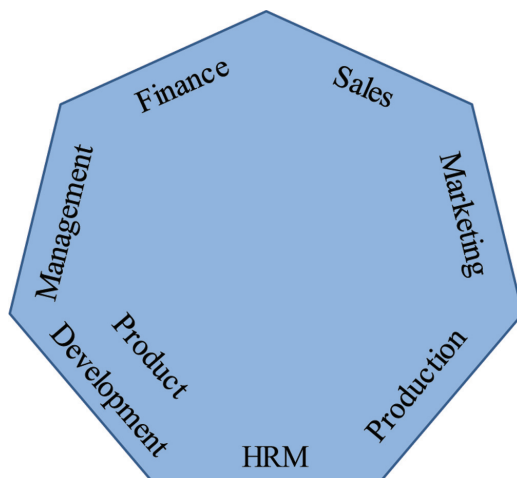


Figure 8.5 Potential functions involved in product development model.

Source: Lindgren, P., 2002.

The functions were defined as shown in Table 8.6.

Table 8.6 Internal functions of PD

Functions Involved in Product Development Model	Definition of Function	Function Activity in Product Development Process
Marketing function		-
Sales function		-
Product development function	-	
Finance function		-
Production function		-
HRM Function		
Management function		

As have appeared at a later point in this research the secondary case examinations have shown major differences from one business to another and from one product development course to another when examining which departments took part in the various stage-gates. I wished to verify this observation further in my primary research. It was also worth noting that some functions can be represented in one participant, e.g. marketing and sales, production and product development, or economy and HR. All secondary cases were evaluated according to the tables shown in Table 8.7 and I wanted to evaluate the primary cases, focus group participants and the survey participants also on the basis of this framework.

Table 8.7 Evaluation of cases

Product Development Functions	Represented in One Person or Function						Represented Together with Another Function by One Person								
	Product Development Phase						Product Development Phase								
	Idea	Concept	Development	Production	Process	Product	Idea	Concept	Development	Production	Process	Product			
I	IG	C	CG	PS	PG	PRC	M	I	IG	C	CG	PS	PG	PRC	M
Product Development															
Marketing															
Sales															
Economy/Finance															
Production															
Human Resource															
Management															
<p>I = Idea Stage IG = Idea Gate C = Concept Stage CS = Concept Gate PS = Product Development Stage or Prototype Stage PG = Product Development Gate or Prototype Gate PRC = Process Development M = Market Introduction and Production Shaded area is the focus of this PhD project.</p>															

The framework model intended to verify at the separate stages and gate which product development functions were involved related to our framework model stages and gates. This research project mainly focused on the very early stages and gates of the NPD model; i.e. typically the idea and concept phase as well as the screening phases belonging to these phases. The reason for this focus point was i.a. our hypothesis that speed in product development course was determined at the very early stages and gates, viz. in the idea and concept phase. Therefore, it was interesting to verify the participants in the initial phases and to verify their impact to speed in product development.

However, it had become apparent through the secondary case research that several businesses did not follow their stages and gates diligently. Furthermore, the stage and gate models were being criticised by the case businesses and researchers for not being sufficient when it came to describing the course of flexible and dynamic product development (Verganti, 2001). Thus, the product development models of several businesses were described as being integrated into and working simultaneously with each other (Sarens, 1984) (Hart et al., 2000) and also much more process oriented than envisioned until now.

Also the chain of events from idea to prototyping was questioned as several cases showed that the businesses employ a much higher degree of “prototyping” than previously imagined.

Therefore, the actual concept phase may be discontinued or distinctly shortened (Verganti, 2001). The empirical research will try to verify this hypothesis.

It is worth considering that the course of a product development was considered from a process oriented point of view (Corso, 2001).

The classic stage-gate models do not allow for “integration players” (network partners) in the NPD process as e.g. suppliers, customers and similar players (Biemans, 1992) (Hard, 2000) – in other words inter-organizational networking. This is mainly due to an inside out view of product development and not an outside in product development view. This lack was covered by the framework model outlined in the hypothesis model beneath.

The reason why product development models often do not follow the course of events prescribed by the theory up to 2003 may be found in the centre of the framework of the project – generally called the core of the product development model. The core sets out the framework and the environment which the product development project and its actors must address and with which it must comply.

If “the Core” allows for or even demands integration with network partners, the road is paved for interaction between network partners. Such interaction is illustrated in Figure 8.6.

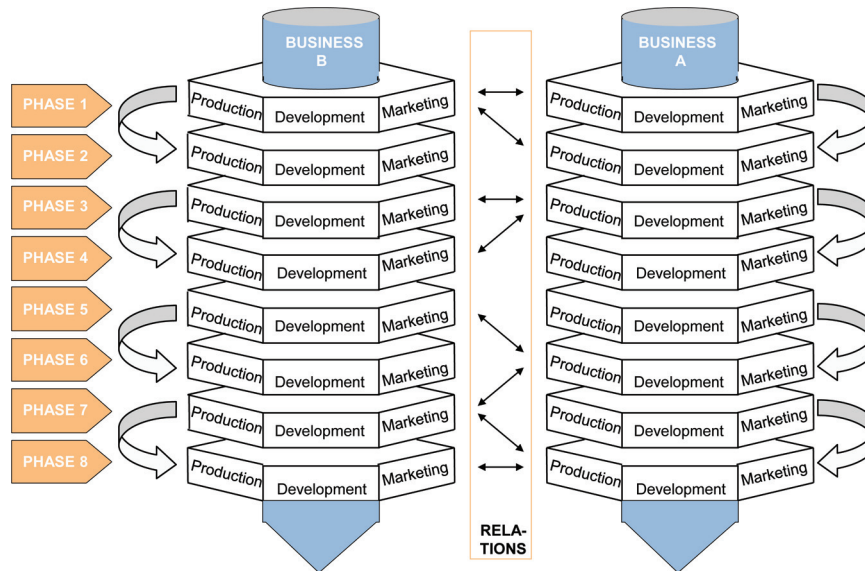


Figure 8.6 Framework model for network based product development.

Source: Bohn & Lindgren, 2000.

As the research project was focusing on network based NPD, I had developed the model further as can be seen in Figure 8.6 (Bohn & Lindgren, 2000).

The network perspective in product development had not been in particular focus and had not been particularly developed until now. On the basis of the above discussion of the NPD models, this research project puts forward an analysis framework based on an integration of network actors in the product development model and process. The above-mentioned model showed a very simplistic framework model with only few network actors. The hypothesis was that each network actor had their own product development model and process running inside their individual SME. These product development models and processes were linked and interact with each other via relations. Their interaction during the common product development model and process of the networks forms the final product. This is shown in Table 8.8.

By means of the aspects outlined in Table 8.8, my empirical research endeavoured to verify the network interaction and the network partners' participation in the SMEs' product development projects.

Table 8.8 Network partners' participation in SME's PD

	Customers			Suppliers			Competition			Other Network Partners		
	Y	N	ISC	DN	Y	N	ISC	DN	Y	N	ISC	DN
Idea Generation												
Concept Generation												
Product												
Development												
Process												
Development												
Phase												
Idea Screening												
Concept Screening												
Proto Type Test												
Process Test												

Y = Yes

N = No

ISC = In some cases

DN = Do not know

Which stages and gates are network actors involved in and which stages and gates are characterised by much interaction? What influence does this have on speed in product development? I want to examine the degree of network interaction in order to discover the potential of NB HS NPD and the impact on NB HS NPD. Furthermore, I wanted to learn who takes part in the management of the NB HS NPD projects.

Process in NB HS NPD

When dealing with the empirical data an identification of the four Ps in each separate process within the product development process was attempted in order to verify the processes employed by the businesses. The extent to which such processes were used in the idea and concept phase with the object of speeding product development was also examined.

In the secondary case research and literature study I observed dynamism in functions involved in the product development process. The hypothesis to be verified was whether some functions could change and change their involvement in the product development process from idea to market introduction. The empirical research wanted to verify how the above-mentioned circumstances influence speed in the product development.

In this way the empirical data would try to verify and comment on the following areas:

1. Interaction and change in involvement of functions during the PD process
2. Change in involvement of functions between phases in the product development phases
3. Functions involved between networks and change of functions within the network in the product development process
4. Impact on speed in PD by actors in the network

8.2.3 HS Enablers to NB PD

Which enablers are appropriate and in what form, will depend on the analysis of the characteristics of the field of product development and of the product development task. On the basis of the above a need arises for examining the high speed enablers of network based product development. Central aspects to involve were questions of:

1. What HS enablers are used by businesses
2. How is the ten high speed enablers used and incorporated in the product development process?

3. How do SME achieve high speed in the internal and external product development networks without causing first mover disadvantage?
4. Which types of speed in network based product development can be verified.

Thus, by empirical data the research wanted to verify the high speed product development process in industrial businesses. The process will be defined as a series of partial processes/activities in which internal connections were determined, in which each separate enabler is identified, and in which their contribution to the overall goal achievement – costs, performance, and speed – was uncovered.