

PART V

Comparing Theoretical Framework and Empirical Results

This part presents the comparison of the theoretical framework and the empirical results of the research project. The part also presents the learning aspects of the research project. Chapter 13 will present the comparison of the theoretical framework and the empirical results. The chapter will give answers to the hypotheses initially set up in the research project. A reflection and analysis of this will be presented continuously during the chapter. Chapter 14 presents the learning perspectives of the research project and offers suggestions for further research referring to the learning which can be drawn from the project.

13

Comparing Theoretical Framework Model, Hypothesis, and Empirical Results

This chapter compares the theoretical framework model, hypotheses, and the empirical results of the research project to give answers to and verify the research questions previously outlined. Furthermore, the chapter seeks to reflect on the findings of this comparison. The chapter will be divided into five parts. Firstly, an answer to the main question – *What is high speed NPD?* – will be given. Secondly, I will answer the question – *What enablers to HS PD can be identified?*. Thirdly, I will answer the question – *What framework in the idea and concept stage/gate area of high speed product development based on networks can be measured?* Fourthly, I will answer the question – *What success criteria can be used for measuring high speed product development based on networks?*. An answer will be given to each main question. Finally, the impacts of NB HS product development will be commented on, analysed and put into perspective.

13.1 Introduction

On the basis of the theoretical framework and the empirical findings analysed and described in the previous chapters, this chapter seeks to answer the research questions initially raised in the research project. In addition, this chapter tries to compare and verify the theoretical hypothesis model with the empirical findings. Finally, the chapter tries to analyse and reflect on the findings to clarify the impacts on businesses and product development in the context of NB HS NPD.

The main research questions of the research project were shown in Table 13.1.

The chapter will be structured according to the above overall research questions and according to the overall research framework model shown in Figure 13.1.

Table 13.1 Overall research questions of PhD project

Overall Research Questions	Hypotheses to be Tested
1. What is high speed NPD?	What is time and speed in NB HS NPD? HS NPD can be seen from different points of view (Macro environment, business, product, market, customer, competitive and network view) HS is central in the second phase of the PD process – the PD phase. HS NPD is a matter of right speed and not high speed.
2. What framework in the idea and concept stage/gate of high speed product development based on networks can be measured?	<ol style="list-style-type: none"> 1. The HS PD projects can be divided into radical and incremental PD projects/tasks. 2. The radical and the incremental PD projects follow different generic HS PD models and processes and can thus be described by different generic frameworks. 3. HS PD projects always have a formulated PD core 4. A HS PD model follows a different PD model than the ordinary PD model of the business.
3. What enablers to HS PD can be identified?	<ol style="list-style-type: none"> 1. HS enablers are identical to the 10 enablers – 1–10. 2. There can be more than these 10 enablers to enable HS PD. 3. Businesses use different HS enablers 4. The enablers will play different roles according to the PD situation and project (Secondary Focus) 5. The customer enabler, the network enabler and the PD model enabler play an important role in the upper phase of the HS PD phase.
4. What success criteria can be used for measuring high speed product development based on networks?	<ol style="list-style-type: none"> 1. The success criteria for HS PD are dependent on the specific PD project – radical or incremental. 2. HS PD success criteria can be formulated as short-term and long-term success criteria 3. Time, cost, and performance are central success criteria in a short-term perspective 4. Together with time, cost and performance continuous improvement, continuous innovation, and learning are central success criteria in a long-term perspective. 5. NB HS NPD demands businesses to distinguish between PD leadership and PD management.

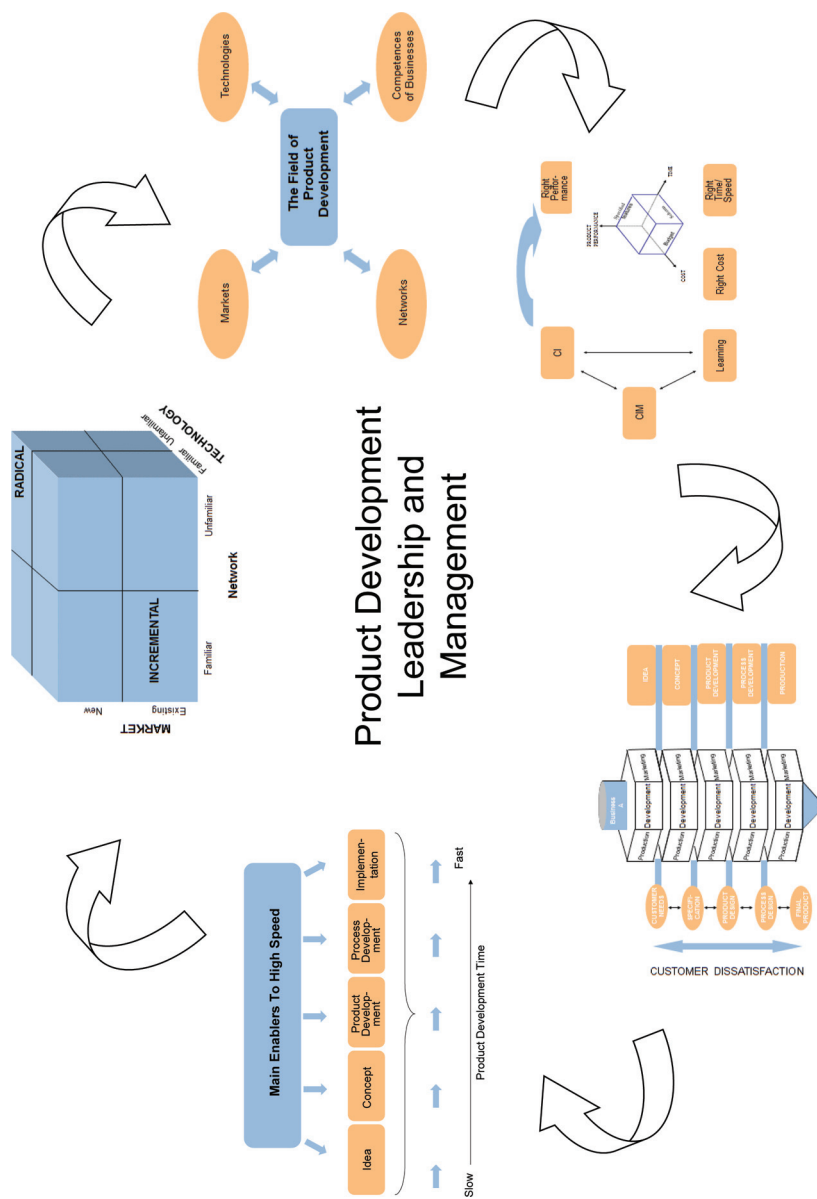


Figure 13.1 The overall research framework model.

The empirical data and the findings give the possibility to answer each question and verify the hypotheses and the framework model. This supports, increases, and puts into perspective the result of the research.

13.2 What Is High Speed NPD?

In the course of the theoretical literature study the PhD project showed that there was a necessity to distinguish between time and speed. The theoretical study and the practical study showed and verified differences in the definition of both time and speed.

13.2.1 Defining Time and Speed in NB HS NPD

A definition of speed in NPD turned out to be more difficult to formulate than originally expected. Initially, it seemed as if it was very obvious. Both researchers and industry seemed to know what they were talking about and how they defined speed in relation to NB NPD.

Subsequent to a longitudinal, theoretical literature study and to an empirical pilot research further clearness came to the definition of NB high speed NPD.

The theoretical study showed that the definition of time and speed should be made in a relative perspective where time and speed should be defined on the basis of the observer's point of view of the product development activity. Table 13.2 shows the differences in views on time NB HS NPD.

Table 13.2 Definition of time

Views on Time from Different Actors in NB HS NPD		
	Theoretical Definition of Time	Practical Definition of Time
The macro view – the society view either national or community view	From the point in time when the society, the nation, the community e.g. recognize the need or demand for a new product to the point in time when the product is introduced to the society.	Inside out but not with a SME business optimal view – physical time
Market view	From the point in time when potential customer needs and demands are recognized (often before customers have realised the demand) to the point in time when the total product is delivered.	Inside out but not with a SME optimal business view – physical time

Table 13.2 Continued

Technical view	From the point in time when a new product is technically possible to develop to the point in time when it is delivered to sales and production.	Inside out but not with a SME business optimal view
Network view	From the point in time when the network agrees on developing a new product to the point in time when the network decides to introduce the product to the market – the time when it is optimal to the network partners	A multi inside out or a mix of outside in and inside out view. Still not with an optimal business view
Business view	The point in time when the business decides to develop a new product to the point in time when the business decides that it is optimal to introduce the product to the market.	Inside out view but not with an optimal business view
The customer view	The point in time when needs or wants are identified by the customer to the point in time when the product is ready and available on the market for consuming.	Outside in view but not with an optimal business view – right time
The competitor view	The point in time when the competitor recognises the want or need for a new product to the point in time when the product is introduced to the market by the competitor	Outside in but not with an optimal business view – right time
The new marketing view	The point in time when the business possibility is recognised to the point in time when it is business optimal to the business to introduce the product to the market.	Outside in but with an optimal business view

As can be seen there can be several different views on time; the business view, the customer view etc. Additionally, there can be several different ways in which we choose to work with time; low speed, high speed, right speed etc. Businesses in the research mainly think about time as physical time but theoretically time is more complex to define. The businesses' use of time is mostly not based on a business economically optimal definition of time. Firstly, it is not optimal to the market entry point, secondly it does not take into

consideration alternative time – time of informal processes, time of coming too early or too late to a market. Furthermore, the businesses define time for product development from an inside out view and perspective, and they define time as physical time.

In this definition, time is verified in the research to be transferred by businesses to cost – and direct cost. The businesses place the product in the interval between too early and too late. They were therefore “lucky” if they “hit” the right time to introduce a new product. This meant that they often lost anyhow because either they introduce the product to the market too late or too early.

The research verified that these costs were not calculated in the businesses but it was verified that these costs or loss of values could have a large influence on businesses and especially on ROI of PD projects.

As can be seen the prioritising of the view on time can be different according to e.g. market, business, competitor, and competition. However, the research showed that:

- Some businesses saw business possibilities before customers – they saw the idea before it was brought into the formal idea stage.
- Many businesses often developed products before their customers demanded the products, which meant – “at an in-optimal time” – seen from a business economic point of view.
- Businesses who saw a competitor implementing a new product first, recognized and harvested a business possibility first. In other words, they realise the difficulties it created to speed the product development. Firstly, they were often “stuck” in a situation where the competitors had gained first mover advantage and had harvested the major part of the market beforehand. Secondly, they faced the risk of increasing the cost of product development because of increasing informal product development processes and thereby high alternative cost.
- In most cases businesses used a definition of time in NPD corresponding to the verified definition on time called the business definition. This was shown in Figure 13.2.

The choice of time perspective gave the involved business new limits and potentials to time and speed in product development. As can be seen, the time limit is much tighter when the business view the potential at a later point of time than their customer and their competitors. This stresses the importance of over-viewing and analysing continuously the field of product development. It also stress the importance of choosing the right speed in the point of entry of ideas to the business and right speed in the product

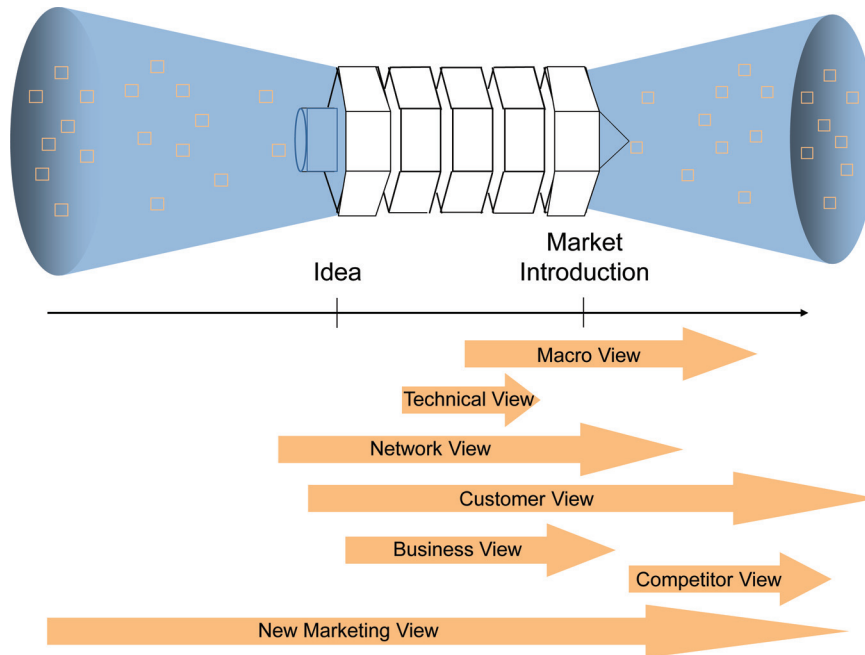


Figure 13.2 Different views on PD.

developments upper part of the product development process – idea and concept development.

The research showed significant consequences on cost – both direct and alternative cost when businesses did not choose the right speed. Businesses which use the new marketing view where they focus on perceived value and alternative cost as well as value direct cost, had significantly less cost and better performance in product development than SMEs using the business view, the customer view or the competitor view. Furthermore, businesses who focused on right speed had significantly better results than other businesses. The curve illustrated in Figure 13.3 shows the result of the above-mentioned.

Definition

HS MI = High speed Market introduction

RS MI = Right speed market introduction

NS MI = Normal speed market introduction

The Figure 13.3 showed how the cost curve develops with different views on speed.

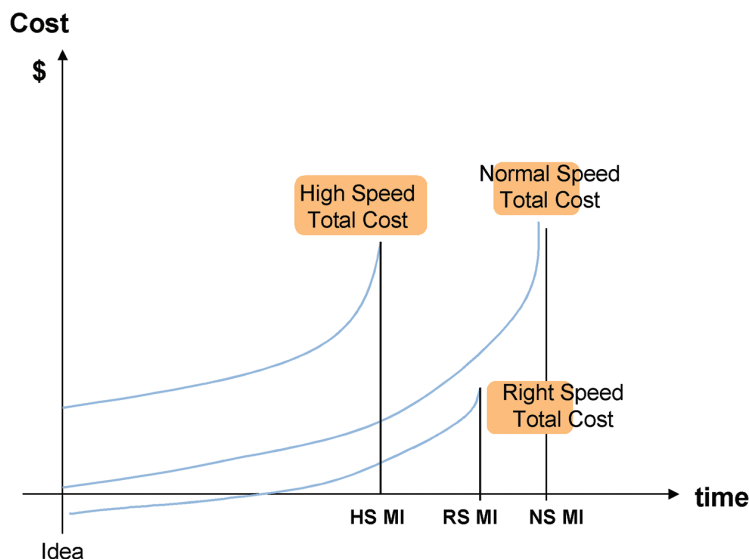


Figure 13.3 Cost curve of different PD views and speed strategies.

SMEs with a business view – an inside out view – experienced increased costs, both direct and alternative, when speeding time, because product development demands too many resources to speed time. Such resources were required either to reach the market before it “slipped” away, or to e.g. fight the competitors because the market was already covered by competitors. The business view was very much identical to the result in the curve shown as the high speed cost curve.

The research showed very significantly that the business view created more failures to product development and increased costs to repair and solve product failures after the product had been introduced to the market. The same can be verified by the technological view. If the technological view was used, the product would often be developed too complicated and often not in relation to the optimal point of entry.

The research verified that the new marketing view could offer major competitive advantage if used appropriately. If businesses strictly used the new marketing view in their product development, a competitor would “perceive” the time and speed in product development of this particular business as very high and would face a major challenge to compete. The competitors would often use “the HS model” to compete. This, however, would increase their cost of NPD and would thus result in increased competitive advantage to the business focusing on RS. I called this the “dead lock of HS NPD”.

The empirical research showed that very few businesses used the new marketing view on product development. Most businesses used the business or the technical view and only a few used the market view. The market view was mostly focused on the competitors' and customers' value and not on perceived value. Some of the secondary cases showed the practice of the new marketing view (Case No. 1 Zara, Case No. 62 Ryanair, Case No. 14 Nike).

The empirical research only showed few examples of businesses which used the network view. I claimed that the network business view was not optimal to product development because the network view used an inside out or a multi-inside out/outside in perspective. This view had a potential "born in" conflict as the network partners would usually not have the same business goals or views on the optimal speed of product development. Businesses were seldom focused on the business optimal time to introduce new products. This was mainly due to a different calculation on alternative time and cost.

As a consequence, I claimed that my research had verified that in this context businesses should view time and speed in network based product development as:

"The time transformed into value and perceived value minus cost both direct and alternative which a product development project takes from identification of the potential product idea to the time the product is taken out of the market."

This is shown in Figure 13.4.

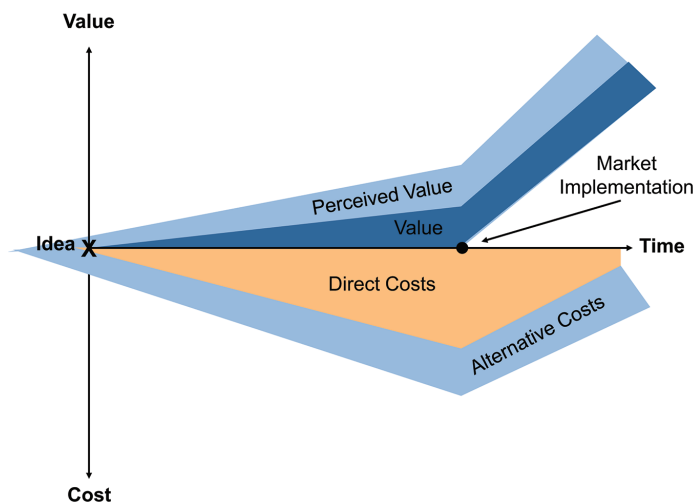


Figure 13.4 Cost value curve.

“The business economic optimal time is when the product is delivered to the market and when this introduction maximize

Net profit = (Direct and perceived alternative value) – (Direct and alternative cost)

This is shown in Figure 13.5.

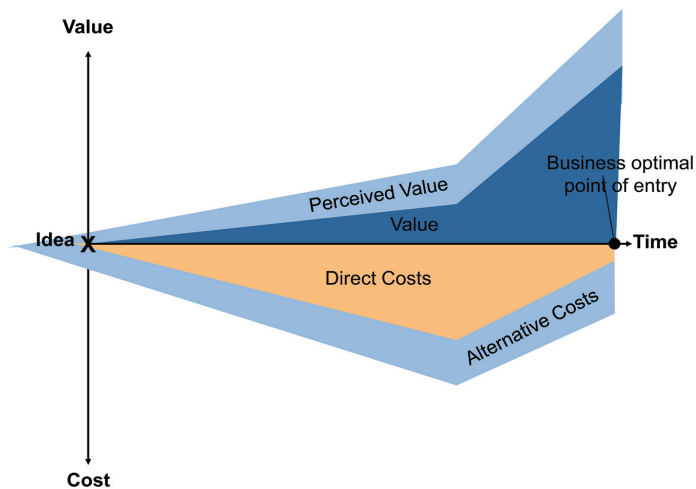


Figure 13.5 Business optimal time of market introduction.

The research verified that speed could only be defined when businesses know an exact start and an exact end of a product development project. The research verified that the businesses could not clarify the start or the end of a product development project.

The research therefore proposes that time in PD could be defined as:

“The net profit per working hour from identification of the potential product idea to the time, when the product is taken out of the market”. Alternative cost and perceived value are calculated from the business optimal point and from both before and after the business optimal point of entry.

Furthermore, the research proposes that Time in PD is defined as:

“The relative time according to which view the viewer has of the NPD project – either the Macro view, the business view, the market view, the technical view, the network view or the new marketing view”

The last definition will be further commented on later in this chapter.

The empirical study showed, however, that not many SMEs calculated the time for a product development project. They just did it. Those SMEs who define time did it within the concept of physical time used for PD projects. As an example, time could be defined in relation to the amount of time it takes to develop a new windmill or the amount of time it takes to develop a new chicken slaughtering machine.

SMEs defined one product development project to run at a higher speed than another when it takes e.g. 1 working day or 1 working month less to develop a new product than last time a similar PD project was carried out.

The research showed that SMEs did not focus on the difference on the status, position, or characteristics of “the main components in the field of product development”.

Time in NPD was therefore verified in SMEs:

“as the total physical time – man-hour, working days etc. that it takes to develop a new product from the idea enters the businesses’ product development system – idea stage – and to the product is introduced and implemented to the market”.

The time was often transformed into cost; but direct cost. The time when this was calculated was often after the PD project had been fulfilled. Businesses seldom used estimations or ROI analyses on this area beforehand.

Speed in NPD was empirically verified to be defined as:

“the time (working days or man-hour) one product development process takes from an idea comes up in the business to the product is implemented to the market” compared to the time (working days or man-hour) another product development process takes from an idea comes up in the business to the product is implemented to the market” The empirical research verified that a product development project is said to run with a higher speed 1) if it reach the market before the other product development project 2) one product development project measured in time (working days) are developed faster than another product development project.”

The first empirical argument shows that businesses do not calculate the cost of reaching the market. The second argument shows that businesses do not calculate the alternative cost or the perceived value before or after the market introduction.

Therefore, the theoretical definition is quite different to this calculation as it was the time when it was business economically optimal and efficient to implement the product. Consequently, I claimed that it was theoretically impossible to define speed of a product development project within physical time.

However, the SMEs made the comparisons on speed as shown in Figure 13.6.

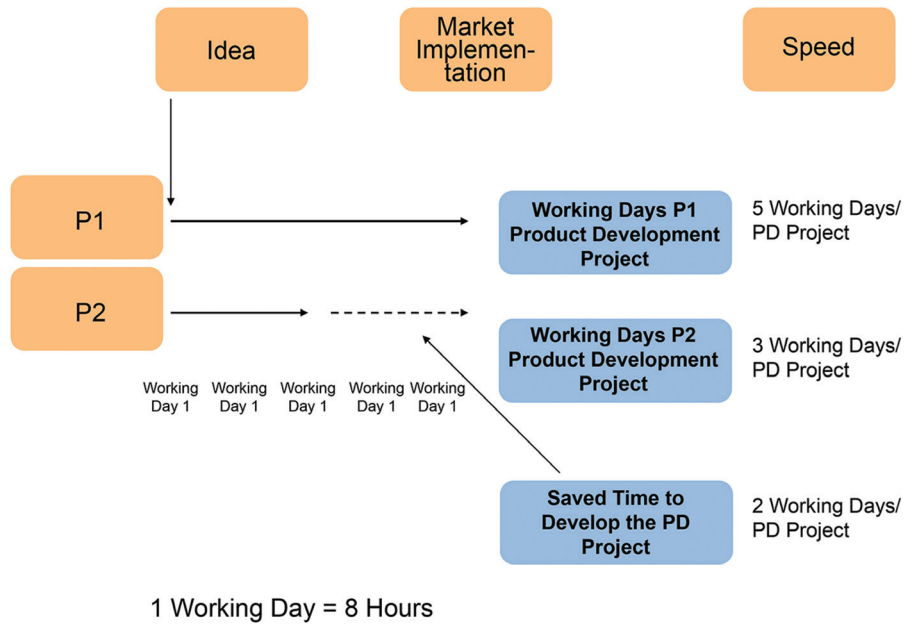


Figure 13.6 Empirical definition of speed in PD.

As an example, product development project P1 runs at a speed of 5 working days and product development P2 at a speed of 3 working days. P2 saves 2 working days in product development compared to P1. P2 runs product development faster or at a higher speed than P1.

The involved SMEs transferred physical time into cost and direct cost (wages, materials, etc.) which the product development consumed to develop a new product to the market.

Speed in NPD was defined as saved direct cost (wages, materials, etc.) which one product development project spends on developing a new product to the market compared to a similar product development project.

One product development project (P1) was measured as running faster than another (P2) when comparing the costs of the two NPD projects as seen in Table 13.3.

Table 13.3 Definition on speed verified in the empirical research

	Measurement	Working Days	Cost (Direct Cost)
NPD Time for project 1	Cost of NPD project	5 working days	€ 200,000 EURO
NPD time for project 2	Cost of NPD project 2	3 working days	€ 100,000 EURO
Speed faster in project 2	Saved cost and speed	2 working days	€ 100,000 EURO

The empirical data very clearly verified that this was how the SMEs of my research define time, speed, and speed in NPD. The SMEs' definition was – as can be seen – quite different from the theoretical definitions listed in Table 13.4.

Table 13.4 Practical and theoretical definitions of speed and time in PD

	SME Definition and Empirical Research	Theoretical Definition
Time	Physical time from idea start to market implementation	Relative time dependent on which view is taken and the business optimal point of entry
	Direct costs	Cost (both direct and alternative cost) – value and perceived value form before idea comes up to the product is taken out of the market.
Speed	Physical time saved	Relative time saved. Net profit gained from one product development project to another.
	Direct costs saved from one PD project to another	Direct costs and alternative costs
Cost	Direct costs	Right performance
Performance	A product that match the businesses' view of good performance	

Moreover, it could be verified that businesses used the SME measurement to compare one product development project to another, the performance of one product development team on time and speed to another NPD team, or their business's ability to develop new products faster than their competitors.

However, as stressed and verified earlier very seldom did the basis or the characteristics of the field of product development for one product development project equal those of another. The research showed that the market, the technology, the network, and the competences of the businesses were always different and changed from one PD situation to another.

Therefore, both theoretically and practically one development project of e.g. a windmill could not be compared in terms of time or speed to another development project of a windmill when “the main components of PD”:

- were different from one NPD project to another
- changed continuously and individually over time

The empirical results verified that it was not possible to compare PD projects in terms of physical time and speed when the conditions of one PD project were never the same as the condition of another. Therefore, I proposed that time and speed used to measure product development activities were deliberated in another way.

The research verified that SMEs made a mistake when they measured high speed in NPD within physical time and direct costs. The research also very well verified that SMEs made a mistake when they measured high speed with a focus only on lowest possible costs as seen in Figure 13.7.

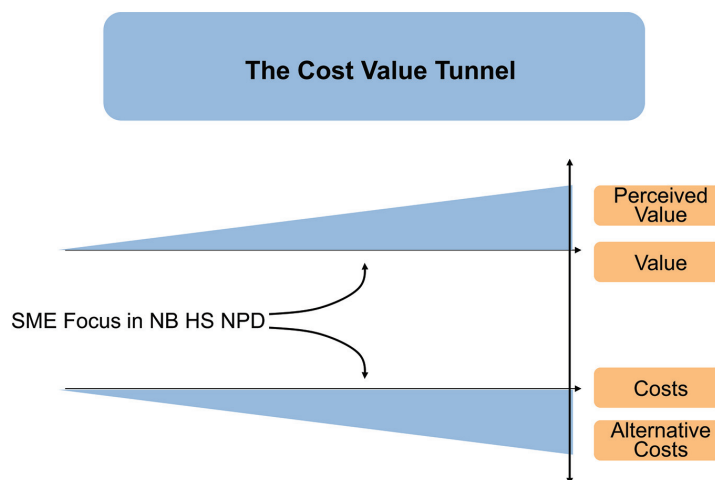


Figure 13.7 Cost value tunnel.

Source: Bohn and Lindgren, 2002.

Instead, my research project verified that it was more preferable to focus also on value and perceived value which was verified to result in a major decrease in costs, and an increase in net profit and competitive advantage as shown in Figure 13.8.

Therefore it could be verified that NB HS NPD defined within physical time and speed gave no meaning to business economics optimisation because it focused only on costs and only on direct costs. The research verified that

businesses which forget to calculate both direct costs and alternative costs, value and alternative value of product development projects came too late or too soon to the business optimal time for a market introduction. These businesses could be define as “slow speed” businesses.

The measurement of speed had therefore to be seen primarily in relation to:

1. the task of the PD project as illustrated in incremental or radicalness of the task
2. the complexity of the product development projects or to “the field of product development”
3. the value and cost of speeding the PD project
4. the perceived value and alternative cost of speeding the product development project.

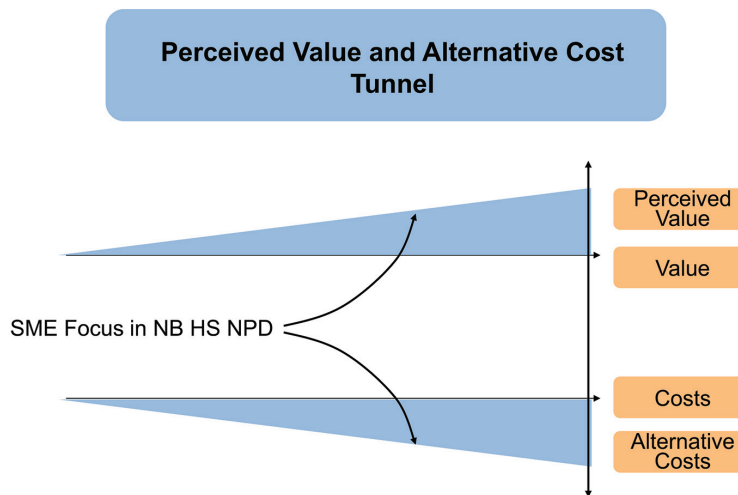


Figure 13.8 Perceived value and alternative cost tunnel.

When talking about comparing speed in two product development projects, the task of defining speed and time becomes very complex. When businesses want to do this in any case I proposed that they define the individual product development task along with the characteristics of the market, technology, network and the competence of the business in both PD projects. The measurement on the businesses’ ability to develop new products faster and at higher speed in one PD project than in another depends the above mentioned generic elements.

However, the empirical research showed very clearly that any product development project faces a new “product development field”. To compare

one product development project or task with another demands that “the two fields of product development” are equal. The empirical study verified that this is never the case, and I therefore question the relevance of businesses comparing product development projects in terms of physical time and speed.

How can product development projects then be compared in relevant business economic terms – and in time and speed?

Can NB HS NPD not be defined? and were businesses’ measurement of time and speed of product development projects worthless?

The answer to the first question is “Yes”; indeed it is relevant to measure NB HS NPD in time and speed. Yes, indeed it is worth measuring NPD in time and speed. However, time and speed must be defined in another way and must be seen in relation to the businesses involved, the product or the product development task to be developed, the market and the technology with which the product development has to be conducted, and the network on which the product has to be developed.

The definition of time and speed must be taken from the “the main components on the field of product development” and

- their initial position
- the way in which they change during the time of a product development project
- their interaction with each other

Secondly, the research project had to be defined within the framework of radical and incremental product development. As can be seen in the empirical research most businesses defined their product development projects in the range of incremental product development (85–90%). It could be relevant to compare one incremental product development project with another incremental product development project within time and speed, whereas it was more complex to compare incremental PD projects to radical projects and radical PD projects to radical projects as shown in Figure 13.9.

The empirical data in my research were mainly focused on incremental product development projects and situations in which the main components were fairly stable and where it was preferable to measure PD within time and right speed. I argued that time and speed in this area of product development should have a business economic relevance to the business. Time and speed must be defined and viewed in relation to right time introduced to the field of product development. However, the view and definition of right time in NB HS NPD is always different seen from the different views of product development. This is illustrated in Figure 13.10.

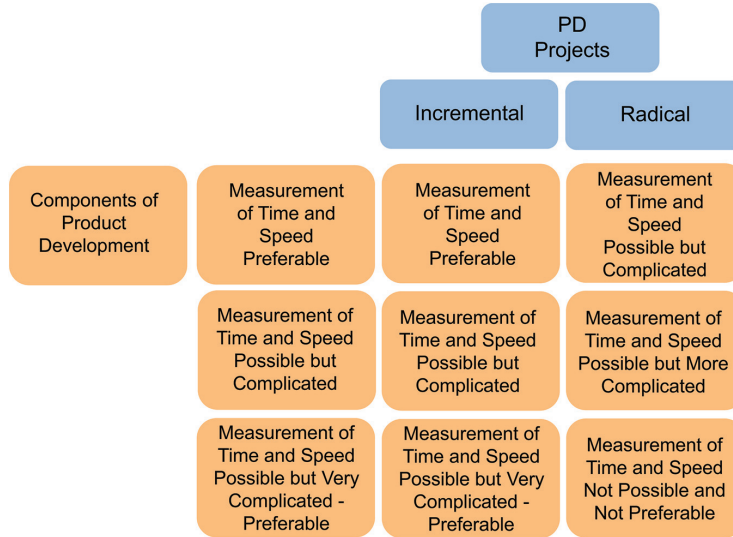


Figure 13.9 Measurement of time and speed in PD projects compared to the PD task and “the components of PD.”

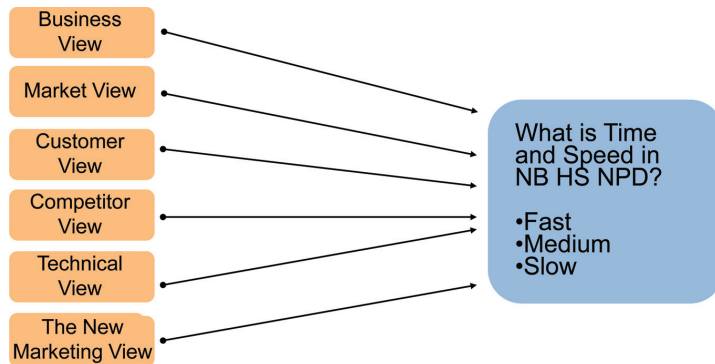


Figure 13.10 Different views on time and speed in PD.

However, the business optimal point of time and speed – right time and right speed – will always be the same seen from the new marketing point of view. For each business there was only one optimal point to enter the market with the new product. Such an optimal point was defined as:

“when the market is business economically optimal to the individual business to introduce the new product”

Thus, I claim that such time and speed were relative as argued before and depended on the task of product development and the characteristics of the field of product development. I also claimed that this point in relation to my scientific view was related to the new marketing view of product development as shown in Figure 13.11. This will be further commented on in the next paragraph.

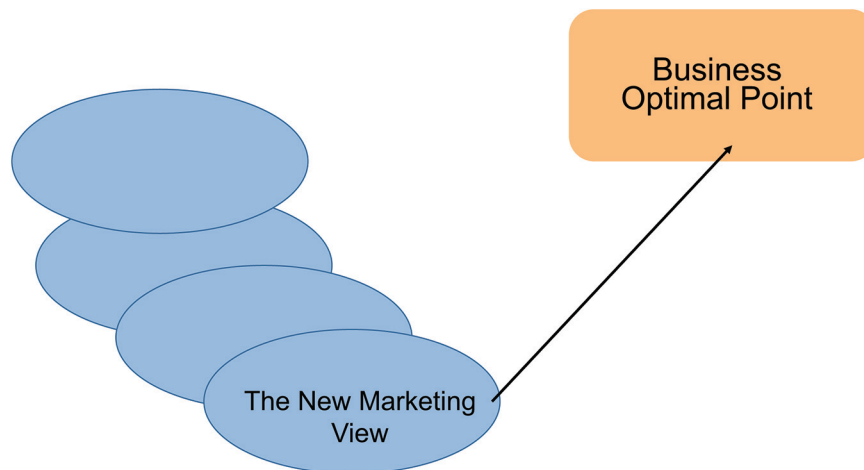


Figure 13.11 Business optimal view on time and speed.

13.2.2 Summary on Time and Speed in NB HS NPD

The research showed that the businesses' views on time and speed take their point of departure in an inside out perspective. In my research project I chose the new marketing view on the definition of time and speed – an outside in view. An analysis of the empirical data showed that it was not possible to verify that SME businesses follow the proposed view on time and speed. Furthermore, the research showed that businesses were narrowly focusing on costs and direct costs instead of on both costs and value including direct and alternative costs and perceived value when measuring time and speed. The result of the PhD project gave the following picture seen in Figure 13.12 of the difference between the practical and the theoretical measurement of speed and time.

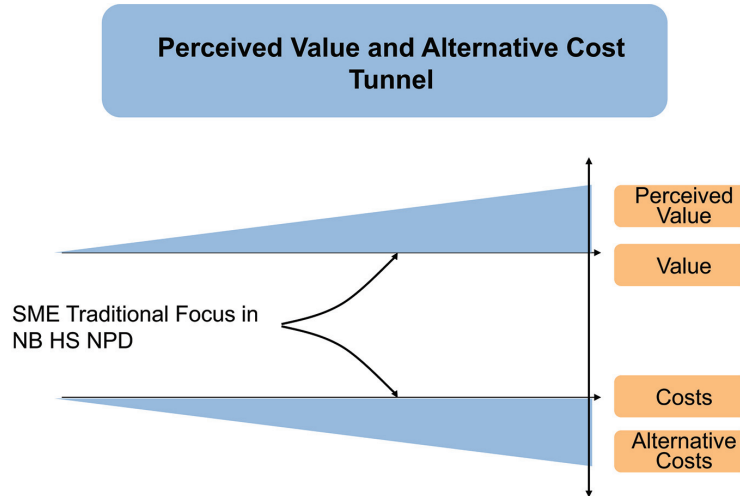


Figure 13.12 SMEs focus on cost and value in NPD.

13.2.3 HS NPD Seen from Different Points of View

Theoretically, HS NPD could be seen from different points of view, macro environment, business, product, market, customer, competitor, and network view as seen in Figure 13.10.

The Business View

My research verified that businesses mainly focus on HS NPD from a **business view**. The business focus was concentrated on the business's ability to diminish physical time and increase speed in NPD seen from an internal business view – an inside out view focusing on primarily cost and direct cost.

The Macro View

The research verified that high speed in product development is often increased by businesses without a view to the macro environment. The businesses hardly ever had a view to the macro environment. The lack of verification on this area of the research was due to a lack of direct focus in the research on this view, but also to the fact that none of the case businesses used that view on NB HS NPD. Literature and articles showed a strong pressure from the macro environment to speed product development. Both from national, international, political, economic, and research environments there was a high pressure on businesses

to speed product development. This must be said to have an indirect influence on the way in which businesses perceived and made their effort and initiation on speeding the PD process. However, the pressure on time and speed of the businesses' PD from the macro environment were seldom based on optimised business economic calculations or on pure calculation and analysis of the customers' demand.

The Market View

The market view could be divided into two parts – one view which looks at time and speed in relation to the customers' wants and needs for new products, and one view which looks at the competitors and benchmark the competitors' ability to carry out HS PD related to the businesses' performance on this topic.

The customer view showed a radical increase in the demands, wants and needs verified in literature and secondary cases. However, the empirical research showed only incremental demands for new products.

The competitor view showed high pressure on product development but still related to the incremental customer demands. This seemed to be “wamped” or incorrect information on real customer demands. It can therefore be verified that there was seldom a reason to put pressure on speed in PD.

The Customer View

The customer view was characterized by a customer want perspective and not by a customer need or demand perspective. My research verified that such a view increases the pressure on speed in PD and diminishes the lifetime of products. Even products that had not fully lived out their life were removed from the market. However, in many cases this could be a business optimal decision to many businesses as shown in Figure 13.13.

The Competitor View

When a business took the competitor view they tended to believe that the competitive situation outside the business called for and demanded a strong pressure on speed in their product development. However, as the research verified the pressure on speed in product development was seldom related to actual radical needs in the market place. Instead it was founded in incremental needs. This often caused product development which was too fast and therefore resulted in first mover bad advantage.

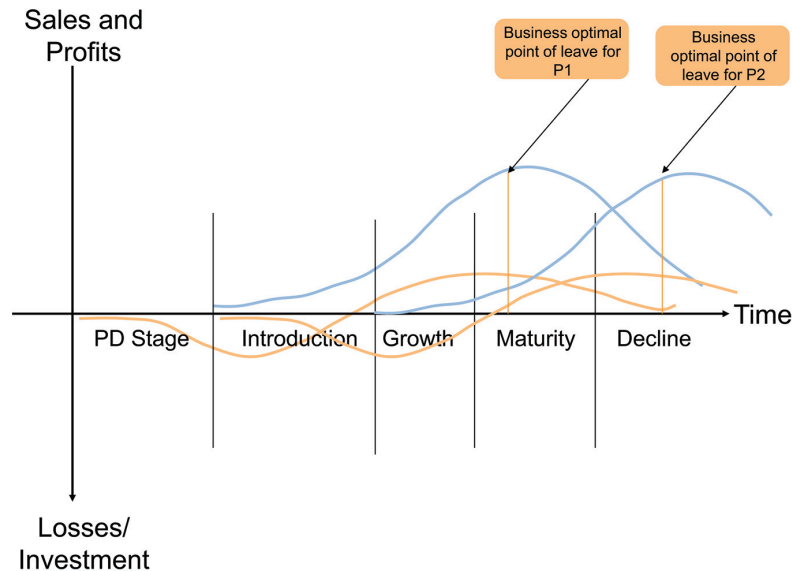


Figure 13.13 Business optimal point of leave related to lifecycle from inception to demise.

Source: Lindgren P. 2003.

The Technological View

The pressure on speed in PD seen in a technological perspective turned out to be more complicated. The research showed that businesses were under high pressure from technological innovation and possibilities. However, businesses often failed to analyse the technological challenge of the product development project. The consequence was that they speed the PD too much because of perceived low technological innovation degree. An increasing demand for the mixing of different technologies together with the businesses' lack of ability to analyse the need and use of technology to solve the product development task, pressed the involved businesses into rather NB HS radical product development projects. Such projects were decisive when businesses also experience the pressure of time. The research showed that risk and uncertainty increase when technological radical innovation was combined with a high pressure on speed and unknown networks as shown in Figure 13.14.

The Network View

The research showed very clearly that the networks employed were mainly narrow physical networks, mostly internal, and customer supplier network relations. The network view was seldom analysed and used when deciding

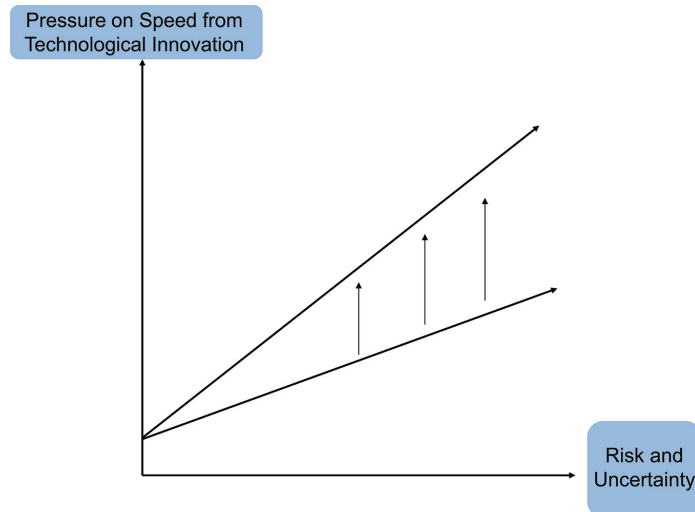


Figure 13.14 Risk and uncertainty related to pressure on speed.

on speed. The network view was mainly used when considering the following questions:

- Do the existing internal and external network partners have the competences to develop the new product?
- Does the business need to attract and integrate new network partners?
- Does the business need to repel networks partners both initially and during the course of the product development process?

The above-mentioned questions demand a strong product development leadership. At a later point in this book, I will deal exhaustively with product development leadership. Furthermore, developments on the global market showed and stressed the importance of beginning the implementation of an increased network view to gain high speed product development projects. This involved an answer to the following questions:

- Is the business ready to do network?
- Does the PD project need a broad or a narrow network?
- Is the network ready to develop the new product?
- Can the current network perform the product development task at the right speed?

The overall answer to these questions was that the businesses were not using the network enabler enough. There was still much to learn here for SMEs.

The lack of use of the network enabler was a major barrier to speed product development further.

The Business's Competence View

The research verified that from the business's perspective – inside out – businesses focused primarily on time and speed in product development. The outside in view was only found in a few businesses.

However, looking at the business's competence to carry out product development and their ability to speed product development further it was verified in the research that most businesses said that they could not increase speed in PD any further. This was claimed to be mainly due to:

- barriers in the stage-gate models
- physical barriers in process
- risk aversion on faults due to more high speed.

The research showed that most businesses in this case did not pay attention to **the product view**. Most businesses did not make an in-depth analysis of the product and the consequences to the core of the products or the core benefits of the products when putting pressure on time and speed in PD. Many businesses did not analyse the perceived needs of the customers. Many businesses did not use the possibility of digitalising the products and of using the e-development enabler together with changing the product to a process – process enabler. The product development therefore turned out to be perceived as more radical than intended and expected.

The research verified that some product development projects seemed at first sight incremental in nature but turned out to be radical because the pressure on speed in product development changed the core of the product and the core benefits of the product. In some cases this provoked:

- faults in NPD
- unexpected reactions from the market and the customers
- slow speed seen from the customer, market and the new marketing view
- the real needs and demands of the new product

The above-mentioned stressed the importance of carefully analysing beforehand:

- the competencies of the businesses to match the individual tasks of product development projects
- the consequences of PD on the core of the product.

The New Marketing View

In the secondary cases, the primary case, the focus group interviews, the survey, and in other research activities carried out in this research project I verified very few examples of businesses with a view of NB HS NPD that equalled the new marketing view. The new marketing view considers:

the optimal time and the optimal speed of product development as correlated to performing product development with a speed and time that perform a product development process that match the business optimum time of entering the market.

The new marketing view considers time and speed not only with a focus on value and cost but also with a focus on perceived value and alternative cost.

When businesses focus simultaneously on value, perceived value, cost and alternative cost in PD, the research showed very clearly that businesses attain better performance, higher speed, diminished cost, increasing profit, faster ROI, and major competitive advantage both on a short-term and a long-term basis. Both the secondary data and the empirical data (Case No. 1 Zara, Case No. 62 Ryanair, Case No. 38 Lyngsø the focus group PUIN) showed that these businesses achieve major business results on the global market.

Summary

There are more theoretical views to HS NPD but very few of these were used empirically up to 2003. Table 13.5 gives an overview of the empirical and theoretical views which were verified in the research.

Table 13.5 Different views on high speed PD

Different Views on HS PD	Verified/Not Verified
The business view	Verified
The Macro view	Not verified
The Market view	Verified
The customer view	
The competitor view	
The Technological view	Verified
The Network view	Not verified
The Product view	Not verified
The New marketing view	Verified in very few secondary businesses or product development projects and in one primary case. Not verified empirically.

13.2.4 HS Central to PD Phase

At an earlier point in this book I stated that my hypothesis was that high speed was central to the second phase of the PD process – the PD phase. The research painted a picture that differed slightly from my hypothesis.

The research focused on time and speed in the three general phases of the product development phase:

1. Time and speed in the innovation phase
2. Time and speed in the product development phase
3. Time and speed in the process phase

However, it must be pointed out that the main focus had been on the two first general phases of the product development. The research could verify that in some businesses time and speed were in focus in all phases of the product development process.

The hypothesis of my research project was that time was not in focus in the innovation phase, speed and time were very much in focus in the second phase, and costs were very much in focus in the third phase. As seen in Table 13.6 the research verified a much more complex picture and result in this area.

Table 13.6 Success criteria and general PD phases

Focus	Innovation Phase	Product Development Phase	Process Development Phase
Hypotheses	Innovation	Time	Cost
Case	Innovation and performance	Time	Cost and time
PUIN focus group	Innovation and performance	Time and performance	Time and cost
Survey	Innovation and time	Time and performance	Time and cost
Hypothesis verified/not verified	Verified but with and ad to performance and slightly to time	Verified with and ad to performance	Verified with and ad to time

Time and Speed in Innovation Phase

To some extent, time and speed were in focus in the innovation according to the survey. This hypothesis could only be partly verified. The case research showed that most businesses focused on innovation in the innovation phase but some businesses focused on speed and time in this phase. The research showed that focus on time and speed was related to the business in question, the PD task, but also to the position of the main components in “the field of product development”. The analyses and the businesses’ internal analyses of the perceived position of the field of product development influence the pressure on time and speed in PD. The task of product development project

also influenced the focus on time in a product development project. If the product development task was characterised as very radical, there was less focus on time and speed, and focus on performance and innovation was more highlighted. If the product development project task was a more incremental character, there was more focus on time and speed. If businesses perceive the characteristics of the field of product development as stable and if the task of product development was rather incremental, then there was also a pressure on time and speed in this phase. This is shown in Table 13.7.

Table 13.7 Pressure on time related to field of product development and PD task

	Stable	Evolving	Dynamic
Market	Yes	Yes	No
Technology	Yes	Yes	No/yes
Network	Yes	No/yes	No
The business competence	Yes	No/yes	No
Task of product development			
Radical	Yes	No/yes	No
Incremental	Yes	Yes	Yes

Generally, businesses did not speed PD in the grey areas because:

1. they perceive risk as higher in the grey area
2. businesses did not focus on speed in fuzzy areas

However, the research verified that businesses with high speed competences and with network partners who had high speed competences could suddenly add speed to NPD to gain competitive advantage. Speed in NPD therefore also depended on the ability and motivation of the businesses and the network partners for speeding NPD. The technological evolution could also be a driver to high speed.

Another area which proved to be important when observing time and speed in product development was the strategic importance of the product development project. If the strategic importance was high to the business, high pressure was generally exercised on time and speed also in the innovation phase.

Summing up on the pressure on time and speed in the innovation phase showed that time and speed could be in focus in this phase, if:

- the position in the field of product development was stable
- the task of product development was incremental
- the product development task had strategic importance to the business
- the competences and motivation of the businesses were focused on high speed to gain a competitive advantage.
- the competences of the network partners were focused on high speed
- the “field of product development” drive the NPD process to high speed

In other situations, innovation and performance of a new idea would be in focus in the initial phases. Therefore, my hypotheses was not verified completely because time can be in focus in the initial phase.

13.2.5 Time and Speed in Development Phase

The focus on time in the development phase was also more complex than presented in the hypothesis. The research verified that time was not always in focus in the development phase. In the concept generation stage many businesses still had major focus on innovation and performance. In the concept gate all businesses were very much focused on time. The product development phase showed a fuzzy picture of some businesses focusing on time and other on performance depending on:

- whether the position and characteristics on the field of product development were stable
- whether the task of product development was incremental
- whether the businesses run the screenings phase
- whether the product development task had strategic importance to the business
- whether the business wanted to gain radical competitive advantage

13.2.6 Time and Speed in Process Phase

The research verified that time and speed were not particularly in focus as the primary success criteria in SME businesses in the process phase up to 2003. Cost and performance were in most cases in focus in the product development process phase. Many businesses focused on “encapsulating” the product with the best performance to the market.

13.2.7 Time and Speed Related to PD – Stages and Gates

The above-mentioned focus areas on time and speed concerned the general phases of the product development project.

The research could, however, also show how the businesses focused on time and speed in the individual stages and gates of the product development process.

The hypothesis of the research project was that time was important especially in the middle of the product development phase and thus in the middle of the product development stage and gate. The result of the research showed the following characteristics as seen in Table 13.8:

Table 13.8 Time and speed related to stage and gate

Product Development Stage and Gates	Process					Process		
	Idea Stage	Idea Gate	Concept Stage	Concept Gate	Prototype Stage	Prototype Gate	Development Gate	Development Gate
Hypotheses Case research	Innovation Innovation and time	Innovation Time	Innovation Innovation (performance) and time	Innovation Time	Time Performance and time	Time Performance and time	Cost Cost performance and time	Cost Cost, performance and time
PUIIN focus group	Innovation and time	Time	Innovation (performance and time)	Time	Performance and time	Performance and time	Cost, Performance and time	Cost, performance and time
Survey	Innovation and time	Time		Time	Performance and time	Performance and time	Cost, Performance and time	Cost, performance and time
Verified/not verified	Partly verified with an add to time	Not verified	Partly verified	Not verified	Partly verified with an add to time	Partly verified with an add to performance	Partly verified with an add to performance	Partly verified with an add to performance and time

As can be seen, the research showed a more complex and fuzzy picture of the focus on time and speed than expected in the hypothesis. There were no considerable differences in the answers in the different research types, but the research showed that the hypothesis could not be verified. Time and speed can be in focus in all stage and gates dependent on the characteristics mentioned above.

Nevertheless, speed and time are significantly in focus in the idea screenings and concept screenings phase according to the empirical research. Often the screening phases are very much focused on time and speed. This again confirms that time and speed can be in focus in the innovation phase.

In the prototype gate it was significant that focus was very much on cost and performance.

13.2.8 HS NPD – A Matter of Right Speed, Not High Speed

Earlier in this chapter I argued that measurement of time and speed in product development had to be seen in relation to the components of the field of product development (the market, the technology, the network, and the competences of the businesses) and the task of the PD project (radical or incremental). The PhD project asserts that the definition of speed in relation to product development must at least up to 2003 be seen in relation to the market and with the new marketing view. PU projects should be measured against business economic terms. In each specific product development case the management must ask the questions.

When and What is the right time and right speed of a product development project?

Speed and Time Measurement in SMEs

The research showed very clearly that businesses measure the time and speed of a PD project on the basis of physical time. This physical time used to develop a product was transformed into direct cost. My research showed, however, that the transformation of time and speed into cost was seldom made in small businesses. My research showed that this was due particularly to two problems:

1. SMEs had difficulties in defining a beginning and an end to a PD project especially when talking about incremental PD projects.

2. SMEs did not directly calculate time in terms of costs on product development projects. If they did so, time was mainly calculated in terms of direct costs.

At a previous point in this research project I commented on the difficulties of defining a start and an end to a product development project. My research very clearly showed the difficulties for the businesses to define such beginnings and ends.

The discussion of a beginning and an end of a PD project was related to the discussion of defining product development instead as a process without a beginning and an end or with many beginnings and many ends. The research showed that businesses mainly define their product development projects as projects with beginnings and ends and not as product development processes. The research showed that this was a result of strong focus of the businesses on the stage-gate terminology in product development which demanded a beginning and an end.

However, if businesses cannot define the beginning and the end of their product development projects – especially in incremental product development projects – then time and speed cannot be defined within physical time and the following questions can be put:

- Is time and speed then a relevant measurement in NPD and is it relevant to measure time and speed?

Additionally,

- Can businesses manage their product development process on the basis of physical time and speed in physical time?

Furthermore,

- Can businesses manage their product development process with the use of their existing product development models?

The answers to these questions must be “No; physical time and speed is not a relevant measurement when used “in the ways” it was used by SMEs and many researchers up to 2003”. Businesses and researchers needed to develop a new definition and measure of time and speed and some new models to handle product development. Businesses must try to focus more on reaching right speed and right time to market because physical time focus on an inside out perspective which will often not give a competitive advantage – at least not up to 2003. I also argue that businesses need new decision models and normative guidelines to choose product development model targets at right time and right speed.

Right Time and Right Speed

I claimed that right time and right speed:

- is very much related to the ability of the product development managements to define the product development task “read the field of product development” both initially and as the product development progresses
- is related to the finding of the optimum time – right time – to introduce the product to the market
- is related to the matching of NPD process with right speed and time

I claimed that this ability was strongly related to learning.

Managers of product development needed to develop a strategic design of the way in which NB HS NPD should be used. They needed to understand why NB HS NPD should be used, and to realise what NH HS NPD models and processes should be used.

The strategic design of NB HS NPD had to be strongly related to product development knowledge and product development knowledge creation at the management level within the business. The managers of businesses had to learn about NB HS NPD and to develop knowledge of HS in product development leadership. Yet, learning in NB HS product development management was by far not easy as the case research showed.

In the case and survey research I observed different types of speed in NB HS NPD as seen in Table 13.9.

Table 13.9 Types of speed in NB HS NPD

Types of Speed	Characteristics	Cases
Idea to market introduction speed – “time to market speed”	The ability to speed the NPD project from idea to market introduction	Cases Nos. 39, 41, 1 and 63
Stage and gates speed	The ability to speed the single stage and gates within the product development project.	Cases No. 39 and 1
Transfer speed	Speed from one stage to another gate	Case No. 1
Complex speed	The ability to speed complex NPD projects	Case No. 64
Concurrent speed	The ability to speed several NPD projects at the same time	Cases Nos. 49 and 64.
Market speed	The ability to speed incremental NPD on the market.	Cases Nos. 55 and 65
Radical Speed	The ability to speed radical PD projects	Case No. 66

Up to 2003 we had only fragmented knowledge of and research on the types of speed and speed tools available and appropriate in different situations of product development. Learning had to be established in all areas of high speed product development to find models of speed in NB NPD and to find when it was advantageous to “hurry slowly”. The research showed that when characteristics in market, technology, network, and the competences of the businesses were in a certain position, a slow speed could be advantageous as learning of market, technology, network, and competences develop, proceed, and get ready for the new product.

The empirical data showed how businesses choose to hurry slowly because of e.g. market competition, lack of competences or a strategic decision to wait until technology and market are stable.

I assert therefore that the speed of PD had to match the special conditions of the PD task, otherwise the speed of PD would be too slow or too fast which will give businesses increased cost and a competitive disadvantage.

Even so, the question of speed was more complicated than outlined above. During the product development process the speed sometimes has to be increased, and sometimes to be slowed down. Some of the main components in the field of product development can turn out to influence and make radical changes to “the game of product development”. Therefore, businesses often have to change speed during the product development process. The manager of PD had to decide continuously on “right speed” during the PD process.

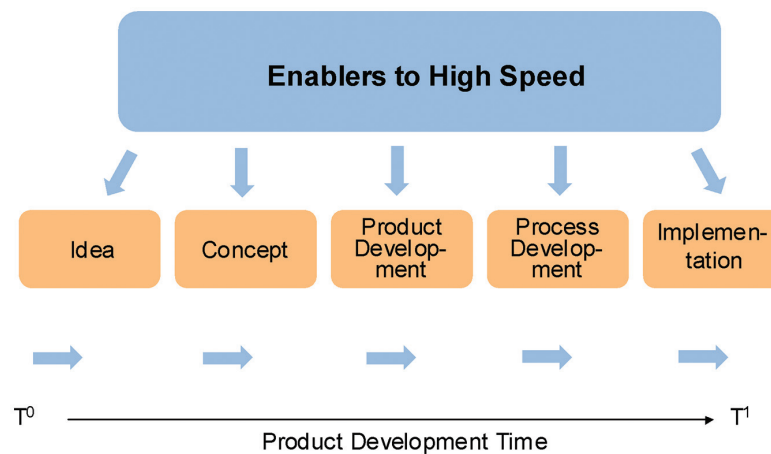


Figure 13.15 Speed in NB PD.

Right speed in product development had to be learned. The critical issue before talking about speed in product development was the ability of the management to analyse “the game of product development” and to learn from one product development project to another which speed was advantageous to this specific product development situation. Even more critical was the ability of the product development managers to learn throughout the product development process. The last learning area concerned the development process from idea to market introduction as well as the span of time after market introduction.

The question of how to establish learning of speed in product development across networks in the product development process was important and was verified in the case research as a major problem to SME. This is illustrated in Figure 13.16.

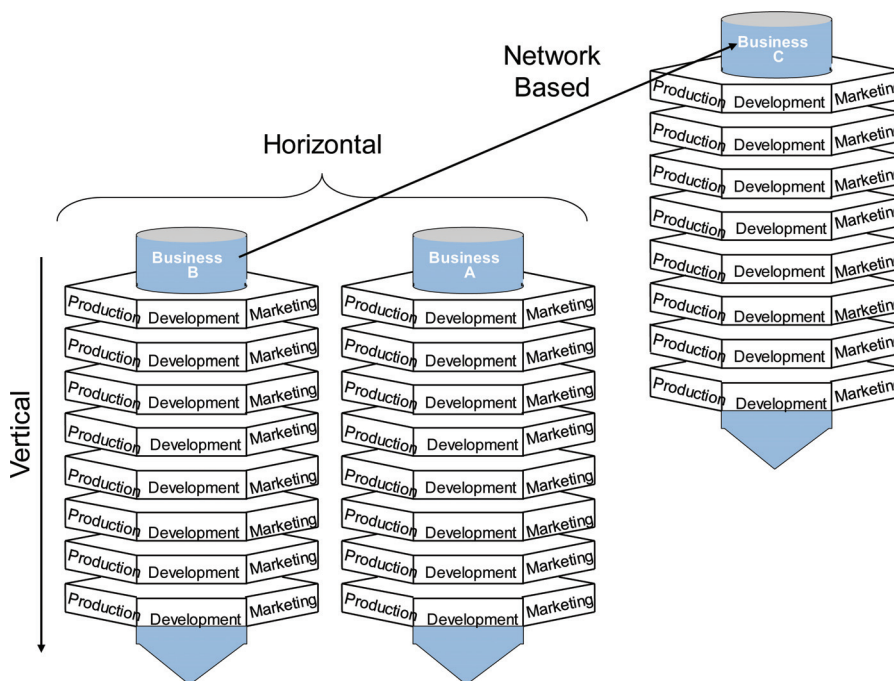


Figure 13.16 Learning speed across networks.

1. Right speed initially in the NPD project
2. Right speed along the NPD project
3. Right speed related to other PD projects
4. Right speed related to projects of network partners

This became the focus of research projects carried out after 2003. However, my research before 2003 did verify that businesses did not define right speed in general and certainly not in relation to points 2–4.

Theoretical Product Development Model and Empirical Model

Whether businesses had a formal stage-gate product development model was of interest for the research to verify the PD model and conditions together with characteristics in SMEs. My hypothesis was that the stage-gate model existed in the businesses and that businesses used this model. This hypothesis could only be partly verified.

In the research the major part of the businesses answered that they had a formal product development model. The research showed that the formal stage-gate product development model existed. This is illustrated in Table 13.10.

Table 13.10 Confirmation of existence of formal PD model

	Hypothesis	Case Research	Focus Group	Survey	Verified
PU model – formal	Stage-gate	Overall stage-gate – but combined with an informal model and processes	Overall Stage-gate combined with informal models and processes	Overall Stage-gate combined with informal models and processes	Partly verified
Functions involved in initial phase	Sales, product development and production	Sales, product development and to some degree management	Sales, product development, management to some degree	Sales, product development and management	Partly verified

However, a large number of businesses said that they did not have a formal, written product development model. The reasons stated were that they often felt restricted by a formal product development model. They wanted to have more flexibility in their product development process and they therefore did not write it down. They felt that they could not obtain such flexibility in a formal product development model.

However, the research showed evidence of a formal “not written down” product development model in the businesses who answered *No* to having a formal product development model. Such models had four stages – an idea, a concept, a product development, and a process development stage. This confirmed the hypothesis of the research that a major group of businesses

follow a stage model also when they believe themselves to be without a written, formal product development model.

On the other hand, the picture became less clear where the gates were concerned. The survey showed that the businesses did not give a very high priority to the idea screening or the concept screening gate. Instead, they gave a high priority to the prototype and process screening gate. This indicates that there was not much focus on “reading and screening the product development game and task” within the initial product development process. It also indicated that many ideas and concepts “slip” easily through to the prototype development stage. The research verified that this could be fatal to the business in terms of time, cost, and performance.

The research also showed that businesses often get “stuck” in their formal product development model as e.g. the stage-gate model. This caused problems with flexibility and change of speed later in the product development process. The businesses tried to solve this problem by creating informal product development models and processes. The informal product development model and process could be described as running along or beside the formal product development model or process generating both direct, indirect, and alternative cost and value. However, the businesses did not know how much cost and value were generated in their informal models both management, employees and other invitation the informal models and processes.

The businesses confessed that the importance of the informal product development model in different areas was significant when discussing time, speed, cost, and performance but also CIM, and CI on learning.

Furthermore, the research verified that the pressure on high speed forced the development of informal product development models and processes in businesses. 52,9% of the businesses in the survey said that they applied informal product development models concurrently with the formal product development processes. The managers in the case businesses and focus group responsible for product development revealed to me the contents of the informal product development model.

My research showed that the informal processes and models were very much existent in the product development, the prototype, and the proto test stage and gate at which point in time, time and speed were very important.

The hypothesis was that the informal models and processes were often out of strategic product development control. Therefore, in most cases the models and processes were not providing the businesses with right performance, right cost, or right speed because they were focused on the process inside the product development model without continuous interaction with “the field of product development”. Furthermore, the learning gained by the businesses

from such informal models and processes was not transferred to continuous improvement (CIM) or to continuous innovation (CI) of the formal product development models and processes of the businesses. This was because the informal models and processes were “one of a kind”, and because the knowledge transfer to the formal product development model and process was not existing or formalised.

Businesses had realized that stage-gate models were effective for some product development tasks and situations. However, dynamic and flexible product development models seemed to be more effective. Furthermore, the stage-gate models were not related to “the field of product development”, as seen in Figure 13.17.

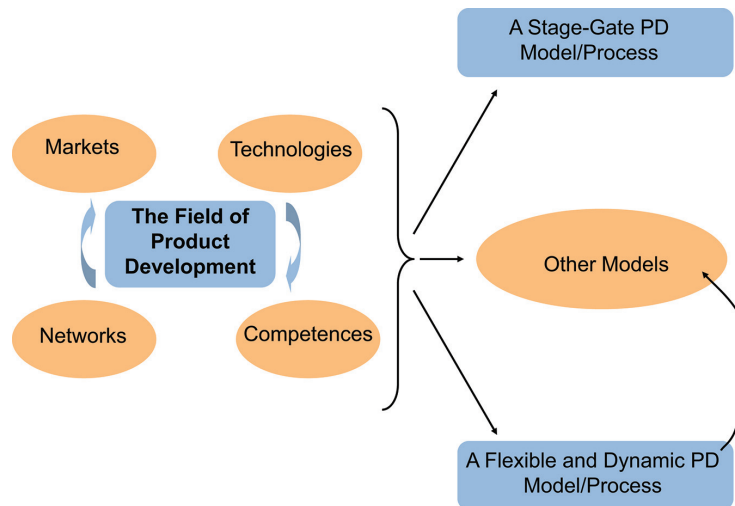


Figure 13.17 The choice of PD model and process.

Source: Lindgren & Bohn, 2002.

My observations show that product development managers up to 2003 faced the difficult task of deciding which product development model and process were most suited for the specific product development task.

The choice of model and process turned out to have a major influence on the possibility of speed in product development in at least three ways. First, how much speed can be achieved during the product development project. Secondly, how can speed be changed and how much change of speed does the business need in the product development process. Thirdly, how much speed can be gained in variation on behalf of the original product development concept.

Businesses can gain speed both in a stage-gate model and in a flexible product development model. However, the costs of changing speed and performance of the product differ and are influenced by the choice of the product development model as can be seen in Figure 13.18.

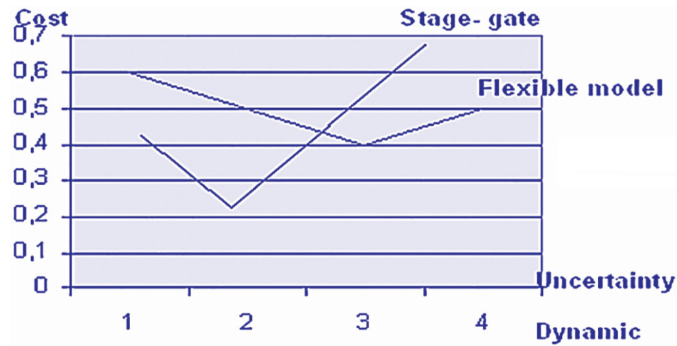


Figure 13.18 Costs of flexible and stage-gate product development models related to uncertainty and dynamics.

Source: Lindgren inspired by R. Verganti, 2002.

Firstly, the flexibility of speed possibilities is not the same in the two models because the cost of changing during the process was higher with a stage-gate model. Secondly, the possibilities of performance of the final product differ from one model to another in accordance with the point in time at which the change of speed in product development is required.

Managers of product development who had developed a strategic design of how to use NB HS NPD model, who understood why NB HS NPD should be used, and who had realised what NH HS NPD models and processes should be used were better at performing right speed and right time in NB HS NPD. Nevertheless, the strategic design of the NB HS NPD model had to be strongly related to product development knowledge and product development knowledge creation at the management level within the business and the business's network. The managers of businesses had to learn NB HS NPD and to develop leadership of NB HS NPD. Yet, learning in product development management was far from easy as my case research showed. Additionally, learning could only be reached by the SMEs who focus and involve themselves in the learning process of NB HS NPD. It follows that researchers and SMEs had to find new PD models to gain right speed in NB NPD.

13.2.9 Point of Entry and Sources to NB HS PD Ideas

The research showed that most businesses focused on attracting new ideas but not specifically at high speed.

The area of ideas coming into the business was not subject to high speed or increased proactiveness. Furthermore, the area was seldom very structured. This reduced the possibility of the businesses to improve the speed at which new ideas were attracted to the business. The attraction of ideas was often a process of inside out, and not an outside in activity and view.

The research looked into two areas of the phase of attracting new ideas to the business with HS. The results are shown in Table 13.11.

The hypothesis was that major sources to new ideas for product development were sales, management, and product development. In most cases the findings of the research verified this hypothesis. This is illustrated in Table 13.11.

Table 13.11 Where was the idea discovered?

Dimension	Hypothesis	Case	PUIIN Focus Group	Survey	Hypothesis Verified/Not Verified
Where were the idea discovered	On the market place	on the market place, inside the business and by network partners	on the market place, inside the business and by network partners	on the market place, inside the business and by network partners	Partly verified
Initiator of idea	Internal	All network partners and internal	All network partners and internal	All network partners and internal	Partly verified

As can be seen, the answer to both questions present a more fuzzy picture of the discovery of ideas. My hypothesis could only be partly verified.

13.2.10 After the PD Process Time

The research project did not show significant evidence of time and speed being a success criteria to businesses after the product development process had been finished.

This was maybe due to the fact that the PhD project did not have a particular focus on this area. This was focus for research projects after 2003.

However, the research offered the following results outlined in Table 13.12.

Table 13.12 Businesses' focus on success criterias on the market

	Literature Search	Case Research	Focus Group Interviews	Survey	Verified
Time	(+/-)	No	No specific focus	No specific focus	No
Cost	Yes	Yes	No specific focus	No specific focus	(Yes)
Performance	Yes	Yes	Yes	Not in focus	(Yes)
CI	Yes	Not in focus	Not in focus	Not in focus	Not in focus
CIM	Yes	Not in focus	Not in focus	Not in focus	Not in focus
Learning	Yes	Not in focus	Not in focus	Not in focus	Not in focus

As can be seen, the time criterion was not very much in focus when the product was on the market. The explanation was that businesses had often structured their product development in a way that left the developed product to the sales department and the customers after the process gate. Therefore, there was no pressure to speed product development “on the market”. Moreover, the product development was seen as a stage-gate and not a process. As a consequence, businesses had not focused on product development, the existence of product development “on the market” and high speed product development “on the market”.

Analysing the use and handling of radical and incremental product development projects and looking into the ratio of incremental and radical product development projects in SMEs gave a clear impression that there was a major potential in 2003 for businesses to implement new models and processes of handling product development.

Firstly, the research verifies that businesses would profit from focusing more on pressing more product development down “on the market” and doing more direct prototyping especially on incremental product development.

Furthermore, the research verified that many product development projects should be “kept” on the market and should never enter the formal product development model as shown in Figure 13.19.

Secondly, businesses would profit from using more flexible and agile product development models. Many of these models we did not know about in 2003 or were just testing as prototypes in specific industries. Businesses should be able to choose product development models in accordance with the position of “the field of product development” as seen in Figure 13.19.

Several researchers had put forward models for speeding up NPD but few of them had in 2003 suggested which models to choose in different product

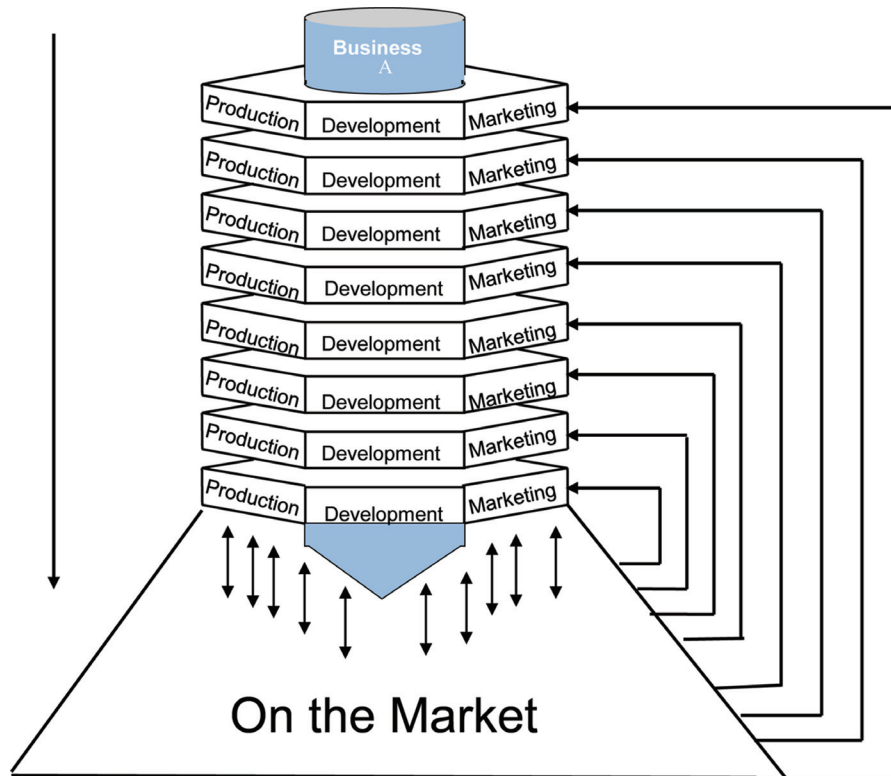


Figure 13.19 PD on the market.

development situations. Two mainstream NPD models had been proposed. “The Stage-Gate” model and “The Water-fall” model had proved to be extremely efficient when market, technology, network, and the competences of the businesses were stable or to some extent evolving. Especially the car industry (Case No. 72 Ford, Case No. 36 VW), the furniture industry (Case No. 67 Licentia, Case No. 58 Tvilum) the pump industry (Case No. 54 Grundfos), the windmill industry (Case No. 59 NEG Micon), and several industries producing mainly hardware (Case No. 6 TC, Case No. 69 DANCASE, Case No. 70 BM) had shown until 2003 to have profited from using stage-gate product development models.

The “flexible” product development models – especially the software industry and industries facing dynamic markets, technologies, networks, and

competences as e.g. Case No. 57 TDC, Case No. 38 Lyngsø, Case No. 68 Metza, Case No. 50 Microsoft Internet (Macormarc, Verganti, Iansiti, 2001) had turned out to profit from using more “flexible” and dynamic product development models.

The question for the PD manager was to determine which PD model was best and appropriate to the product development model and process to gain right speed. Summing up on my research until 203 showed characteristics that must exist in order for the business to determine which NPD models to choose and the appropriateness to high speed as seen in Table 13.13.

Table 13.13 PD models and appropriateness to high speed PD

	Stage Gate Model	Flexible Model
Characteristics		
Markets	Familiar markets	Unfamiliar markets
Technology	Familiar Technology	Unfamiliar Technology
Network	Physical networks and stabilised ICT networks	Dynamic networks, ICT – networks, Virtual and dynamic networks
Competences	Stable and physical competences	Dynamic and virtual competences
Product	Products are mainly hardware	Products are mainly processes Software, services,
Strength	When main components can be characterised as stable and in some case evolving on the product development field.	Flexible to sudden change in the main components on the product development field.
Weakness	Inflexible to sudden change on the product development field	When product development turns out to be stable for a long period.
Opportunities	When market, technology, network and competence turn to stabilise	When market, technology, network and competence turn to be dynamic and virtual
Threats	“Trapped in a dynamic process” either in market, technology, network or competence – performance does not match demand of market.	“Trapped in a stable process” either in market, technology, network or competence – too much cost.
Time for change of NPD – model and speed	Going from stabilised to dynamic PD – characteristics When products turn to processes	Going from dynamic to stabilised PD – characteristics When processes turn into products – standard modules

The proposal of tools in the two types of models should only be considered as guidelines up to 2003, as further research had to be done.

Long-Term Versus Short-Term Success Criteria

According to research, businesses focused on short-term success criteria such as time, cost, and performance up to 2003. Businesses hardly ever focused on CIM, CI or learning. Therefore, it was difficult to gain long-term success criteria such as right cost, right performance, and right time. It was difficult to achieve CIM because the product development process had to be improved continuously both initially within the product development process, across product development projects, and on the market place. It was difficult to achieve CI because businesses had to innovate new products and seek innovation possibilities both at the start of a product development project, along the product development process, and when the product had been introduced to the market.

The research verified that major focus in businesses was on short-term success criteria along the product development process from idea to market introduction as seen in Table 13.14.

Table 13.14 Short-term and long-term success criteria

NB HS NPD					
Short-Term and Long Term Success Criteria					
	Hypothesis	Case Research	PUIIN Focus Group	Survey	Verified/Not Verified
High Speed – Time	Yes	Yes	Yes	Yes	Yes
Cost	Yes	Yes	Yes	Yes	Yes
Performance	Yes	Yes	Yes	Yes	Yes
Continuous improvement	Yes	Not verified	Not verified	Not verified	Not verified
Continuous Innovation	Yes	Not verified	Not verified	Not verified	Not verified
Learning	Yes	Not verified	Not verified	Not verified	Not verified
Right Time – Right Speed	Yes	Not verified	Not verified	Not verified	Not verified
Right Cost	Yes	Not verified	Not verified	Not verified	Not verified
Right Performance	Yes	Not verified	Not verified	Not verified	Not verified

The research verified that a focus on long-term success criteria proved to be difficult for SME to practice because they did not link it to a strategic focus on product development learning and knowledge creation.

The research showed that many businesses were “stuck” in a predefined product development model which was often the stage-gate model. The research showed that the existing product development model did not “fit” the relevant product development situation for the future, and the businesses were not able to carry out or chose a flexible product development design or a flexible choice of product development models and processes because of e.g. ISO standards, business policy, competences lack of PUL. The research verified that many businesses (employees and managers) tried to break the formal product development models. They participate in informal PD models and processes to reach “the want of speed” either from customers, network partners, employees, or management. The cost and value of these informal models and processes were not calculated.

The following statements verified the above:

“If we were to develop new products according to our ISO 9000 standard, products would never reach the market.” (Lyngsø)

“I went down into production and forced my employees to break the rules of our product development model. I forced them to make faults to speed the development process. The employees were not happy due to their high quality feelings. They reached the high speed. It cost a lot – but we achieved a first mover advantage on the market” (AKV Langholt)

It seemed as if there was a strong demand for a more flexible design in the product development of the businesses. It also appeared that there was important knowledge in the informal product development models and processes of the businesses which were not used and could be valuable to progress the speed and diminished the costs of NPD and reach long term success criteria.

The knowledge in the informal PD models and processes was worth nothing if the knowledge was not made available in an open form. Furthermore, the knowledge must be transferred to other NPD projects and NPD networks before it could be used to reach right speed in the businesses’ product development activities. When PUL was implemented in businesses, and when learning interacted with CIM and CI, my hypothesis was that long-term success criteria such as right performance, right cost, and right speed could be reached.

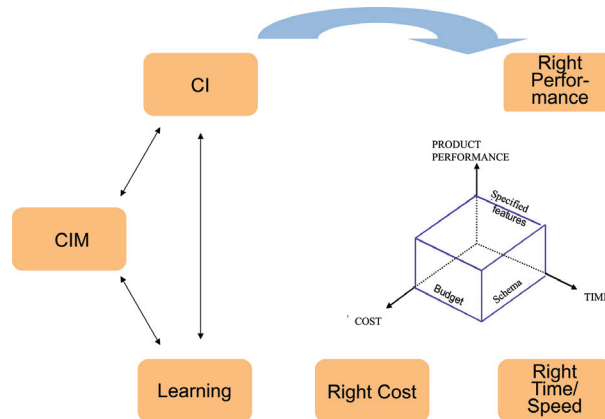


Figure 13.20 Relationship between long term success criteria in network based product development.

Source: Inspired by Lindgren & Bohn.

13.3 Measuring Framework in Idea and Concept Stage-Gate of HS NB PD

The following hypotheses were to be tested:

1. The NB HS PD projects can be divided into radical and incremental PD projects
2. The radical and the incremental PD projects follow different generic HS PD models and processes and can therefore be described by different generic frameworks
3. The HS NPD project always have a formulated core
4. A HS PD model follows another PD model than the business's normal PD model

13.3.1 Division of NB HS NPD

The research verified that product development projects/tasks could be divided into radical and incremental product development projects by different criterions.

The research also very clearly verified that most product development projects (85–90%) were incremental. This was a higher share than expected. However, there were major differences between the radicalness and incrementalness in regard to different criteria.

The most radical component was technology. All others were very much incremental as seen in Table 13.15.

Table 13.15 Incremental and radical PD in SMEs

	Hypothesis	Case	PUIIN	Survey	Verified/ Not Verified
Market	Incremental	Mostly Incremental	Mostly Incremental	Mostly Incremental	Verified
Technology	Radical	Mostly Incremental	Mostly Incremental	Medium	Partly verified
Network	Radical	Mostly Incremental	Mostly Incremental	Medium	Not verified
Innovativeness	Radical	Mostly Incremental	Mostly Incremental	Medium	Not verified

13.3.2 Strategic Areas and NB HS PD Tasks

One of the objects of my research was to verify empirically the general task of the PD tasks in SMEs. The research showed that the picture of the PD tasks is far less complicated than the hypothesis had indicated. NB HS NPD was carried out in a “field of product development” which the involved SMEs judge as less complicated in relation to PD than the hypothesis had proposed (Please see Chapters 10–13).

Firstly, the research showed that most product development projects (approximately 85–90%) are generally incremental and very few are in the areas of radical product development. More specifically the research showed that most product development projects were focused on known customer needs, known customer groups, and well known and familiar markets. On these dimensions product development in the SMEs involved in the research was therefore very much incremental and could not support the original hypothesis of the PhD project that PD projects were generally radical.

On the technical dimension, however, the product development task tended to be found in the unfamiliar and radical area. This was also the case with customer technology or the choice of production technology to produce the new products. This meant that in general businesses face a more radical challenge on the technical side of the product development projects than on the market side. Still, my research showed differences in this radical element from one product development project to another. Furthermore, there was no indication that the perceived radical product development task was related to market wants or market needs.

Additionally, neither the perceived innovation degree was very often found in the radical innovative area. Only very few of the product development projects were perceived as being in the radical innovation area as seen in Table 13.16.

Table 13.16 Strategic areas and PD task

Dimension	Hypothesis	Case	PUIN Focus Group	Survey	Hypothesis
Innovation degree	High	High/Medium	Low/Medium	Medium/low	Not Verified
Market	New	Old	Old	Old	Not verified
Customer needs	New	Old	Old	Old	Not verified
Customer group	Old	Old	Old	Old	Verified
Customer technology	Old	Old	Old	Old	Verified
Technology	New	Old/new	Old/new	Old/new	To some extent verified
Network	Old and geographical narrow networks	Mainly old networks. When radical new networks	Mainly old networks. When radical new networks	Mainly old networks. When radical new networks	To some extent verified
Competence's Product management	Middle mostly the business	Middle mostly the business	Middle mostly the business	Middle mostly the business	Verified
Competition	Middle	Middle/high	Middle/high	Middle/high	Verified
Product development task	Radical	Mostly incremental	Mostly incremental	Mostly incremental	Not verified

The network dimension was also mainly concentrated on incremental newness of networks. Moreover, the pressure by new PD projects on the competences of the businesses was also seen as incremental and very familiar.

The competition on new product was perceived as being in the middle to high competitive areas. There was a strong indication in the empirical data that the competitive situation was a major driver to high speed product development.

The pressure on the competences of the businesses was perceived in the businesses as middle to low. This meant that the product development projects were not perceived as pushing the competences of the businesses out in areas of radical product development.

All in all, this gave an overview of the SMEs' product development projects as mostly focused on incremental product development projects in the area of related product development and product development to known markets and market segments.

It could therefore be concluded from the research that a very small amount of the product development projects were into the area of radical product development or/and in the area of diversification (Kotler, 2000). The hypothesis of the research on the very radical task and characteristics of product development projects in SMEs were therefore not verified.

Summing Up on Radical and Incremental PD Projects and Tasks

An analysis of the results of the empirical data showed very clearly that PD tasks in businesses up to 2003 were incremental. A reflection on the high degree of incremental product development projects indicated that the product development models in businesses today were too complexly organised and too time-consuming. Furthermore, it indicated that there was a potential to speed product development projects needs further than was the case up to 2003. It also indicated that there was a huge need for a change in leadership in product development. I will comment on this at a later point in this book. Finally, a strong indication of a need to implement more flexibility in the choice of NPD models and processes seemed to be another result of my empirical research.

It must also be stressed that most of the businesses involved were developing on hardware products and hardware parts of the products. A major potential on the immaterial, digital, and virtual side of the product seemed to be of importance to the businesses in their future development activities.

13.3.3 Generic Framework of PD Projects

The research verified that the radical and the incremental PD projects did not follow different generic HS PD models and processes in SMEs. The SMEs followed the same generic formal product development models and could therefore be described by different generic frameworks.

However, my research also showed that radical and incremental product development projects in businesses were not organised and did not follow different product development models. Generally, incremental and radical product development projects were treated equally in the businesses.

Still, my research verified that when businesses formulate product development projects to run at high speed, then the product development projects follow different generic HS PD models and processes. Such models and processes were supplemented by informal PD models and processes and could therefore be described by different generic frameworks either stage-gate model, supplemented with an informal model or rapid prototyping models. The flexible model could not be verified in the empirical research.

The research showed very clearly that the HS PD model in the businesses followed another model than the normal and often certified PD model in the businesses involved.

13.3.4 HS Product Development Models

Businesses which put pressure on speed in their PD project used:

- Informal PD models and processes
- Rapid prototyping
- More involvement by top managers
- More involvement from network partners
- More development activities taking place outside the core of the product task
- A core of the product that is more dynamic
- The pressing of more product development activities down to “on the market activities”
- The building of a “service or nursing organisation” outside the formal PD organisation to maintain and increase HS in PD

The research verified very clearly that HS PD models and processes had different forms from those of the businesses’ formal product development models and processes.

Table 13.17 Core of NB HS NPD

Core	Literature			Focus Group		
	Hypothesis	Search	Case Research	Interviews	Survey	Verified
Mission	Yes	Not verified	Partly verified	Partly verified	Partly verified	Partly verified
Goals	Yes	Yes	Not verified	Partly verified	Partly verified	Partly verified
Strategy	Yes	Yes	Verified but later in the process	Verified but later in the process	Partly verified	Partly verified but later in the process
Economic Resources	Yes	Not verified	Not verified	Not verified	Not verified	Not verified
Personal/ Organisational Resources	Yes	Not verified	Partly verified	Partly verified	Not verified	Not verified
Contact Limits	Yes	Not verified	Partly verified	Partly verified	Not verified	Not Verified

13.3.5 HS PD Projects Always Have a Formulated PD Core

The core of the businesses' product development was hypothetically said to consist of five parts mission: goals, strategy, economic resources, personal/organisational resources and contact limits to network partners.

However, this hypothesis was formulated as the optimal and idealistic foundation of a business developing new products. The research showed quite another picture when businesses were carrying out NB HS NPD as shown in Table 13.17.

Mission of Product Development Project

The hypothesis was that businesses always formulated a mission for their specific product development projects. This hypothesis was verified significantly by all empirical studies. This is shown in Table 13.18.

Table 13.18 The core of SMEs' PD model

Does the Business Always Formulate a Mission for the Product Development Project?	Yes	Verified
Hypotheses	All	
Case research	All	Yes
PUIN focus group	All	Yes
Survey	All	Yes

None of the empirical studies gave any indication of what the mission was about or of the contents of the mission. The case research and the focus group interviews verified that the mission was seldom written down and was just orally communicated to all participants in the product development project. The research could not give an answer to the way in which the mission was used to guide the product development project but businesses were convinced that if the mission was formulated, it had an influence on the speed of the PD project.

Nevertheless, the case research and the PUIN focus group interview gave a strong indication that businesses with ISO certification had their mission written down and known by participants of the product development project later on in the PD project. The formulation of the mission did not take place until the product development idea had entered the formal product development model. This was another indication of an informal PD model and process in the HS PD model and process of the businesses.

The research showed that the core of product development projects was under extremely high pressure when businesses wanted to speed the product

development process. Sometimes businesses even forgot to formulate the core or they formulated it later in the product development process. Therefore the borders of the HS product development project were often fuzzy and in these projects often unclear. Often the core was so inexact that it resulted in bad performance on the success criteria; especially sideways on time.

Goals of Product Development Project

Hypothetically, the goals of the businesses' product development projects were always formulated. The empirical study verified that this hypothesis could only be partly verified. This is illustrated in Table 13.19.

Table 13.19 Goal formulation in PD

Does the Business Always Formulate Goals for the Product Development Project?	Yes	Verified
Hypotheses	All	
Case research	All	Yes
PUIN focus group	All	Yes
Survey	%	Yes

In general, when businesses carry out PD the goals were always formulated. The research verified, however, that when businesses wanted to develop new products at high speed, the goals were most often not formulated.

Strategy of Product Development Project

Hypothetically, the strategy of the businesses' product development projects was always formulated before or at the very beginning of the product development project. As illustrated in Table 13.20, the empirical study could not verify this assertion.

Table 13.20 Goal formulation in PD

Does the Business Always Formulate the Strategy for the Product Development Project?	Yes	Verified
Hypotheses	Yes	
Case research	No	No
PUIN focus group	No	No
Survey	No	No

The empirical case study showed that in general businesses formulate the strategy late in the product development project. This was also the case in high speed product development projects.

Personnel and Organisation

When considering personnel and organisational aspects, my hypothesis was that the resources of personnel/organisation were always defined prior to the initiation of a product development project. This hypothesis could only be partly verified by the empirical study. The results are listed in Table 13.21.

Table 13.21 Organisational resources and PD

Does the Business Always Formulate the Resources of Personnel and Organisation?	Yes	Verified
Hypotheses	Yes	
Case research	Yes but firstly at the concept stage	(yes)
PUIN focus group	Yes but firstly at the concept stage	(yes)
Survey	%	(yes)

All empirical studies showed a very limited interest in involving competitors in the product development projects. The empiricism also showed strong restrictions and traditions determining where and when in the product development phase customers, suppliers, and other network partners should be included in the development.

The research showed that the network partners involved were mainly customers and suppliers and definitely not competitors.

Generally, there seemed to be much more potential in the network component for the SME. However, a more intense use of the network component will demand additional development of the businesses' ability to work in networks and to use the network component (Kræmmergaard et al., 2002).

13.4 Identifying Enablers to HS PD

The following hypotheses were elaborated initially in the research project:

1. HS enablers are identical to the 10 enablers – 1–10
2. There can be more than these 10 enablers to HS PD
3. Businesses use different HS enablers
4. The enablers will play a different role according to the PD situation and project (secondary focus)
5. The customer enabler, the network enabler, and the PD model enabler play an important role in the upper phase of the HS PD phase

13.4.1 HS Enablers Identical to the 10 Enablers

One of the hypotheses of this research was that the HS enablers were identical to the 10 enablers (1–10) identified in the literature study.

The research was able to verify 8 of the 10 HS enablers. The results are listed in Table 13.22.

Table 13.22 Use of HS enablers in SMEs

High Speed Enablers	Literature		Focus Group			Verified
	Search	Case Research	Interviews	Survey		
1. The ICT Enabler	Yes, in a few businesses	Yes, in a few businesses and very little	Yes, but in few businesses	Yes, but in few businesses	(+)	
2. The customer Enabler	Yes	Yes	Yes	Yes	Yes	
3. PU model enabler	Yes	Yes – but mainly stage-gate	Yes – mainly stage-gate	Yes – mainly stage-gate	(+)	
4. The Network Enabler	Yes	Yes – but mainly customer and to some extent suppliers Limit networks	Yes – but mainly customers and to some extent suppliers Limit networks	Yes – but mainly customers and to some extent suppliers Limit networks	(+)	
5. The Innovation Enabler	Yes	No but in few businesses	No but in few businesses	No but in few businesses	–	
6. The HRM Enabler	Yes	Yes – but few businesses	Yes – but few businesses and limit efforts	No	(–)	
7. The Process Enabler	Yes	No	No	No	No	
8. The Product to Process Enabler	Yes	To some extent – few businesses and limit efforts	No	To some extent	(+)	
9. The Modularisation Enabler	Yes	Yes, but not fulfilled	Yes, but not fulfilled	Yes, but not fulfilled	(+)	
10. The E-development Enabler	Yes, in a few businesses	Yes, in very few businesses	Yes, but in very few businesses	Yes, but in very few businesses	(–)	

As can be seen in the comments on each HS enabler there were differences in the use of the enablers.

The ICT Enabler was quite surprisingly not used very intensely or effectively in most businesses. This stressed a large potential within businesses to use the ICT enabler more and better in network based product development. Therefore, the research could not verify extensive use of the ICT enabler in NB HS NPD. The result was very surprising and is deemed critical related to the future trends of PD which demands intensive use of the ICT enabler.

The Customer Enabler could be verified as a major enabler for businesses in order to speed product development. Businesses generally invited the customers in at a very early point of time in the product development process to speed product development, to narrow the focus on real needs of the customer, and to higher the performance of the product in order to meet customer demands. However, the customer was invited to join the PD at the upper part of the PD process, not so much at the lower part of the PD process, or “on the market”.

The PD Model Enabler was used in the businesses but mainly in a very restricted way. Most businesses used the PD model enabler with a view to optimising the stage-gate model. Some businesses used the “rapid prototyping model” where businesses miss out on some stage and gates into rapid prototyping. Others performed simultaneous or parallel product development where some product development processes were developed parallel.

No business tried to use other product development models e.g. flexible models, either because they did not know about them, or because they did not know how to shift among product development models.

The research was able to verify the following product development models as seen in Table 13.23 used to speed PD:

Table 13.23 High speed PD models verified in the research

Hypothetical HS PD Models	Case	Focus			Verified
		Group	Survey	Other	
Stage-gate model (Parallel or simultaneous PD)	Yes	Yes	Yes	Yes	Yes
Flexible models (Verganti model)	No	Partly	No	Partly	Partly verified
“Task force model” (TDC task force model)	Partly	Partly	No	Partly	Partly verified
“On the Market model” (Corso on the market model)	No	No	No	Partly	Not verified
Informal HS PD Models	Yes	Yes	Yes	Yes	Verified
“Lindholst model” (Linco HS model)	Yes	Yes	No	No	Partly verified

Table 13.23 Continued

“10% overflow model” (Grundfos model)	No	Partly	No	No	Partly verified
The network HS model(Italy model)	No	No	No	Partly	Partly verified

The above shown in Table 13.23 verifies that businesses did use other PD models to HS the product development but its very fragmented.

The Network Enabler was also very much in use in the businesses but mainly focused on customer and to some extent on the supplier network. The competitors were hardly ever integrated in the NPD process, and other organisations were mainly integrated in the NPD process at the beginning of the process.

The Innovation Enabler could not be verified in the research.

The HRM Enabler could only be verified in very few businesses, and the use of this enabler was very limited. Most businesses do not see the HRM enabler as an enabler to speed product development.

The Process Enabler could not be verified in any of the businesses.

The Product to Process Enabler was to some extent used in the businesses but still in very few businesses and only to a very limited degree.

The Modularization Enabler was used in many businesses but it was not fulfilled in its use. Furthermore, many businesses reported that they had major problems implementing the modularization enabler. The problems mostly concerned the definition and implementation of an optimal product architecture that could support the use of this enabler.

Modularisation was an important enabler to HS. However, in many businesses this enabler had not yet been of great success. I claimed that this was due to an inside out view. Modularisation should be done in accordance with the market. The research verified that the businesses which used the modularisation enabler with an outside in perspective were more successful in the use of this enabler.

The E-Development Enabler was also used very little in the businesses up to 2003, and it seemed as if there was a large potential in this area for speeding up the product development in SMEs by using this enabler.

13.4.2 More Than 10 Enablers to Enable HS PD

Through the research the PhD project verified two extra enablers to HS product development that could not be found in the literature study as seen in Table 13.24.

Table 13.24 Extra enablers in NB HS NPD

Extra Enablers	Literature Search	Case Research	Focus Group Interviews	Survey	Verified
Informal product development models and processes	No	Yes	Yes	Yes	Yes
Management	(-)	Yes	Yes	Yes	Yes

The Informal Model and Process Enabler was verified in almost all businesses. This enabler was verified by businesses as having major importance to speed product development. Furthermore, this enabler was used officially or unofficially by the management level to speed the product development process.

The Management Enabler was used to speed the product development process in most businesses. This enabler was used in different ways e.g. by managers involving themselves directly in the product development project to make the organisation and the surrounding environment see that the product development project had a major management focus and was of high strategic importance.

The management enabler was also used to “kick start” the speed of a product development project when starting or when a critical situation occurred.


Different Enabler Roles According to PD Situation and Project

The research showed that the different HS enablers play different roles in the process of speeding the product development process.

Firstly, it was verified that HS enablers are used at different times. The customer enabler is e.g. mainly used at the beginning of the product development process where the modularization enabler was used at the end of the product development process. The Figure 13.21 shows where in the product development process the HS enablers were identified.

Secondly, some of the HS enablers were identified as being overall enablers that were used more or less at any point in the product development process. Others were running as supporting the HS enablers used.

The research also verified that HS enablers used in a wrong way can result in bad performance, increasing cost, and even slower speed in product development. This could be HS enablers used at the wrong place or HS enablers used in a wrong mix of HS enablers. The research verified that it is important



Use of
High
Speed
Enabler in
Networks

HS enablers used in the survey businesses	Idea - phase	Concept - phase	Prototyping - phase	Implementation - phase
ICT Communication Enabler	Yes – but very limited	Yes – but very limited	Yes – but very limited	Yes – but very limited
Customer Enabler	yes	yes	yes	Yes – but very seldom
PD Model Enabler	Yes – but very limited	Yes – but very limited	Yes – but very limited	Yes – but very limited
Network Enabler	Yes – but limited	Yes – but limited	-	-
Innovation Enabler	No	No	No	No
HRM Enabler	Yes – but limited to very few businesses	Yes – but limited to very few businesses	Yes – but limited to very few businesses	Yes – but limited to very few businesses
Process Enabler	No – not verified	No – not verified	No – not verified	No – not verified
Product to Process Enabler	No	Very limited	Very limited	Very limited
Modularization Enabler	-	yes	yes	yes
E-Development Enabler	No	Very limited	Very limited	Very limited
Informal Product Development Model	yes	yes	yes	yes
Management	yes	yes	yes	yes

Figure 13.21 HS enablers in network.

for managers responsible for the businesses product development activities to choose the right HS enablers.

The research also showed that HS enablers had a different speed value to product development depending on:

- the characteristics and development of the main components on the field of product development
- the time at which a HS enabler was used to speed the product development process

The research verified that HS enablers used in a combination could give synergy effects on speed in product development but also “synergy bad effects” when used wrongly.

13.4.3 Customer, Network and PD Model Enabler

Through the research it was verified that in most cases the customer enabler was used primarily to speed the product development process. By using the customer enabler optimally a more precise and accurate need structure could be identified. Such a structure could effectively help the businesses from

developing wrong products to speeding the PD process. The customer enabler was seldom used in the final phase of the product development process.

The network enabler was often used in the idea and concept stages and gates but mainly in a narrow perspective. Mostly narrow and close network partners were used, and only very seldom were unknown physical networks used. Neither were the SMEs involved in the research using electronic and virtual networks very much.

The product development model enabler was used in the businesses but in a very narrow and limited way. The businesses were very focused on using their traditional stage-gate model but trying to use it with parallel processing. However, it was verified that these stage and gate models had reached the limit to further speeding of the PD process. Businesses cannot speed the process further using the stage-gate philosophy of PD. The SMEs could only speed the PD process by allowing informal PD models and PD processes running parallel to the formal stage-gate models.

New PD models needed to be developed and implemented in the businesses.

13.4.4 Summary on Enablers to NB HS NPD

Summing up on the enablers to high speed product development the research verified eight originally identified HS enablers and two extra enablers. The empirical research could not verify two of the enablers identified in the secondary case research. The use of the HS enablers differed from one business to another but some of the enablers – especially the customer enabler – are used more often than others.

The research verified that businesses use the HS enablers very differently but that the customer enabler, the product development model enabler, and to some extent the network enabler were the most important enablers in use. The research verified that it was very critical to PD management to choose from and mix HS enablers. It was also verified that there is a large potential in an additional and more intensive use of HS enablers.

13.5 Success Criteria for Measuring NB HS PD

The research verified that success criteria in NB HS PD were more complex to define than the hypotheses had identified. Businesses define their success criteria on product development much more individually and much more in relation to the characteristics of the PD project. Businesses up to 2003 often

prioritise the success criteria differently and even change the prioritising as the product development process evolves.

13.5.1 Success Criteria Dependent on Specific PD Project

At a previous point of this thesis I stated that product development projects could be divided into either incremental or radical product development projects and that the research showed that most PD projects could be characterised as incremental.

Dividing product development projects into incremental and radical development projects was nevertheless seldom done in businesses up to 2003 at least not in a focused or analytical way. The research presented the following picture seen in Figure 13.22 of the way in which businesses handle this process.

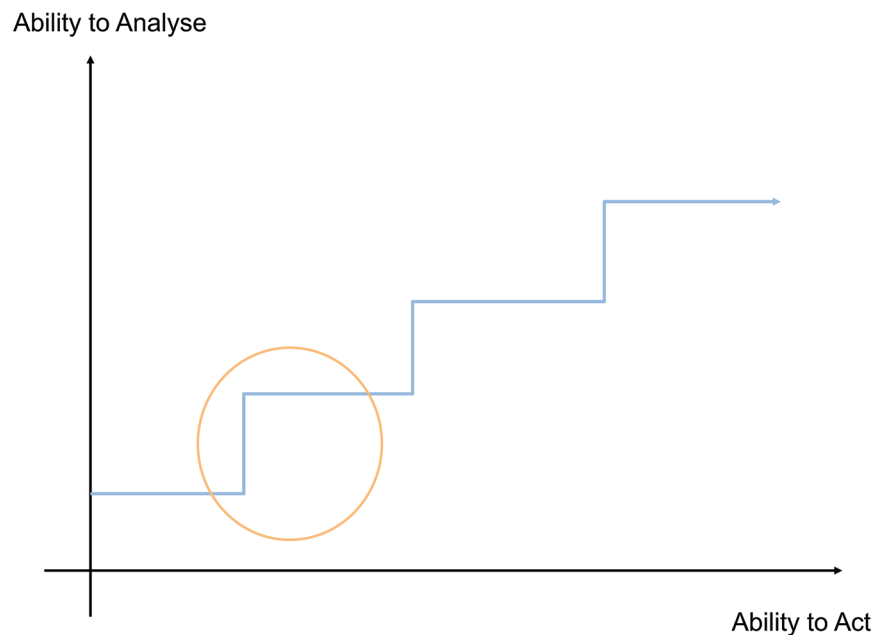


Figure 13.22 Ability to act and/or analyse.

The research verified that most businesses were working in the mid-zone of the model and that they were facing difficulties about analysing, acting and not least implementing product development strategies according to the characteristics of the product development projects. Businesses had difficulties in choosing from success criteria related to the characteristics of the PD project.

The research verified that the businesses focus narrowly on the same success criteria – most often costs – on all PD projects.

13.5.2 Short- and Long-Term HS PD Success Criteria

The research verified that both the short-term and the long-term success criteria existed in the involved businesses. Yet, it was highly significant that very few of the involved businesses focused on long-term success criteria. Additionally, the formulation of success criteria together with the prioritisation of success criteria were most often made through coincidence and randomness. Very few of the businesses had a strategic view on success criteria and they were often not particularly focused on or prioritising the success criteria – with the exception of cost.

Furthermore, the businesses featuring in the empirical research seldom formulated the success criteria as measurable. This is quite different from what was observed and seen in some of the secondary cases.

Finally, it was significant that businesses seldom overview or control their objectives and success criteria. This issue was a very surprising result of the research as businesses today are so focused on the short-term criteria cost and time.

In this connection, it was also very interesting to see that businesses hardly ever paid any attention to the collection and transforming of learning from one product development project to another.

13.5.3 Central Success Criteria in Short-Term Perspective

My hypothesis that the short-term success criteria time, cost and performance were central success criteria in businesses in the time up to 2003 could be verified. Although the short-term success criteria were said to be in focus, businesses hardly ever knew why they were in focus. Furthermore, the businesses did not know how and why the success criteria were prioritised and measured.

13.5.4 Central Success Criteria in Long-Term Perspective

It could also be verified that continuous improvement, continuous innovation, and learning were not major success criteria in businesses and certainly not when seen in a long-term perspective.

From this verification it could be concluded that businesses were very focused on short-term success criteria in their product development activities and furthermore, that businesses focused more on cost than on value.

13.5.5 Product Development Management and Leadership

My suggestion was to focus on product development leadership (PUL). PUL affected and was closely related to learning and knowledge management of product development. Learning and PUL of NB HS NPD created knowledge about the interaction and development of the market, technology, network, and competence component in the product development field. PUL choose the right product development model and process and thereby the right mix of main components to “the product development field” to gain right speed.

PUL should be elaborated along with product development management (PUM) to gain right time product development. Focus had been on PUM until now where PUM is in between the four main components influencing NB HS NPD. PUM tends to be much involved in day-to-day product development management. Seen from the point of view of the product development management level, PUM has difficulties in developing and maintaining the objective view of “the product development game”. It was also difficult to elaborate a flexible view and design in the “product development game” where all components are endogenous and exogenous variables played out and into the “product development field”.

PUL is the ability and the know-how of the “game of product development”. PUL is to know **why** the “game of product development” is, and **what** the “game of product development ” is about to decide and perform how the right speed in businesses product development activity should be. As was verified in the research project, the product development managers of the businesses focused mostly on short-term success criteria and on PUM.

At the PUM level focus is on short term success criteria such as time, cost, and performance. On the PUL level focus is on CIM, CI, and to learning create long term success criteria such as right cost, right performance, and right time. CIM is in focus because the product development process has to be improved continuously both initially within the product development process, across product development projects, and on the market place. CI is in focus because businesses have to innovate new products and seek innovation possibilities at the start of a product development project, along the product development process, and when the product has been introduced to the market.

My research also showed that PUL has proved to be difficult to practice without linking it to a strategic focus on product development learning and knowledge creation. My observation showed that many businesses were “stuck” in a predefined product development model. The product development model did not “fit” the relevant product development situation, and the businesses were not able to carry out or chose a flexible product development design because of e.g. ISO standards, business policy, competences lack of PUL.

The employees and managers therefore tried to or needed to break the formal product development model and to introduce informal models and processes to reach “the want of speed” either from customers, network partners, employees, or management. It seemed as if there was a strong demand for a more flexible design in the product development of the businesses. It also appeared that there was knowledge in informal product development models and processes of the businesses which could be valuable to progress the speed and diminish the costs of NPD.

This knowledge has to be made available in an open form and transferred before it can be used to reach right speed in the businesses’ product development. When PUL is implemented in businesses and learning interacts with CIM and CI, my hypothesis was that long-term success criteria such as right performance, right cost and right speed can be gained in product development.

The research project aimed at proposing a descriptive framework model for network based high speed product development. The research project suggests managers to redesign businesses’ management of NPD models and processes to reach better performance, lower cost, and product development within right time.

The framework advocates that management in product development increase their focuses on product development leadership (PUL). The framework suggests that PUL is strongly related to learning and knowledge creation on how “the product development game” is played both in the specific situation and across the product development project of the businesses. The framework proposes that learning and knowledge transfer is concentrated on understanding the main components in “the product development field”. In this way, the businesses will be able to chose the structure of the product development models and processes. The choice of speed in product development includes a decision on product development model and process based on a thorough understanding of “the game of product development”. Moreover, a decision on speed in product development must be made continuously and overviewed

and decided upon as the product moves along the product development process from idea to market introduction but also when the product has already been introduced to the market.

The framework finally recommends that businesses focus more on long term success criteria to gain right performance, right cost, and – essentially – right speed.

13.6 Summary of Impacts on Businesses Trying to Gain NB HS PD

Through the research some significant results and observations could be verified in NB HS NPD. These were:

- Pressure on time in NPD created informal processes and models within the business but also within the network
- Pressure on time in NPD created both first mover advantage and first mover bad advantage
- Pressure on speed and time in NPD would often raise total cost in businesses who focus only on costs
- Pressure on speed and time often diminished quality when focusing on costs
- Focus on right time could raise quality and diminish costs
- Focus on speed and time was often miscalculated in relation to radical and incremental product development projects
- Focus on right speed and right time in NPD could result in increased liquidity
- Pressure on speed and time could often be impossible because of the businesses' failure to choose the right PD model for the PD project – businesses got stuck in the chosen product development
- In the future NB RS NPD will be a very strong, competitive weapon
- First mover advantage and first mover bad advantage can both be the result of NB HS NPD
- Costs were primarily in focus for SMEs in 2003 when they tried to do HS in NPD
- SMEs focused primarily on direct costs and very seldom on alternative costs
- SME focused very seldom on perceived value in product development
- Quality could be increased by NB RS NPD
- Quality decreased when focus was on high speed

- Quality increased when focus was on right speed
- Many SMEs forced incremental PD into radical PD even if the PD task was incremental
- NB RS NPD may result in major liquidity possibilities because money was paid by the customers before the supplier require payment
- NB RS NPD was a major competitive weapon for the future global market
- The impact on market, technology and networks by network based right speed product development was expected to be enormous

The above-mentioned findings resulted in the hypothesis that another product development model may exist and must be elaborated to explain the high speed of product development.

I therefore proposed the following normative guideline to businesses who want to work with NB HS NPD:

1. Define “the field of product development”
2. Define the task of product development – Incremental or radical
3. Define the success criteria – time and speed – in relation to relative time and speed and in relation to right speed and right time
4. Define costs in relation to both direct and alternative costs (offer costs)
5. Define speed in relation to right speed and value instead of high speed and direct costs
6. Define the product development model – stage-gate and flexible model but choose the right model according to the task of the product development project
7. Choose to focus on long-term success criteria and not short-term criteria
8. Choose to relate the long-term criteria to value and not to costs
9. Choose to focus on product development leadership and not product development management
10. Formulate the core of the product development task in a narrow focus on CIM, CI and Learning
11. Choose the contact limits to network partners by value and advantage and improve the use of network partners to optimize and gain right time and right speed
12. Choose to involve all functions and actors in the product development activities of the business to help improve the product development within right time and right speed
13. Choose to use the high speed enablers with an outside in focus and choose to use more of the HS enablers but in an optimal way