KNOWLEDGE PRODUCTIVITY

DESIGNING AND TESTING A METHOD TO DIAGNOSE KNOWLEDGE PRODUCTIVITY AND PLAN FOR ENHANCEMENT

CHRISTIAAN STAM

PROMOTIECOMMISSIE

Voorzitter
Prof. dr. H.W.A.M Coonen, Universiteit Twente

Promotor
Prof. dr. J.W.M. Kessels, Universiteit Twente

Assistent promotor
Dr. D.G. Andriessen, Hogeschool INHOLLAND

Leden
Prof. dr. J.J.H. van den Akker, Universiteit Twente
Prof. dr. R. de Hoog, Universiteit Twente
Prof. dr. ir. J.E. van Aken, Technische Universiteit Eindhoven
Prof. dr. R.J. Tissen, Business Universiteit Nyenrode

ISBN 978-90-365-2605-0

KNOWLEDGE PRODUCTIVITY

DESIGNING AND TESTING A METHOD TO DIAGNOSE KNOWLEDGE PRODUCTIVITY AND PLAN FOR ENHANCEMENT

PROEFSCHRIFT

ter verkrijging van
de graad van doctor aan de Universiteit Twente,
op gezag van de rector magnificus,
prof. dr. W.H.M. Zijm,
volgens besluit van het College voor Promoties
in het openbaar te verdedigen
op donderdag 20 december 2007 om 15.00 uur

door

Christiaan David Stam

geboren op 24 juni 1965

te Nieuwe Niedorp

Promotor
Prof. dr. J.W.M. Kessels, Universiteit Twente

Assistent promotor
Dr. D.G. Andriessen, Hogeschool INHOLLAND

Preface and acknowledgements

Knowledge productivity, the central theme of this thesis, is a tricky construct as it brings together two concepts which are difficult to combine. On the one hand, the concept of *knowledge* which predominantly refers to a human ability. On the other hand, *productivity* which refers to the amount of output per unit of input (labor, equipment, capital).

To me, the anthropomorphic head[1] on the cover represents the ambiguity of the concept of knowledge productivity. If we take a close look at the picture, we see many different agricultural and manufacturing tools. Among other things, we see a carpenter's set square, a farmer's rake, several wood saws, a millstone for grinding wheat or other grain, a pair of tongs to cut or bend iron and a pair of bellows to stoke up the fire. If we take a look at the picture from a distance, we see the head of the person applying all these tools. Although the tools facilitate production, it is the person and his/her abilities and knowledge that determines the effectiveness of the usage of the tools. As it is very difficult to give expression to the knowledge and skills of a person, the artist ordered the instruments in the shape of a head to indicate that the one cannot be seen without the other.

The same seems to be true for knowledge and productivity. This insight, which was the starting point for this research, first emerged from our book *Knowledge productivity: the effect of investing in people, knowledge and learning* (Stam, Evers, Leenheers, De Man, & Van der Spek, 2004). This book was the result of a call for papers and a conference among Dutch scholars, practitioners and consultants in the field of knowledge management and knowledge productivity. The aim of this book was to make sense of the relatively new concept of knowledge productivity. The experience of writing this book, made me decide to investigate the possibility of continuing to do research in the field of knowledge productivity.

The opportunity to do Ph.D. research arose in 2004, when I was appointed as a Research Fellow at the Centre of Applied Research in Intellectual Capital at INHOLLAND University of Professional Education and De Baak – Management Centre VNO-NCW. It speaks for itself that I am very grateful to these two organisations for giving me the opportunity and support to fulfill my personal ambition. I could not have been more fortunate. Thank you.

During the years, many people have supported my mission personally. I would like to thank all these people for supporting me, for motivating me at moments when I needed it, for their trust and respect, for their kind words and for all their constructive feedback. Several of them I want to thank particularly.

My first and very warm gratitude goes to Harry Starren, Executive Director of De Baak. The story I always like to tell about Harry is the story about the first time we met, in June 1993 in the Vondelpark in Amsterdam. As I was applying for a job at De Baak, I had prepared myself thoroughly in the sense that I had practised a lot of answers to typical interview questions. I put on my best suit, went to our meeting place and waited for Harry to arrive. As he was a few minutes late, I had some more time to practise my answers to his supposed questions. When he arrived we shook hands and the first thing he said was: "OK, let's do it." Although I heard what he said, it did not really occur to me that he meant what he said. So, I started to answer all the questions I had expected. He interrupted me half way and said: "Didn't you hear what I said?" Only then did it begin to dawn on me that he had been serious and that I had the job.

The trust I received at that moment was the starting point of many inspiring and exciting years at De Baak. It was hard work, but also very fulfilling as I was constantly challenged to further develop myself, both professionally and as a person. Harry, thank you so much for providing

[1] Unknown artist, probably inspired by Giuseppe Arcimboldo, 1527-1593

this opportunity, thank you for inspiring me, thank you for believing in me, thank you for continuously and unconditionally supporting my ambitions. I thank you for challenging me to become the person I am today. It is for this reason that I dedicate this thesis to you.

Next, I want to thank my supervisors, Prof. dr. Joseph Kessels (Professor Human Resource Development Universiteit Twente and Dean TSM Business School) and Dr. Daan Andriessen (Lector Intellectual Capital, Hogeschool INHOLLAND) for guiding me through this research. Both of you have been inspiring examples to me. Working with you was challenging and a lot of fun. Thank you for "enticing" me to be knowledge productive.

I also thank my colleagues at the Centre for Research in Intellectual Capital as the Centre has been a very stimulating and fertile environment in which to do research. Daan, Marien, Don, Linda, Josephine, Esther, Thomas, Henk, Marjan, Ad, Eja, thank you for providing the room to do my thing, thank you for supporting me and for giving all the invaluable feedback on my work.

Many persons contributed to my professional development and to this Ph.D. thesis. For this I want to thank: Dr. Marc Zegveld; Prof. dr. Joan van Aken and the members of the Design Science Research Group; Rob van der Spek, Jan Kingma and the rest of the Master Class Knowledge Management team; Dr. Susana Menendez, Dr. Ineke van Halsema, Schelte Beltman and the members of the Community 4 Promovendi at INHOLLAND; Suzanne Verdonschot; Charles Savage; Jan Mouritsen.

I also thank all the people and companies involved in the empirical part of this research: Agnes and Jurgen (Transfer Solutions); Maarten and Coen (Midfield); Martin and Valentijn (de Baak); Edwin and Bas (BSP); José (CPB); and Eelko (Health bv). In addition to these people, I also thank all the people that participated in the workshops and filled out the questionnaires. Without you, this design-based research would not have been possible.

And finally, where do I find the words to express my gratitude and love to the persons most precious to me? My parents and my family, for supporting me in anything I do. Céline, for giving me the love and strength I needed to complete this mission. Susanna and David, for regularly holding up a mirror to my face. I am sorry for all the times I could not give you the attention you deserved. I love you.

Christiaan Stam
Naarden, The Netherlands
September 2007

TO HARRY STARREN

Contents

1 Introduction

The starting point of this research is that our economy has changed from an industrial into a knowledge economy (Drucker, 1993; Toffler, 1981), in which the competitive advantage of organizations is based on the ability to exploit knowledge resources. The increased importance of knowledge as an economic resource has been reviewed from many perspectives, resulting in slightly different denotations, each usually emphasizing a different but related aspect of the same phenomenon. Some examples of this are the "knowledge society" (Toffler, 1981), "knowhow society" (Sveiby & Lloyd, 1988), "information society" (Giddens, 1994), "information economy" (Shapiro & Varian, 2003), "learning society", "learning economy" (Harrison & Kessels, 2004), "network society" (Castells, 1996), "intangible economy" (Andriessen, 2004a) and the "creative economy" (Florida, 2002).

Within the different denotations of the new reality, we see that authors are either referring to society as a whole, or to the economy. However, as Jacobs (1999a) argues, the term knowledge society is a tautology – a needless repetition – as society and mankind have always been dependent on the interpretation of knowledge. Yet, the knowledge *economy*, in which knowledge has become the main factor of competitive advantage, is a new phenomenon. The transition to the knowledge economy is about the increase in scale of knowledge as a production factor. Knowledge is not a new production factor, but the relative importance of knowledge, related to land, labour and capital, has substantially increased during the past few decades (Castells, 1996; Weggeman, 2000). In line with this reasoning, Stewart reminds us that, "not for nothing are we *homo sapiens*, thinking man" (Stewart, 1997, p.5, italics in original). As this research focuses on the increased importance of knowledge as an economic resource, it will refer to the new reality as the *knowledge economy*.

Inspired by Stewart (2002) and Drucker (1999), the essence of the knowledge economy can be summarized in three characteristics. First, in the knowledge economy, knowledge is what we buy, sell, and do. Second, intellectual capital (IC) is the new wealth. Third, knowledge productivity (KP) is the biggest challenge. As these three characteristics set the scene for this research we first elaborate on them, before formulating a problem statement and a research question.

1.1 Knowledge is what we buy, sell and do

The essence of this first characteristic of the knowledge economy, is that the economic activities have shifted from "brawn to brain" (Drucker, 1993), or from people working with their hands to people working with their heads, from tangible resources (like steel) to intangible resources (like knowledge).

In order to help better understanding today's society, Toffler (1981) identified three historical waves. The first wave started with the domestication of mankind, around 8000 B.C., and resulted in an agricultural revolution. This wave represents the transformation of mankind from hunters and nomads, to farmers and land owners and reached its climax in the seventeenth and eighteenth centuries. At that time the Industrial Revolution initiated the second wave. The start of the second wave, however, did not imply that the first wave had come to an end. Both waves of change would roll forward at different paces. In addition, after the Second World War, another turning point would mark a new and third wave. It was the point at which people working with their heads, would outnumber those working with their hands (agriculture and industry).

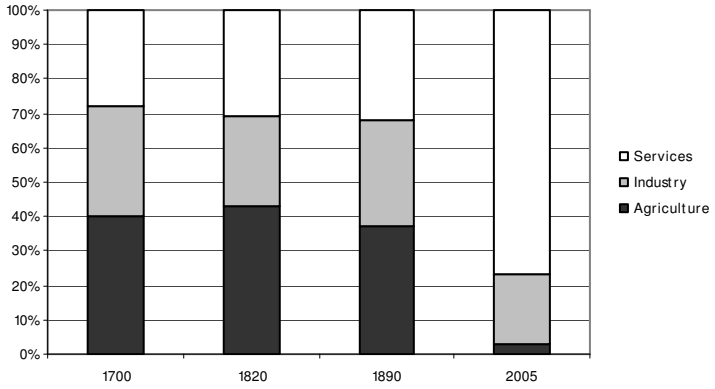


Figure 1.1: Employment per sector, The Netherlands, 1700-2005, in %, (OECD, 2006)

Figure 1.1 clearly illustrates the transition of the Dutch economy to a knowledge-based economy. By 2005, services in The Netherlands (public sector included) accounted for about 77% of economic activity, industry (including mining, electricity and construction) accounted for 20%, and agriculture accounted for the remaining 3%. Although The Netherlands has a relatively large services sector, other countries in the developed world show similar patterns. Since the 1970s, the services sector has become the most important sector in almost all OECD economies (Wolfl, 2003). By 2002, the services sector accounted for about 72% of OECD value added[2], manufacturing for about 26%, and agriculture for just 2% of value added (OECD, 2005). Another effect that contributed to the increased knowledge intensity of today's economy is that the character of work in the manufacturing industry is changing. As employment declines, and the manufacturing sector becomes more productive and moves up the value chain, more and more workers in the manufacturing sector are engaged in services-related occupations (e.g. scientific professionals, accountants, lawyers, managers, clerks, etc.). In the case of The Netherlands, by 2002, these services-related occupations accounted for more than 50% of workers in the manufacturing industry (Pilat, Cimper, Karsten, & Webb, 2006).

Whereas Toffler was mainly concerned with the transition of society as a whole, Drucker (1993) related these developments to the changed role of knowledge in the production function of organizations. According to Drucker, the change in the role of knowledge, since the Industrial Revolution, took place in three phases. During the first phase (1750-1880), knowledge was mainly applied to creating production tools, like the electrical spinning wheel, which resulted in the Industrial Revolution. The second phase (1880-1945) was the phase of the Productivity Revolution, in which knowledge was mainly applied to labour and processes. An important boost in this second phase was Taylor's Scientific Management: a set of principles describing the one best way to perform a certain task. This second phase, in which man was seen as an extension of machines, resulted in a huge increase in the productivity of labour. Finally, the third phase (since 1945) is the phase of the Management Revolution. The distinguishing characteristic of this phase is that knowledge is mainly applied to knowledge itself. Whereas fifty years ago the majority of people in the developed economies were involved in producing tangible goods, like cars, television sets, soap, etc., nowadays their share of the workforce has dropped to less than twenty percent. Therefore, increase in the industrial productivity alone will no longer automatically contribute to an overall increase of wealth. Traditional factors of production, like natural resources (land), labour and capital have

[2] Gross value added is the value of output less the value of intermediate consumption. It is a measure of the contribution to GDP (Gross Domestic Product) made by an individual producer, industry or sector.

lost significance in the value creation process (Savage, 1996). In today's knowledge economy, knowledge has become the decisive factor in adding value to production processes, products and services (Figure 1.2).

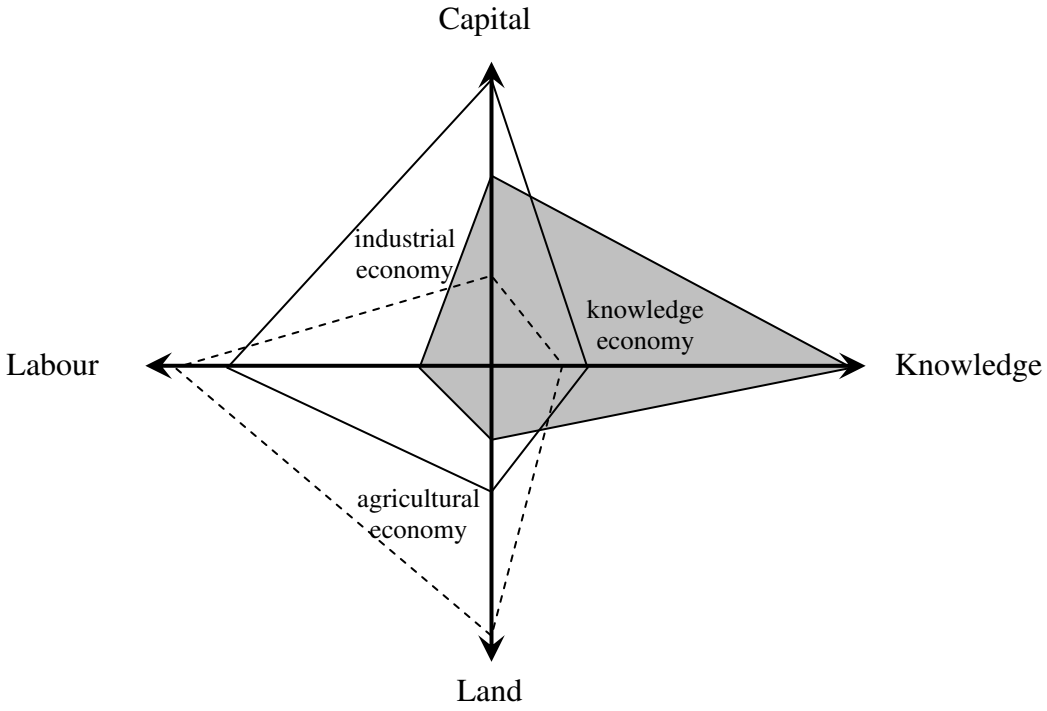


Figure 1.2: Relative importance of factors of production in different economies (based on Tissen, Andriessen, & Lekanne Deprez, 1998)

At an organizational level, the acknowledgement of this shift in the factors of production in the mid 1990s resulted in an increasing interest in the management of knowledge as a resource (Davenport & Prusak, 1998; Nonaka & Takeuchi, 1995; Weggeman, 1997). Based on the hypothesis that knowledge is today's most important source of competitive advantage, management and organizations deliberately aim at increasing the leverage of this resource. In this thesis we will refer to the deliberate management of knowledge resources as *knowledge management* (KM).

1.2 Intellectual capital is the new wealth

This second pillar of the knowledge economy is a logical consequence of the first. It stresses the shift from financial and physical assets in the industrial economy towards knowledge assets, or *intellectual capital* (IC), in the knowledge economy. Intellectual capital refers to non-monetary and non-physical resources.

The concept of intellectual capital is based on the belief that the main resources for building competitive advantage are intangible resources (Edvinsson & Malone, 1997; Stewart, 1997; Sveiby, 1997). However, as a result of the traditional bookkeeping system, these resources are not being monitored. Therefore, we do not know their value and performance, which leads to poor valuation (external communication problem) on the one hand and poor usage (internal management problem) on the other. The belief is that systematic and standardized reporting about intangibles, both internal and external, will lead to better organizational performance.

This shift in significance from financial and physical assets to intangible assets can easily be illustrated by the unit price per lbs (0.454 kg) of some traditional industrial products compared with the unit price of some knowledge-based products (Table 1.1).

Table 1.1: Comparison of unit price per lbs (0,454 kg) of two traditional industrial products and two knowledge-based products (Youngman, 2003)

	Price (US$)	Weight (lbs)	Unit price per lbs
Pentium	851	0.001984	428,930.00
Viagra	8	0.00068	11,766.00
Mercedes Benz E-class	78,445	4134	19.00
Hot rolled steel	370	2000	0.20

The relationship between weight and value in knowledge-based products, seems to have been reversed compared to the traditional industrial products. "An ever increasing share of GDP resides in economic commodities that have little or no physical manifestations" (Youngman, 2003, p.7). The value of a Pentium Processor or Viagra does not lie in the physical weight of the product itself: it is not the material substance customers are paying for. The real value lies in the knowledge and skills of the people who made the products and the marketing power of the companies that sell the products. These are all intangible assets or intellectual capital.

In the introduction to the Fortune 500 largest companies in 2001, Thomas Stewart wrote "In the pages of Fortune that follow are thousands upon thousands of statistics that reveal very little that's meaningful about corporations they purportedly describe" (Stewart, 2001, p.184). According to Stewart, the General Accepted Accounting Principles (GAAP) generally do an unacceptable job of accounting for knowledge-based companies. In today's economy, indicators like revenues, profits and assets only tell a minor part of the story. The real wealth of organizations has to be sought in the people, their knowledge and skills, internal processes and the company's reputation. Therefore, in order to compensate for this shortcoming, Fortune asked Baruch Lev, Professor of accounting at the Stern Business School at New York University, to make an alternative ranking of the smartest US companies by also calculating their knowledge capital. Compared to the "classic" Fortune 500, this new ranking revealed that the value in the knowledge economy does not necessarily reside in companies with high book values and also illustrated the serious shortcomings of financial data as an indicator of wealth in the knowledge economy.

Acknowledgement of this shortcoming inspired many to develop tools that reveal the value of the new wealth (Andriessen, 2004a). Probably the most well known initiative has been the development and application of the Skandia Navigator by Leif Edvinsson in the early and mid nineties. As the world's first Director of Intellectual Capital, Edvinsson's assignment (in 1991) was to grow and develop the company's intellectual capital as a visible, lasting asset that would complement the balance sheet (Edvinsson & Malone, 1997). In the spring of 1993 Skandia published its first (internal) Intellectual Capital Report (IC-report) in which the hidden capital was revealed based on about twenty indicators. Shortly after this internal report, Edvinsson was asked to put together a report for external publication as a supplement to the traditional financial statement. This resulted in the publication of *Visualizing Intellectual Capital* (1995), which again was received with great enthusiasm, both internally and externally. Edvinsson received more than five hundred requests from all over the world to put together IC-reports. Between 1995-1998, Skandia published an IC-report twice a year. Due to overwhelming interest the print run had to be increased every time. The last edition, *Human Capital in Transformation* (1998) the print run was five times higher than the print run for the financial statement.

The interest in the concept of IC was not limited to an organizational level. Also on a national and supranational level many initiatives on the identification, measurement and reporting of intangibles have been carried out. For instance, in 1998-1999 the OECD, together with the Dutch Ministry of Economic Affairs and the Ministry of Education, organized a symposium to address the technical feasibility of improving the quality and comparability of information

on intangibles, the use of this information, and possible strategies for increasing transparency (EZ, 1999). In 2000, the European Union High Level Expert Group (HLEG) on the Intangible Economy published a report on the influence of intangibles on performance and productivity (Eustace, 2000). Between 1998-2001, the MERITUM project (Measuring intangibles to understand and improve innovation management) developed a set of guidelines to measure and disclose intangibles to improve the decision making process of managers and stakeholders (MERITUM, 2002). Between 1998-2003, the Danish Agency for Development of Trade and Industry organized a project in collaboration with researchers and 17 Danish firms that resulted in the so-called Danish Guideline for the development and publication of Intellectual Capital Statements (STI, 2003b). Between 1999-2003, the Nordic Project for Measurement of Intellectual Capital (NORDIKA), financed by the Nordic Industrial Fund, produced another guideline for reporting about intellectual capital (NORDIKA, 2003). Between 2000-2003, as a follow up to the HLEG-project, the PRISM project (Policy making, measurement and Reporting, Intangibles, Skills development and Management) resulted in another report about the importance of intangibles in today's economy (PRISM, 2003). This overview is far from complete, it does however demonstrate the increasing awareness of the importance of intellectual capital in the modern economy and the wish to develop new tools to reveal this wealth, in order to facilitate the management of these resources.

1.3 Knowledge productivity is the biggest challenge

If one accepts as true that knowledge has become our main source of relative advantage and intellectual capital is the new wealth, then the process of transforming this resource into wealth has become the new challenge. Within this research, the process of transforming knowledge into value is referred to as *knowledge productivity* (KP).

It was Drucker (1981; 1993) who realized that the increased importance of knowledge as a source of production, had to be followed by a revision of the concept of productivity. As the productivity of knowledge will be the determining factor in the knowledge economy, the main responsibility of today's management is to make knowledge productive (Drucker, 1993). As he realized that not only the main source of production (knowledge), but also the tools of production (brains) are owned by the employees, he also concluded that the biggest challenge in the knowledge economy was the productivity of the knowledge worker. Therefore, he proclaimed knowledge-worker productivity to be the biggest of the 21st-century management challenges.

> The most important, and indeed the truly unique, contribution of management in the 20th century was the fifty-fold increase in the productivity of the *manual worker* in manufacturing. The most important contribution management needs to make in the 21st century is similarly to increase the productivity of *knowledge work* and *knowledge workers*. The most valuable assets of a 20th-century company was its *production equipment*. The most valuable asset of a 21st-century institution (whether business or non-business) will be its *knowledge workers* and their *productivity*. (Drucker, 1999, p.79, italics in original)

Although we are still referring to "products" and "productivity", the knowledge-based production process (knowledge productivity) has become equally intangible as its input (knowledge) and its output (intellectual capital). As we have seen, in today's economy more than 70% of "production" is based on knowledge. As a consequence, management and organizations have lost sight of the sources of productivity and productivity growth, because "all the major structures of companies – their legal underpinnings, their systems of governance, their management disciplines, their accounting – are based on a model of the

corporation that has become irrelevant" (Stewart, 1997, p.20). Furthermore, management does not have the methods and concepts to reveal the effectiveness of knowledge-based production processes (Edvinsson & Malone, 1997; Stewart, 1997; Sveiby, 1997) and subsequently they do not know how to improve knowledge productivity.

The starting point of this research

The starting point of this research is that it is of vital importance that management and organizations have a clear sight on the drivers of productivity and productivity developments in order to explain and improve organizational performance. However, the lack of appropriate techniques to reveal knowledge productivity hinders management to design effective policies aiming at improving organizational performance. Therefore, to prosper in the knowledge economy, we need new management techniques and strategies (Stewart, 2002).

In developing new management techniques, the first challenge is to make sense of the new reality. "The world is changing in every possible way. The challenge now is to interpret the new world" (Jacobs, 1999a, p.17, translation CS). Therefore, many authors refer to the process of sense making related to knowledge issues (Andriessen, 2004a; Choo, 1998; Edvinsson, 2002; Rylander, 2006). Only by making sense of the new reality, we will be able to change it. Only when we begin to see how knowledge and knowledge assets operate and manifest themselves, then we will understand why managing knowledge should be our first priority (Stewart, 1997). So, how do we make sense of productivity in the knowledge economy? What are the sources or conditions of productivity? And how do we reveal the effectiveness of the knowledge creation process?

When reviewing the literature about knowledge productivity, we see two different interpretations of the concept of knowledge productivity, of which one uses *knowledge* as a starting point, whereas the other uses *productivity* as a starting point (Stam et al., 2004).

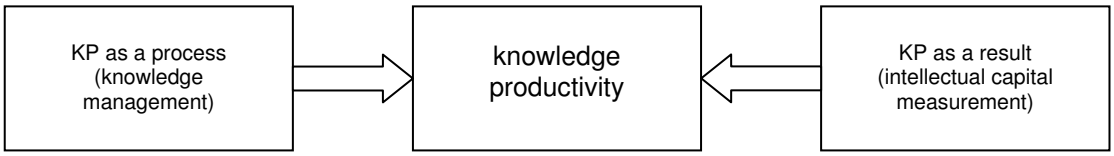


Figure 1.3: Two perspectives on knowledge productivity

Although distinct approaches, they are related in the sense that they both search for more appropriate instruments to reveal and improve knowledge-related performance. The main concern of the first approach is to identify the sources, or conditions for knowledge productivity. The hypothesis is that improvement of the conditions will obviously lead to better performance. The concepts of knowledge management (Nonaka & Takeuchi, 1995; Weggeman, 1997), the Corporate Curriculum (Kessels, 1996; Van Lakerveld, 2005), and knowledge productivity (Kessels, 2001b), are examples of this first approach in the sense that they present theories and methods to improve the conditions for knowledge creation. Core to the second approach is the quest for indicators that can measure and value the output of knowledge-based work. The hypothesis is that these measures will lead the way towards improving conditions. Some examples of this approach are intellectual capital measurement (Andriessen, 2004a; Edvinsson & Malone, 1997; Stewart, 1997; Sveiby, 1997) and the productivity of knowledge as interpreted by Zegveld et al. (2000; 2002; 2007; 2004) in the sense that they provide methods to calculate knowledge-based performance. Within the context of this research, the first approach, aiming at improving the process of knowledge creation, is labelled *knowledge management*. The second approach, aiming at measuring the effects of the knowledge creation process, is labelled *intellectual capital measurement* (***Figure 1.3***).

Important starting point of this study is that both knowledge management and intellectual capital measurement aim at improving knowledge-based performance or knowledge productivity. Furthermore, knowledge management and intellectual capital measurement can enhance each other in the sense that increased awareness about the knowledge-based performance will improve the ability to develop policies for improvement (Bontis, 2002; Marr, Gupta, Pike, & Roos, 2003; Mouritsen, Bukh, Larsen, & Johansen, 2002; Roos, Roos, Dragonetti, & Edvinsson, 1997; Stam et al., 2004; Wiig, 1997). Which brings us to the objective of this research.

1.4 Research problem and question

We think it is of vital importance that management and organizations have a clear sight on the drivers of productivity and productivity developments in order to explain and improve organizational performance.
During the past decades our production process has changed. The traditional factors of production, like natural resources, labour and capital have lost significance. At the same time the importance of intangible inputs, like information and knowledge, rose (Drucker, 1993; Toffler, 1981). Knowledge has become the main ingredient in products and services (Savage, 1996) and subsequently knowledge-worker productivity (Drucker, 1999) or knowledge productivity (Kessels, 1996, 2001b) has become the main challenge.
As a consequence of the transition to the knowledge economy, management and organizations have lost sight of the sources of productivity and productivity developments. Important underlying cause of these problems is the fact that we do not have the methods and concepts to reveal the effectiveness of knowledge-based production processes, and subsequently we do not know how to improve knowledge-based performance (Edvinsson & Malone, 1997; Stewart, 1997; Sveiby, 1997). The lack of appropriate methods that provide information about the knowledge production process hinders organizations to design effective policies aiming at improving knowledge productivity (Stewart, 2002). Therefore, the objective of this study is to help organizations to diagnose KP and subsequently develop a plan for KP enhancement. This objective has been translated into the following main research question:

> *How can we design and test a management method that helps knowledge-intensive organizations to make a diagnosis of their knowledge productivity and develop a plan to enhance it?*

In order to be able to answer the main question, we formulated six sub questions. These questions will be leading in the structure of this study (Figure 1.4).

1. How can we design and test a management method?
2. What is meant by knowledge productivity?
3. How can we diagnose knowledge productivity?
4. How can we plan knowledge productivity enhancement?
5. What does the (initial) management method look like?
6. What can we learn from applying the method in practice?

These research questions contain several key concepts. In order to be clear about the scope of this research, these key concepts need to be clarified beforehand. First, *management* is defined as the process of leading and directing resources, and *method* is defined as a systematic arrangement of actions in order to achieve a certain goal. The systematic arrangement of actions in this research aim at helping the management to diagnose knowledge productivity and help them to make a plan for knowledge productivity enhancement. Second, as knowledge productivity is the subject of investigation, this research focuses on *knowledge-*

intensive organizations (KIO). Based on Weggeman (1997) and Harrison & Kessels (2004), a KIO is defined as an organization with predominantly knowledge workers, which produce knowledge through learning, in order to achieve personal and organizational goals. Chapter 3 will further elaborate on the concepts of KIO, knowledge worker and learning. Third, the concept of *diagnosis* is closely related to the concepts of measurement. However, whereas measurement predominantly refers to the quantitative process of assigning scaled numbers to items (Swanborn, 1981), diagnosis refers to the qualitative process of identifying, testing and reasoning which is required to draw conclusions about the current situation and decide about actions to be taken. Fourth, the word *plan* (verb) refers to the process of drawing up the actions to be taken. This process results in a *plan* (noun) for knowledge productivity enhancement. This plan demarcates the main result of the method to be designed. Finally, the concept of *enhancement* refers to the activities that aim to overcome current limitations. Within the context of this research that will be the limitations with regard to improving knowledge productivity and subsequently organizational performance.

1.5 Structure of this study

Figure 1.4 presents the structure of this study and relates the structure to the research questions to be answered in each chapter.

The aim of Chapter 2 is to answer Sub question 1: How can we develop and test a management method? As we aim at designing and testing a method within the field of management research, this research follows the design-based research approach as developed by Van Aken (1994; 1996; 2004a; 2005; 2007). Chapter 2 elaborates on the main characteristics of this relatively new research approach and describes the methodology for this research.

In Chapter 3 we explore the concepts of knowledge productivity, knowledge management and intellectual capital measurement. The aim of this exploration is to make sense of the concept of knowledge productivity and to develop a conceptual framework for diagnosing KP and planning for enhancement. The main questions to be answered in this chapter are: what is meant by knowledge productivity (Sub question 2); how can we diagnose knowledge productivity (Sub question 3); and how can we plan knowledge productivity enhancement (Sub question 4)? At the end of this chapter we will draw a first sketch of our method.

Next, in Chapter 4, we present the initial design of our method that helps organizations to diagnose KP in order to make a plan for enhancement. This chapter should be regarded as an answer to Sub question 5. The process of designing and testing the method consists of four phases: defining the application domain; creating a list of requirements; designing the method; and evaluating the design. This chapter follows these steps in designing a first draft of the method, which is called the *Knowledge Productivity Enhancer* (KP-enhancer).

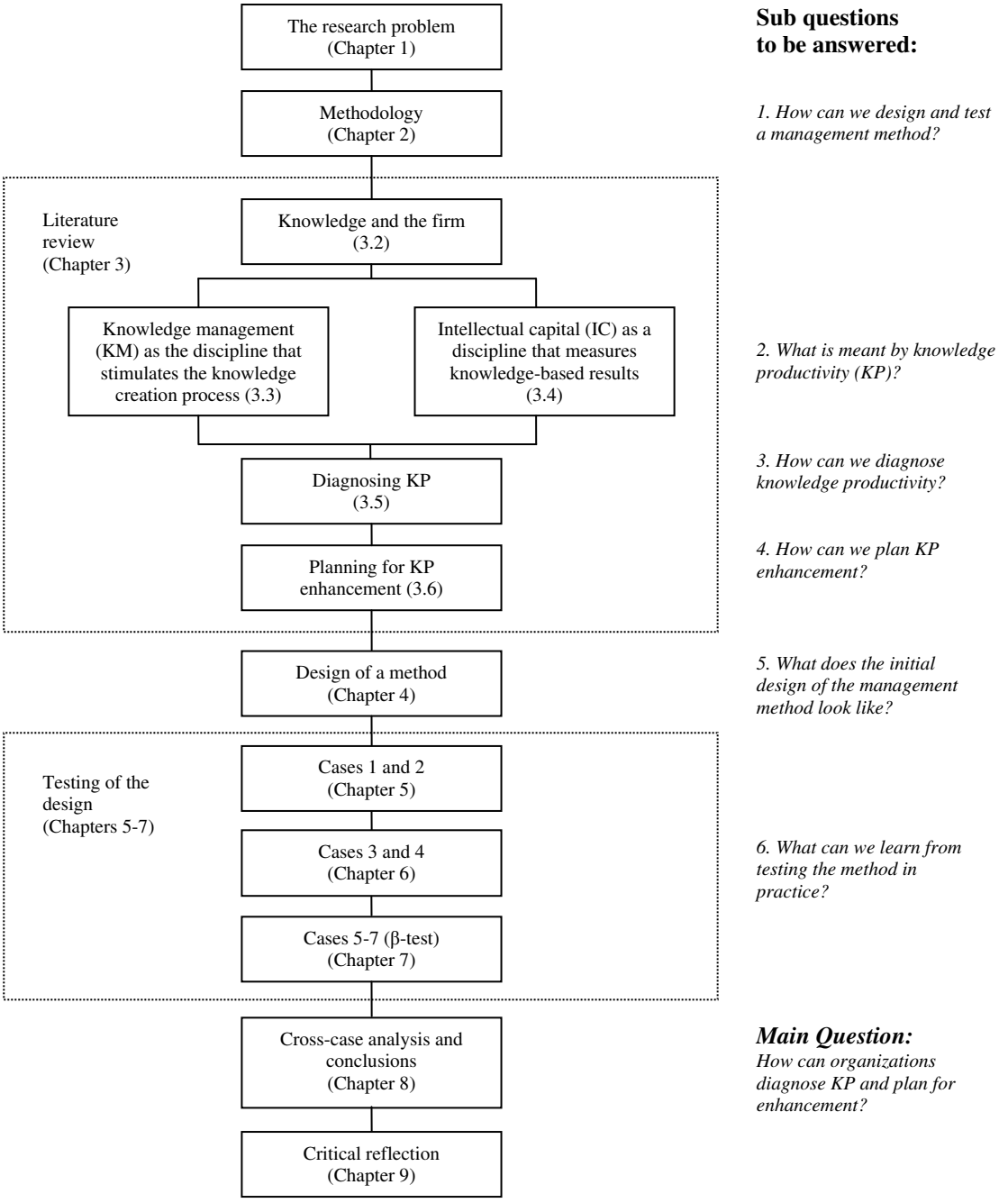


Figure 1.4: Structure of this study

As we do not only want to design a method, but also want to test and improve its effectiveness in practice, the method is applied in seven cases. Chapters 5-7 report on these seven case studies and the improvements that have been made during this process. These cases provide input for answering Sub question 6: what can we learn from applying our method in practice. In Chapter 5 we report about the first two cases: an ICT service provider with 107 employees and a consultancy bureau for SME's with 43 employees. These two case studies took place between October 2005 and May 2006. The aim of these iterations was to test and improve the initial design of the method, as described in Chapter 4. Chapter 6 reports about the third and fourth case in which we applied the KP-enhancer: an executive development centre and a business law firm. These two case studies took place between June 2006 and May 2007. The

aim of these iterations was to test the improved design of the KP-enhancer. In Chapter 7 we report about three cases in which we β-tested the KP-enhancer. The aim of this β-test is to increase the objectivity of the outcomes of our research. As β-testing in the field of management research is a relatively new phenomenon, we first explore this concept and develop a methodology for this study.

In Chapter 8 we compare the results of the case studies and report about the lessons we learned from applying the method in practice (Sub question 6). Next we return to the main research question and present the final design of a method that helps organizations to make a diagnosis of their knowledge productivity and develop a plan to enhance it.
Finally, in Chapter 9 we critically reflect on our research design (design-based research) and some of the choices we made. Did we make the right decisions and if not, what could we have done differently? These reflections will lead to a number of remarks about the nature and merits of the design-based research approach.

1.6 Research relevance

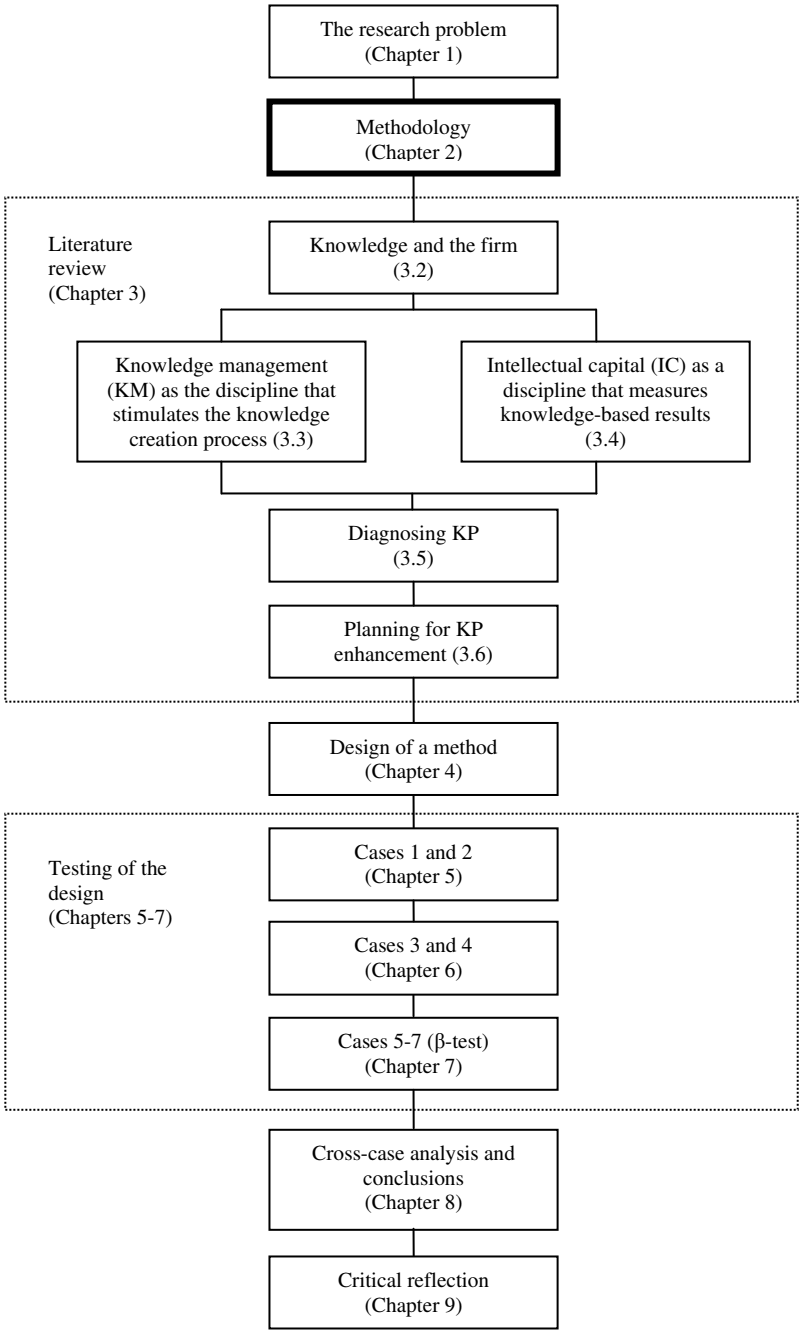
As the aim of this research is to design and test a management method, this research follows a design-based approach. The ultimate objective of design-based research (DBR) is to develop valid and reliable knowledge for solving classes of similar problems in similar contexts. In this research that will be a management method that can be used by (knowledge management) professionals in knowledge-intensive organizations to diagnose knowledge productivity and plan for enhancement. Indirectly, this knowledge can contribute to improving organizational performance. This outcome can be described as *management theory* (Van Aken, 2004a).

Consequence of the design-based approach is that this research does not only contribute to developing valid and reliable general knowledge, but also to solving specific problems. In this research we contribute to solving specific (knowledge management related) problems in seven organizations.

In this research, several concepts and theoretical models are combined and applied in practice. This practical application will not only result in prescriptive knowledge, but will also contribute to further explaining and grounding of the concepts and models that were used. The main contribution of this research is that we explore the concept of knowledge productivity from the perspectives of knowledge management and intellectual capital management.

As we wanted to increase the objectivity of the outcomes of our research, we decided to perform a β-test. Inspired by the process of β-testing in software development, we developed a methodology for β-testing solution concepts. This methodology contributes to the literature about design-based research and other types of action research.

Finally, this research also contributes to macroeconomic programs aimed at further clarifying the issue of productivity in the knowledge economy. Enhancing knowledge productivity means enhancing the ability to create value, and thus stimulating economic growth.



Sub questions
to be answered:

1. How can we design and test a management method?

2. What is meant by knowledge productivity (KP)?

3. How can we diagnose knowledge productivity?

4. How can we plan KP enhancement?

5. What does the initial design of the management method look like?

6. What can we learn from testing the method in practice?

Main Question:
How can organizations diagnose KP and plan for enhancement?

2 Methodology

In this chapter the aim is to answer Sub question 1: How can we design and test a management method? As the objective is to design and to test, this research follows a *design-based research* (DBR) approach. Various terms are used to describe this type of research, including "design science" (Van Aken, 2007), "design research" (Romme, 2003; Van den Akker, Gravemeijer, McKenney, & Nieveen, 2006), and "design-based research" (Andriessen, 2007; DBRC, 2003). Despite the different denotations, they all have in common that they are driven by the desire to increase the practical relevance of research. The main difference between the different design approaches is that they are rooted in different scientific disciplines. Whereas educational Design Research aims at increasing the practical relevance within the field of research for educational policy and practice (Van den Akker et al., 2006), Van Aken's design approach aims at reconciling the rigor-relevance problem in management research (Van Aken, 1994, 1996). As this study is related to management sciences, we follow the approach as developed by Van Aken. However, we will use the term design-based research, as it avoids confusion with studies of designers (Andriessen, 2007). This chapter elaborates on the main characteristics of this relatively new research approach and describes the methodology used in this research.

2.1 Design-based research

The core mission of DBR is to develop knowledge which can be used by professionals in the field to design solutions to their field problems (Van Aken, 2004a). Based on Oost (1999), Andriessen (2007) adds to this that DBR can best be positioned as a research approach aimed at answering a particular type of research problem: the design problem. A design problem is not a separate type of research problem (e.g. description, comparison or definition) but rather the combination of an evaluation problem with an explanation problem. As this research aims at developing and testing a solution concept, this research can be qualified as design-based.

2.1.1 Reconciling the rigor-relevance dilemma

Driving force of DBR is the *utilization problem* (Susman & Evered, 1978; Van Aken, 2005) of management theory. In management research this utilization problem is also referred to as the *rigor-relevance dilemma* (Andriessen, 2004b; Argyris & Schön, 1991). "Management theory is either scientifically proven, but then too reductionistic and hence too broad or too trivial to be of much practical relevance, or relevant to practice, but then lacking sufficient rigorous justification" (Van Aken, 2004a, p.221). Although the word dilemma refers to the notion that there is no satisfactory solution, the challenge of management theory is to reconcile the rigor-relevance dilemma and meet the criteria of both scholarly quality and managerial relevance (Van Aken, 2004a). Andriessen adds to this that reconciliation is the result of a process in which the strength of the two extreme positions are combined. "It involves thinking not in terms of either/or but through/through: improving relevance through rigor and improving rigor through relevance" (Andriessen, 2004a, p.43).

Managers and academics have different frames of reference with respect to management knowledge. Therefore, researchers that aim at reconciling the rigor-relevance dilemma, have to operate within two reputation systems: "the academic reputation system, which rewards rigorous research; and the professional reputation system, which rewards relevant research outcomes and the professional training of prospective managers" (Van Aken, 2004a, p.222).

According to Van Aken, the relevance problem of academic management theory is caused by the nature of its research. So, in order to increase the relevance of management theory, we should change the nature of its research. In his work, Van Aken distinguishes three categories of scientific disciplines (Van Aken, 2004a):

1. The *formal sciences*, such as philosophy and mathematics. Their mission is to build systems of propositions whose main test is their internal logical consistency.
2. *Explanatory science* that describes, explains and possibly predicts observable phenomena within the field. Propositions are accepted to be true on the basis of the evidence provided.
3. *Design science*, which develops knowledge for the design and realization of artifacts, i.e. to solve *construction problems*, or to be used in the improvement of the performance of existing entities, i.e. to solve *performance problems*.

Inspired by Simon (1992, original publication 1969), Van Aken argues that the most important distinction is the one between the explanatory and design sciences.

According to Van Aken (2004a), the relevance problem can be mitigated by complementing description-driven research with prescription-driven research (Table 2.1). The former is based on the paradigm of the explanatory sciences and aims at describing, explaining and possibly predicting observable phenomena. The latter is based on the paradigm of the design sciences and its main objective is to develop knowledge to be used to improve the performance of existing entities. Whereas the explanatory sciences are engaged in a quest for truth, DBR is engaged in a quest to improve human conditions (Van Aken, 2007).

> Most academic research in management is based on the notion that the mission of all science is to understand, i.e. to describe, explain and possibly predict…. However, understanding a problem is only halfway to solving it. The second step is to develop and test (alternative) solutions. (Van Aken, 2004a, p.220)

Van Aken (2004a) proposes to make a distinction between *organization theory* on the one hand and *management theory* on the other. The former is the result of description-driven research on the basis of the paradigm of the explanatory sciences, whereas the latter results from prescription-driven research based on the design sciences (Table 2.1). Organizational theory can be used in a conceptual way by practitioners and can also be used to feed research in management theory. Organizational theory results can be used to derive potential solution concepts, to be subsequently tested and further developed by management theory: "explanatory sciences can provide causal models that we can use in the design sciences to ground means-end statements" (Andriessen, 2004a, p.44). The grounded and field-tested solution concept can be seen as a combination of the outcomes of the two kinds of research.

Table 2.1: The main difference between description-driven and prescription-driven research programmes (Van Aken, 2004a)

Characteristic	*Description-driven research programmes*	*Prescription-driven research programmes*
1. Dominant paradigm	Explanatory sciences	Design sciences
2. Focus	Problem	Solution
3. Perspective	Observer	Player
4. Logic	Hindsight	In prevision intervention outcome
5. Typical research question	Explanation	Alternative solutions for a class of problems
6. Typical research product	Causal model	Tested and grounded solution concept
7. Nature of research product	Algorithm	Heuristic
8. Research strategy	Closed system	Multiple case, using reflective cycle
9. Justification	Conclusive proof	Saturated evidence
10. Type of resulting theory	Organization Theory	Management Theory

Taken together, the defining characteristics of DBR are its interest in solving field problems on the one hand, and its focus on developing design knowledge on the other hand (Van Aken, 2007). As a consequence, DBR simultaneously takes place in and contributes to both theory and practice (Andriessen, 2007). As science and practice operate in different reputation systems, the outcome of DBR is justified by pragmatic validity (Van Aken, 2004a). The following sections elaborate on these defining characteristics.

2.1.2 Solving field problems to develop solution concepts

In the explanatory sciences the typical research product is the causal model. One or more dependent variables are explained in terms of one or more independent variables. The ultimate objective of DBR is to develop valid and reliable knowledge to be used in designing solutions to problems in the field in question. Whereas explanatory or description-driven research aims at explaining a unique and specific problem, DBR aims at developing knowledge for classes of similar problems in similar contexts.

In description-driven research, management implications tend to be treated more or less as an afterthought of the analysis and are not tested as such. Such research uses the perspective of an *observer* and operates in *hindsight*. DBR, however, uses the perspective of a *player* (professional in the field) and uses *in prevision intervention-outcome* logic: what intervention should a player use in the given context to realize the desired outcome (Van Aken, 2004a).

Therefore, in the design sciences the typical research product is the *solution concept*[3].

> A solution concept is "an instruction to perform a finite number of acts in a given order and with a given aim" or "a chunk of general knowledge linking an intervention or an artifact with a desired outcome in a certain field of application" (Van Aken, 2004a, p.228).

In this definition *general* means that the application of the solution concept is not limited to a specific problem, but applicable to the solution of a *class of problems*. However, a solution concept is not a universal law, its use is being limited to a certain field of application (*class of contexts*). Whereas the typical outcome of descriptive research are algorithmic prescriptions ("if you want to achieve Y in situation Z, then perform action X"), in the DBR prescriptions

[3] Again many different words are used to refer to the product of DBR. Frequently used words are *normative prescriptions*, *heuristic technological rules*, *design exemplars*, and *design solutions*.

are of an investigative or *heuristic* nature ("if you want to achieve Y in situation Z, then something like X will help"). This means that a solution concept should be translated by the professional in the field to the specific problem at hand. So, DBR does not develop knowledge for the layman, but rather for the professional in its field.
The main product of this research is a management method (solution concept) that can be used by knowledge managers (professionals in the field) to diagnose KP and subsequently develop a plan for KP enhancement.

2.1.3 Two parallel streams of knowledge production

As we have seen, DBR aims at developing scientific valid knowledge through solving problems in practice. As a consequence, a DBR project is characterized by a combination of two parallel streams of knowledge production. These streams have been labelled *knowledge stream* and *practice stream* (Andriessen, 2007).
The starting point of DBR is that knowledge (theory) and practice enhance each other. They are interdependent and thus, in order to overcome the utilization problem, knowledge and practice should be combined. Therefore, "DBR's dual purpose of contributing simultaneously to theory and practice is expressed in two distinctive but interwoven streams of inquiry, namely the knowledge stream and the practice stream." (Andriessen, 2007, p. 5) Whereas the *practice stream* aims at solving specific problems in specific situations, the *knowledge stream* focuses on producing generalizable and transferable knowledge that can be used as solution concepts for solving similar problems in similar contexts (Figure 2.1).

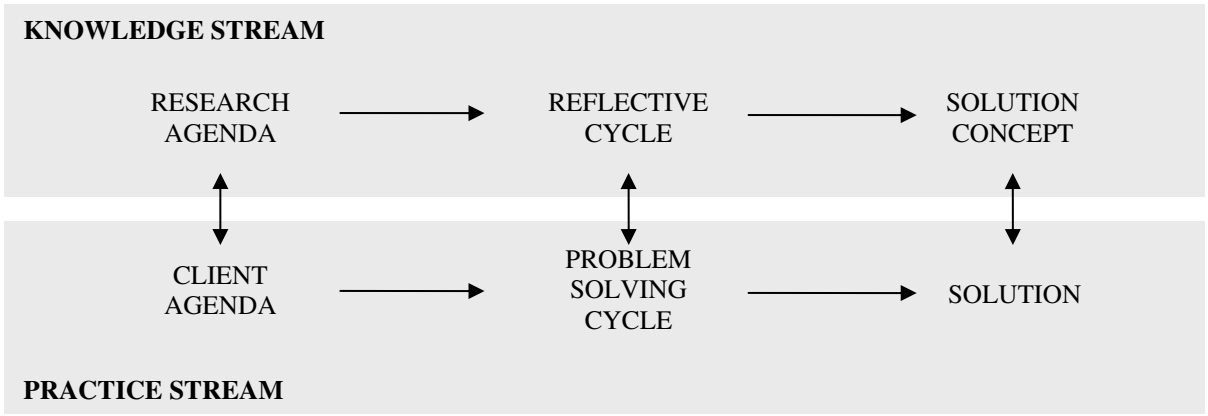


Figure 2.1: DBR is the combination of two parallel streams of knowledge production

In order to connect to the specific modes of knowledge production in the different contexts, both streams are based on different learning cycles. Whereas the practice stream is based on the problem-solving cycle or regulative cycle (Van Strien, 1997), the knowledge stream is based on the reflective cycle (Van Aken, 2004a). The problem solving cycle or regulative cycle (Van Strien, 1997) consists of four phases: defining the problem, planning the intervention, applying the intervention and evaluating the intervention. The reflective cycle is a combination of the *regulative-cycle* of the professional aiming at solving a unique and specific problem and the scientist aiming at the development of general knowledge which can be used in a class of comparable problems.
Acknowledgement of these two different streams of knowledge production and its distinctive characteristics, are an important starting point for this research. This research aims at

developing reliable and valid knowledge for solving a particular problem, however it is acknowledged that this can only be achieved through testing this knowledge in practice.

2.1.4 Justified by generative mechanisms and pragmatic validity

Outcome of this research is a solution concept for diagnosing KP in order to plan KM initiatives. This knowledge should not only be academic valuable, but also appropriate and relevant to improving organizational effectiveness: it should comply with academic rigor and practical relevance. Inherent to this objective, quality control will be a combination of criteria related to academic standards and practical appropriateness.

Whereas grounded theory (Glaser & Strauss, 1967) argues for inductive theory building – developing theoretical ideas from observations of the data themselves – DBR claims grounding can be done with insights from the social sciences that are not given in the form of general laws, but in the form of *generative mechanisms* (Van Aken, 2004a). The generative mechanism is the answer to the question "why does this intervention (in this context) produce this outcome?" When grounding solution concepts, one is interested in both driving and blocking mechanisms, because these will support the translation of the solution concept to other contexts.

The starting point of DBR is that problems and situations might be very similar. However, this is not a guarantee that a solution that worked in situation A also works in situation B. Whereas descriptive or explanatory research leads to propositions which are accepted as true on the basis of the evidence provided, the indeterminate nature of heuristic solution concepts makes it impossible to prove its effects conclusively. However, testing of the solution concept in its intended context can lead to sufficient supporting evidence or *theoretical saturation* (Eisenhardt [1989] in Van Aken, 2004a).

A similar distinction we find between Mode 1 and Mode 2. Both types of knowledge production employ a different type of quality control. In comparison with Mode 1, Mode 2 is more socially accountable and reflexive. (Gibbons, Limoges, Nowotny, Schwartzman, Scott, & Trow, 1994). Knowledge being (scientific) reliable is no longer sufficient.

> Knowledge also needs to be 'socially robust', because its validity is no longer determined solely, or predominantly, by narrowly circumscribed scientific communities, but by much wider communities of engagement comprising knowledge producers, disseminators, traders and users. (Nowotny, Scott, & Gibbons, 2003, pp. 191-192)

This implies that the effectiveness (validity) of the solution concepts will not only be judged by the researcher(s), but also by the users in the field of application. As this group will be mainly concerned with solving the problem at hand, important criterion will be the extent to which the problem has been solved. Therfore, DBR is not only scientifically grounded, but also justified by *pragmatic validity* (Worren, Morrell, & Elliott, 2002).

2.2 Research design

The aim of DBR is solving field problems on the one hand, and developing solution concepts (generalizable and transferable knowledge) on the other. As a consequence, DBR simultaneously takes place in and contributes to both theory and practice. As science and practice are based on different learning cycles, the outcome of DBR is justified by pragmatic validity. Based on these characteristics, this research consists of three interrelated phases.

1. Towards an initial design of a solution concept
2. Testing and further developing of the design
3. Towards a tested and grounded solution concept

Although the knowledge stream and practice stream are continuously interwoven, the strongest connection between the two is in the second phase, in which the solution concept is tested in practice. The other two phases are more dominantly related to the knowledge stream, as they aim at deducing specific knowledge into general knowledge (***Figure 2.2***).

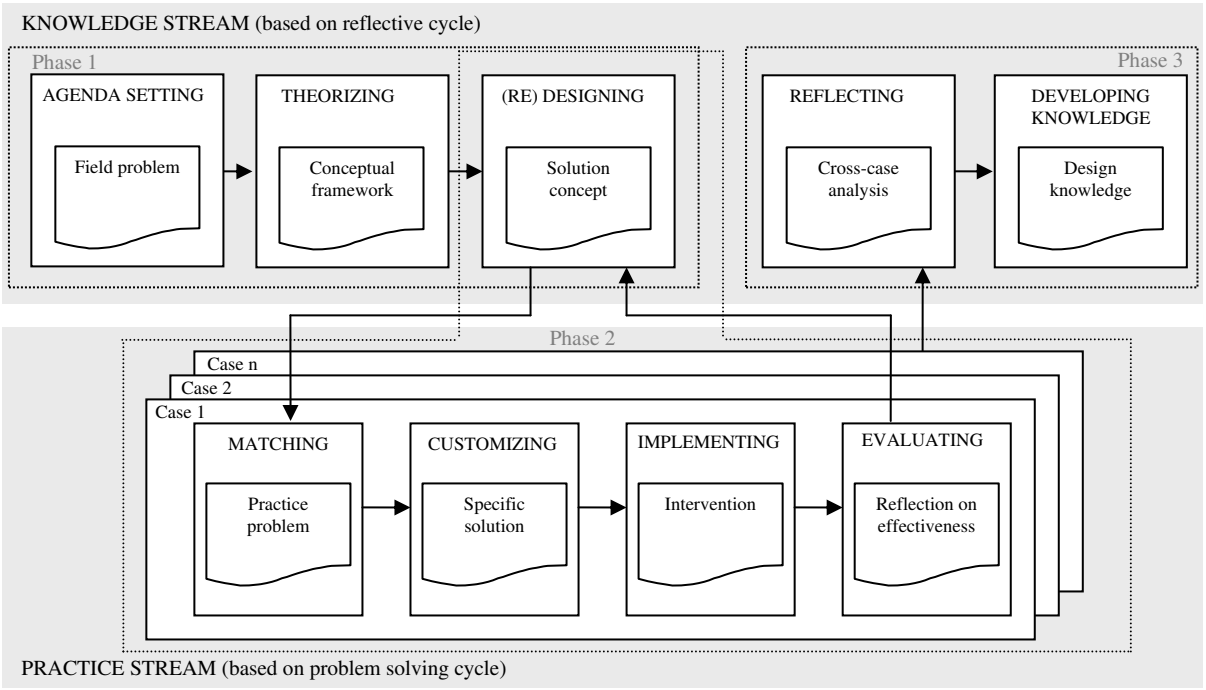


Figure 2.2: Structure of the research from a DBR-perspective (based on Andriessen, 2007)

2.2.1 Phase 1: towards an initial design

The first part of this research will be mainly academic and descriptive, and consists of three steps: agenda setting, theorizing and designing. The result of this phase will be an initial design of our management method (solution concept) to diagnose knowledge productivity in order to plan KM initiatives. The product of this phase will be tested and evaluated in the next phase.

Agenda setting

The starting point of this research is a combination of the professional interest in solving knowledge management related problems and the academic desire to develop reliable knowledge that can be transferred to other contexts than the one in which it was developed. In Chapter 1 this agenda has been translated in a problem statement and subsequent research questions.

Theorizing

The next stage in the research is the further exploration of existing literature from the perspective of the research questions. As this research is based on the concepts of knowledge management, intellectual capital measurement, and knowledge productivity, the review will concentrate on sources related to these concepts. The product of this stage is a conceptual framework, which will serve as a starting point for designing the initial management method (solution concept). Chapter 3 elaborates on this theoretical stage.

Designing

The final step in the first phase is to translate the conceptual framework into an initial design of a method. The process of designing and testing the method consists of four stages (Andriessen, 2004a): defining the application domain; creating a list of requirements; designing the method; and evaluating the design. Chapter 4 follows these stages in designing a first draft of the method, which is called the *Knowledge Productivity Enhancer* (KP-enhancer). This method will be tested in Phase 2 of this research.

2.2.2 Phase 2: testing the design

In the second phase the initial method will be applied in its intended context of application, in order to assess its effectiveness and to make improvements. A solution concept is typically studied within its intended context of application, in order to be as sure as possible of its effectiveness, also under the influence of less well known factors. Therefore, testing the design of the method will be based on *multiple case studies*. "A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (Yin, 2003, p.13). As the aim of this research is not only to test, but also to systematically improve the design, these tests will be repeated several times. Because, "through multiple case studies one can accumulate supporting evidence which can continue until 'theoretical saturation' has been obtained" (Van Aken, 2004a, p.235). As this study aims at applying the method in collaboration with the professionals in the field, this research follows the *developing* multiple case study method (Van Aken, 2004a). This approach is closely related to the *development study*, as proposed by Harrison and Kessels (2004).

Research on solution concepts typically goes through a stage of α-testing and β-testing (Dolan & Matthews, 1993; Van Aken, 2004a). The former is the testing and further development of the solution concept by the researchers themselves in the original context. The latter is the testing of the solution concept by third parties in other contexts in order to obtain more objective evidence. The concept of β-testing within the context of DBR will be further explored in Chapter 7.

Within this research, the second phase of testing the design consists of five steps. After selecting a case (Matching) the solution concept is translated to the specific situation at hand (Customizing) and implemented in collaboration with the professionals in the field (Implementing). Finally, the effectiveness of the method in this specific context is evaluated (Evaluating), lessons are drawn and improvements are made (Redesigning) before it is applied again.

Matching

The aim of this step is to find organizations that fit in the class of contexts and the class of problems for which the method is designed, and that are willing to apply (test) the method. If these criteria are met, then the organization qualifies to serve as a case. The result of this step is a strong indication that the organization qualifies as a case study and is willing to apply the method. This step will be supported by a *call-for-cases*, which informs potential participants about the purpose, the intended results and the practical consequences.

Customizing

If an organization seems to qualify as a case study, the next step is to verify this assumption. Yin (2003) refers to this step as "screening case study nominations". The intake is based on a semi-structured interview. If the organization qualifies as a case study,

a formal plan is made for applying the method. The result of this step is a validated problem statement and a plan for implementation of the method.

Implementing

Within this step the method is implemented within a specific situation to solve a specific problem, which has been formulated in the previous step. After validating the problem statement, data is gathered and interpreted in order to diagnose KP and plan for KM initiatives. Within this step, data is gathered through a web-based survey among all employees (NetQuestionnaires), analysis of financial data, and a series of workshops with a representative group of employees. The result of this phase (a plan for enhancing KP) is the main product of the method under investigation.

Evaluating

Within this research, the design of the method is an incremental process. After each case study the effectiveness of the method will be evaluated. This within-case-analysis focuses on the results and effects of applying the method, the design of the method, the requirements, and the application domain. The lessons learned will be used to improve the design, before applying it in the next case study. The evaluation will be based on the experiences of the researcher, a semi-structured interview with at least two of the persons involved and a statistical analysis of the outcome of the survey. Although the main aim of the case studies is to test the effectiveness of the method in general, every individual case serves a specific purpose within the overall scope of inquiry (Yin, 2003). This specific scope will emerge from the (outcomes of the) research itself.

Redesigning

Based on the outcome of the evaluation, the method is improved before it is applied again in the next case.

Together, these five steps constitute the empirical part of this research. In total, the method will be tested seven times. Chapters 5-7 provide comprehensive reports about these tests.

2.2.3 Phase 3: towards a tested and grounded solution concept

The aim of this research is to develop generalizable and transferable knowledge: knowledge which can be used by others (than those involved in this research) for solving similar problems in similar contexts. As heuristic solution concepts cannot be justified conclusively, the main aim of this research is to collect as much supporting evidence as possible in order to reach a point of saturation of evidence. The question then is, what number of cases do we need to be able to make valid statements about the effectiveness of the method? As we cannot predict how many times the method has to be applied in order to reach this point of saturation of evidence, we aim at four to six cases depending on the availability of cases. Furthermore, in order to increase the objectivity of the outcome our intention is to have the final tests performed by third parties (β-test).

As solving specific problems mainly leads to specific (context-related) knowledge, we need to combine the results from the different case studies in order to develop general knowledge about the effectiveness of the method. Therefore the next (final) step in this research is to reflect on the combined results of all case studies.

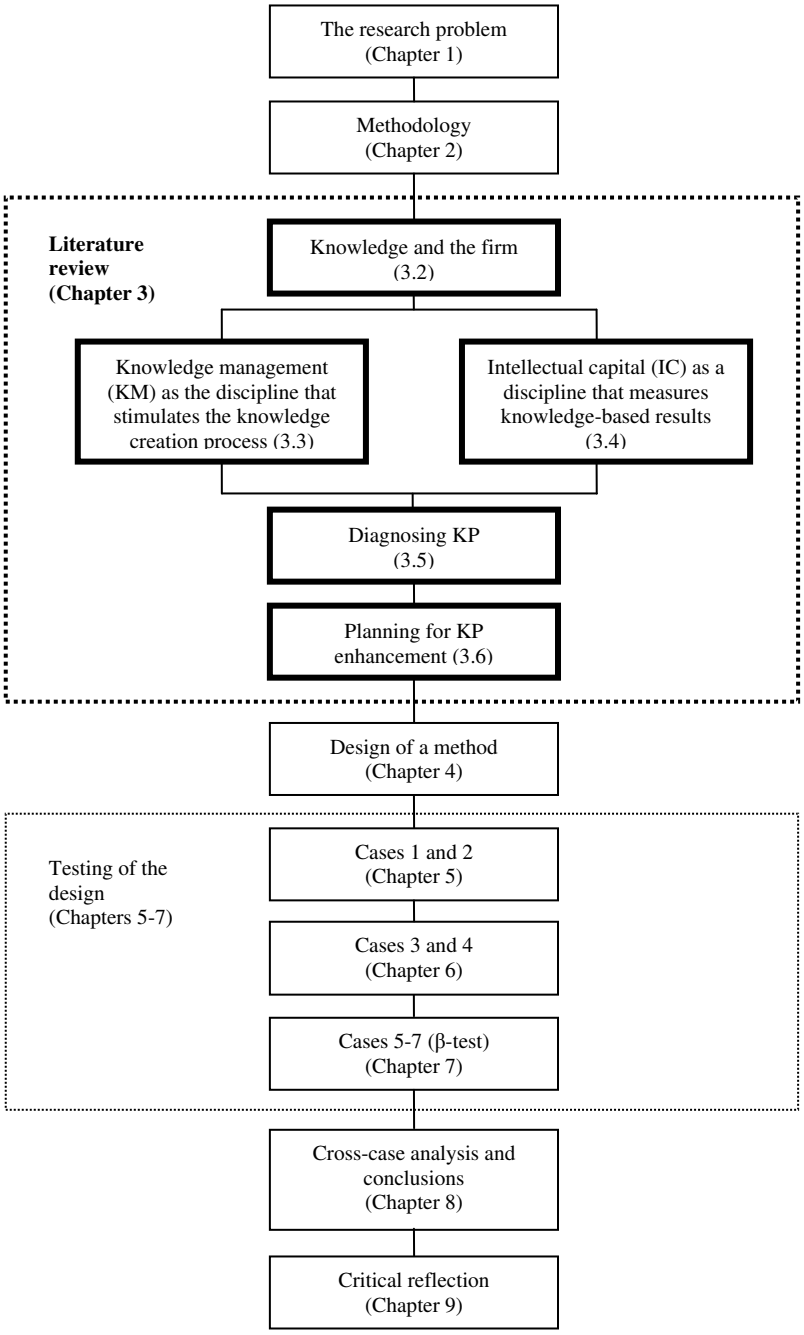
Reflecting

Within this step of the research, we reflect on the combined results of all case studies. This cross-case-analysis (Yin, 2003) will focus on the effects of applying the method, the design of the method and its context of application (class of problems and class of contexts).

Developing knowledge

Finally, after performing the cross-case analysis, we can formulate the final conclusions about the effectiveness of the management method (solution concept), we can also formulate the generative mechanisms and conditions for successful application. Then we return to the main research question and present the final design of a method.

As both steps are closely related, they are combined in one concluding chapter (Chapter 8). Finally, in Chapter 9 we critically reflect on our research design (design-based research) and some of the choices we made. This reflection goes beyond our research questions.



Sub questions to be answered:

1. How can we design and test a management method?

2. What is meant by knowledge productivity (KP)?

3. How can we diagnose knowledge productivity?

4. How can we plan KP enhancement?

5. What does the initial design of the management method look like?

6. What can we learn from testing the method in practice?

Main Question:
How can organizations diagnose KP and plan for enhancement?

3 Literature review

In our research, the main subject of investigation is the concept of knowledge productivity (KP). The starting point of our investigation is that KP refers to *the process of transforming knowledge into value*. In Chapter 1 we argued that the concept of knowledge productivity is subject to two different interpretations. On the one hand KP is interpreted as a process, on the other KP is interpreted as a result. These two interpretations, were labelled *knowledge management* (KM) and *intellectual capital measurement* and will be further explored in this chapter. The aim of this exploration is to make sense of the concept of knowledge productivity and develop a conceptual framework for designing a management method related to the diagnosis and enhancement of KP. In order to do so, we will answer sub questions 2-4 from the research question:

2. What is meant by knowledge productivity?
3. How can we diagnose knowledge productivity?
4. How can we plan knowledge productivity enhancement?

In this chapter we first briefly introduce the concept of KP (3.1). In the next section we further explore the context of this research through elaborating on the concepts of the knowledge-based view of the firm; the knowledge-intensive organization; the knowledge worker; and learning (3.2). In order to better understand the two perspectives on KP we explore the concepts of knowledge management (3.3) and intellectual capital measurement (3.4). Next we investigate two different approaches to diagnosing KP (3.5). Then we elaborate on a method that combines the concepts of knowledge management and intellectual capital measurement in order to plan for enhancement (3.6).And finally, in the concluding section (3.7) we reflect on the literature review and formulate an answer to Sub questions 2-4. These answers serve as a starting point for the initial design of our method in Chapter 4.

3.1 Introduction

In Chapter 1 we argued that KP refers to the process of transforming knowledge into value. Knowledge productivity is subject to two different interpretations (Stam et al., 2004). Combining these interpretations implies that knowledge productivity refers to the organizational ability to produce knowledge-based results.

The wealth of knowledge

Although KP is a relatively new concept, the combination of the concepts of *knowledge* and *productivity* is not new. The awareness that knowledge and productivity are closely related already goes back for many decades. Some would argue that it goes back for several centuries (Warsh, 2006). In a sense, the importance of knowledge as an economic factor has always been the core of the economic sciences. The famous story about the pin factory in The Wealth of Nations (Smith, 2000, original publication 1776), already stressed the importance of knowledge accumulation (through specialization). However, as mathematics started to dominate the economic sciences, and as knowledge was hard to quantify, knowledge was long considered to be a *side-effect*, a *spill-over*, or *residual*. The acknowledgement of knowledge as an important wealth creating factor, has been an "underground river" that came to the surface every now and then, but only recently started to get accepted in mainstream economics and management sciences (Warsh, 2006).

In a sense, it was in *The production and distribution of knowledge in the United States* that Machlup (1972, original publication in 1962) rediscovered the importance of knowledge as a product. In his recalculation of the national product of the United States, Machlup discovered

that "total knowledge production in 1958 already accounted for almost 29 per cent of adjusted GNP" (p.362). In addition, the "knowledge-industry" was not only the largest industry, but also grew faster than the traditional industries. These conclusions led to the observation that there should be some relationship between knowledge, value creation and economic growth.

Drucker: knowledge worker productivity

It was Drucker (1993; 1999) who translated the macro-economic discovery of Machlup to organizational level. According to Drucker, "we know that productivities are created and destroyed, improved or damaged, in what we call the 'micro-economy': the individual enterprise, plant, shop, or office" (Drucker, 1981, p.20). He also realized that the real productive power of organizations is determined by the ability of the knowledge workers to make knowledge productive. Therefore, in *The post-capitalist society*, Drucker (1993) stressed the importance of the development of a new economic theory that puts knowledge in the centre of the wealth creating process (p.171). In *Knowledge worker productivity: The biggest challenge* (Drucker, 1999) he elaborates on this new economic theory and describes a set of management guidelines for knowledge-worker productivity. According to these guidelines, six major factors determine knowledge worker productivity (pp.83-84):

1. Knowledge worker productivity requires awareness of the individual contribution. It demands that we keep asking the question 'What is the task?'. This helps knowledge workers to focus on their task and eliminate anything else.
2. It demands that we impose the responsibility for their productivity on the individual knowledge workers themselves. Knowledge workers have to manage themselves. They have to have autonomy.
3. Continuing innovation has to be part of the work, the task and the responsibility of knowledge workers.
4. Knowledge work requires both continuous learning and continuous teaching on the part of the knowledge worker.
5. Productivity of the knowledge worker is not – at least not primarily – a matter of the quantity of output. Quality is at least as important and depends on the task of the knowledge worker.
6. Knowledge workers should be seen and treated as an 'asset' rather than a 'cost'. Knowledge productivity requires that knowledge workers want to work for the organization in preference to all other opportunities.

The competitive advantage of businesses increasingly depends on the ability of organizations to make the knowledge worker more productive. The above guidelines are based on the presupposition that the person that does the job (the knowledge worker) is the only true expert of productivity (Drucker, 1981). However, the productivity of knowledge and knowledge workers is primarily seen as a management responsibility. "Knowledge-worker productivity is the biggest of the 21st-century management challenges" (Drucker, 1999, p.92). In order to face this challenge Drucker suggests to develop a theory that discloses the relationship between the productivity of knowledge workers and the environment.

> Not to see the forest for the trees is a serious failing. But it is an equally serious failing not to see the trees for the forest. One can only plant and cut down individual trees. Yet the forest is the 'ecology', the environment without which individual trees would never grow. To make knowledge productive, we will have to learn to see both forest and tree. We will have to learn to connect. (Drucker, 1993, p.180)

To get better insight in the sources of productivity we will have to see the effectiveness of the people in relationship to their environment.

Combining Machlup and Drucker

The different interpretations of Machlup and Drucker illustrate the two different approaches of the concept of knowledge productivity. Is it about knowledge, or is it about productivity? Is it a process or a result? Whereas Machlup, based on economic theories, interpreted knowledge productivity as a result, Drucker, based on management theories, interpreted knowledge productivity as an organizational ability. Whereas Machlup predominantly aims at explaining, Drucker predominantly aims at improving the knowledge-based production process.
As we think that increased awareness about this process contributes to the ability to develop policies for improvement (Bontis, 2002; Marr et al., 2003; Mouritsen et al., 2002; Roos et al., 1997; Stam et al., 2004; Wiig, 1997), we think the challenge is to combine the two different interpretations. To conclude, as knowledge management aims at improving the process of knowledge creation, and as intellectual capital measurement aims at explaining knowledge-based results, we think we should combine these two concepts.

In Chapter 1 we argued that knowledge productivity refers to "the process of transforming knowledge into value". At this point, combining Machlup (1972) and Drucker (1999), this can be specified as:

> ***knowledge productivity refers to the management ability to generate knowledge-based results.***

Although this description is more specific than our description in Chapter 1, it certainly needs further specification. What does "management ability" mean and what does "knowledge-based results" mean? In the remainder of this chapter we will further specify this description of the main concept of our research.

3.2 Knowledge and the firm

Before we further elaborate on the two different approaches to knowledge productivity, we first explore the context in which this research takes place. As *knowledge* is an important concept in our study, we first define this concept (3.2.1). The starting point of our study is that knowledge is the main source of competitive advantage. Therefore, our study will be positioned in the *knowledge-based view of the firm* (3.2.2). In Chapter 1 we defined the *knowledge-intensive organization* as an organization with predominantly *knowledge workers*, which produce knowledge through *learning*, in order to achieve personal and organizational goals. Therefore, in the sections that follow, we successively elaborate on the concepts of the *knowledge-intensive organization* (3.2.3), the *knowledge worker* (3.2.4), and *learning* (3.2.5). Finally we will further specify our definition of knowledge productivity.

3.2.1 Knowledge: an autopoietic epistemology

As knowledge is an important concept in our study, we will first define this concept and make our epistemology clear. Within this study, knowledge is defined as a *personal ability* (Kessels, 1996, 2001b; Mouritsen et al., 2002; Sveiby, 1997; Weggeman, 1997), which means that knowledge is always related to a person. Interpreting knowledge as a personal ability implies an autopoietic epistemology (Von Krogh & Roos, 1995).
In today's knowledge management literature, it seems to be common ground to make a distinction between "tacit" and "explicit" knowledge. This dichotomy is based on Polanyi

(1974; 1983) and Nonaka and Takeuchi (1995). Tacit knowledge – or personal knowledge – is personal, context-specific, and therefore, hard to formalize and communicate. It is inextricably bound up with the person who carries it and the context in which it has been obtained. Tacit knowledge represents personal experiences, skills and attitudes (knowhow). It is personal craftsmanship developed in practice. It is dynamic, and always "under construction". It is difficult to give verbal expression to tacit knowledge, and therefore, it is hard to transfer. Explicit knowledge – or codified knowledge – is knowledge that is transmittable in formal, and systematic language, such as theories, formulas, procedures and handbooks.

More and more, the distinction between tacit and explicit knowledge is questioned, as the concept of explicit knowledge does not add anything to the concept of information (Kessels, 2001b; Malhotra, 2000; Weggeman, 1997). "In fact, explicit knowledge is nothing more than information about the ability of another person" (Kessels, 2001b, p.7, translation CS). Explicit knowledge informs us about the knowledge of others, however, it does not help us to acquire the same knowledge, as knowledge can only be obtained through personal experience. It is a misconception that knowledge – as an ability – can be shared or stored. Therefore, we should not refer to two types of knowledge, but to two distinct knowledge-components: "information" (I-component) on the one hand and "experience, skills and attitude" (ESA-component) on the other. Knowledge as such is "an ability to perform a certain task". This ability is a metaphorical function of the two knowledge components (Knowledge = I*ESA) (Weggeman, 1997, 2000). Compared to information, knowledge refers to a higher degree of processing and understanding (Jacobs, 1999a). Similarly, when explaining the essence of knowledge, Kessels (2001b) prefers to use the distinction made by Aristotle (*The Nicomachean Ethics*) between *episteme* as universal, context-free and objective knowledge, *techne* as practical and context-specific technical knowhow, and *phronesis* as practical wisdom. According to Kessels, knowledge as a personal ability should be compared to the concepts of techne and phronesis. Within this research, no distinction is made between different types of knowledge.

Different authors (Marr et al., 2003; Roos, 2005; Venzin, Krogh, & Roos, 1998; Von Krogh & Roos, 1995) suggest three different epistemologies relevant to knowledge management research and practice: *cognitivist*, *connectionist*, and *autopoietic* epistemology. The c*ognitivist* epistemology considers organizations as open systems, which develop knowledge by formatting increasingly accurate representations of their predefined worlds. Hence, cognitivist approaches equate knowledge with data (observations of states of the world) and information (result of processing data). *Connectionist* epistemology has many similarities with the cognitivist approach, however the rules for processing information are not universal, but context or task-related. Organizations are seen as self-organized networks composed by relationships and driven by communication. Therefore, knowledge resides in the connections of experts and is problem-solution oriented. Finally, the *autopoietic* (from Greek: self-creation or self-production) epistemology considers the organization as an autonomous and observing system that is open to data, but closed to information. Information (and knowledge) cannot be transferred easily, since they require internal interpretation within the system according to the individual's rules. Consequently, knowledge resides in mind, body and social systems.

To conclude, this research follows an autopoietic approach (Von Krogh & Roos, 1995). Knowledge is not an objective or universal entity, but a subjective personal ability which resides in body and mind. Knowledge is always subject to personal interpretation and the usefulness is dependent on the context. The applicability of the knowledge depends on the individual interpretation, within a certain context.

3.2.2 Knowledge-based view of the firm

Within the organization sciences, distinction can be made between different theories of the firm: the industry-based view, the resource-based view, and the knowledge-based view of the firm. Presupposition of this research is that knowledge is the main source of competitive advantage, therefore this study should be positioned in the knowledge-based view of the firm.

The main differences between the different theories of the firm lie in their so-called strategic reference points (Zegveld, 2000). Whereas the industry-based theory uses the external (competitors, suppliers, customers) as starting point for strategy development, the resource-based theory uses the internal (organization, competences) as starting point. The knowledge-based view can be seen as a further specification of the resource-based view. Exemplary for the industry-based view is Porter's *Competitive Strategy* (1980), in which he argues that the essence of formulating competitive strategy is relating a company to its environment. The structure of the industry determines the strategic options as well as the competitive rules of the game. Since outside forces usually affect all firms in the industry, the key is found in the differing abilities of firms to deal with them.
During the past decades a *resource-based view* of the firm emerged (Penrose, 1959; Prahalad & Hamel, 1990; Stalk, Evans, & Shulman, 1992). The resource-based view of the firm is based on the assumption that firm-specific competencies have become the most important source of sustainable competitive advantage. The traditional competitive environment was relatively stable and transparent. It was characterized by clear defined markets, customers and competitors. Today's competitive environment however, is characterized by dynamic changing markets and fast changing customer demands. More and more competitiveness is based on the ability to anticipate these changes and thus asks for a more dynamic strategic approach as an alternative to the traditional industry-based, competitive advantage view. Exemplary for the resource-based view are Hamel and Prahalad (1994), whose main message it is that not the relative position within the industry, but the firm's core competences determine competitive advantage. Core competencies are those distinctive skills and capabilities which, taken together, represent the firm's ability to do business better than its competitors.

> In the short run, a company's competitiveness derives from the price/performance attributes of current products .... In the long run, competitiveness derives from an ability to build, at lower cost and more speedily than competitors, the core competencies that spawn unanticipated products. The real sources of advantage are to be found in management's ability to consolidate corporate wide technologies and production skills into competencies that empower individual businesses to adapt quickly to changing opportunities. (Prahalad & Hamel, 1990, p.81)

So core competencies are the main resources and can be seen as the collective learning in the organization. The ability to learn is a necessary precondition in order to be able to continuously adapt to changing customer demands. Within the resource-based view, the strategic reference point shifted from the external to the internal (Zegveld, 2000). Contrary to the industry-based view, the firm itself became the main subject of investigation. In the long run, competitiveness is derived from the ability to build a core competence, at lower cost and faster than competitors.
The last decade, more and more authors have claimed that *knowledge* is de most important resource. This awareness about knowledge being the most important resource became the starting point of more and more books and resulted in a so-called *knowledge-based theory* of the firm (Grant, 1996; Spender, 1996; Sveiby, 2001). Exemplary for the knowledge-based view are Nonaka and Takeuchi (1995), who argue that, in an economy where the only certainty is uncertainty, the sure source of lasting competitive advantage is knowledge.

Knowledge management literature can be seen as a further specification of the resource-based view into a knowledge-based theory of the firm. “To the extent that it focuses upon knowledge as the most strategically important of the firm’s resources, it is an outgrowth of the resource-based view” (Grant, 1996, p.110). Most important and fundamental difference between the resource-based view and the knowledge-based view is that the former only implicitly refers to knowledge, whereas the latter gives extensive elaborations on the nature and definition of knowledge and the way it should be managed.
Like knowledge management, the concept of intellectual capital also gives further content to the idea of core competences and should therefore also be seen as a further specification of the resource-based theory (Mouritsen et al., 2002; Roos et al., 1997). A difference however, is that intellectual capital management employs a wider strategic focus than knowledge management. Whereas knowledge management focuses on knowledge resources (information and knowledge) in particular, intellectual capital management takes all intangible resources (human capital, structural capital, and relational capital) into account. The management of intellectual capital is broader than the management of knowledge, because it involves the identification, measurement and implementation of activities that contribute to enhancing competitive advantages (Sanchez, Chaminade, & Olea, 2000). In this sense intellectual capital management could be positioned somewhere in between the concept of core competences and the concept of knowledge management (Figure 3.1).

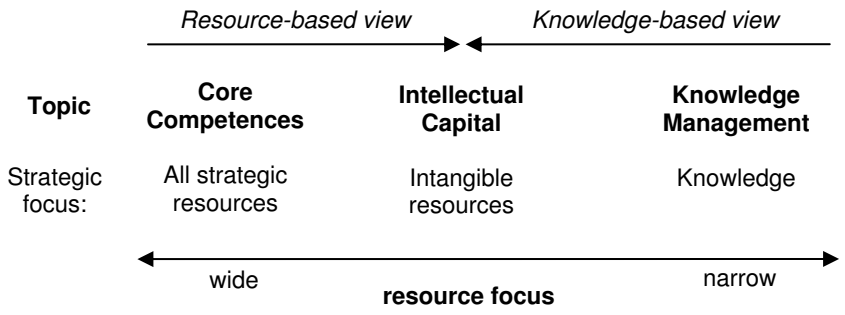


Figure 3.1: Strategic focus of different management topics

Both knowledge management and intellectual capital management were introduced more or less simultaneously. However, subsequently, both concepts were explored in two separate communities. Whereas the knowledge management community was mainly inspired by people like Nonaka and Takeuchi (1991; 1995) and Davenport and Prusak (1998), the intellectual capital community was mainly inspired by people like Sveiby (1997), Edvinsson (1997) and Stewart (1997).
The concept of knowledge productivity claims that knowledge is an organization’s most important resource (Kessels, 1996, 2001b). Therefore, the concept of knowledge productivity is closely related to the concepts of knowledge management and intellectual capital measurement and should be positioned in the knowledge-based view of the firm.

3.2.3 Knowledge-intensive organizations

Focus of our research is at knowledge-intensive organizations (KIO’s). This new type of organization has been described as “knowhow companies” (Sveiby & Lloyd, 1988), “knowledge organization” (Drucker, 1993), “knowledge-creating company” (Nonaka & Takeuchi, 1995), “knowledge company” (Stewart, 1997), “knowledge-intensive organizations” (Weggeman, 1997), “knowing organization” (Choo, 1998), and “knowledge-

intensive firms" (Harrison & Kessels, 2004). Within this research we refer to this type of organizations as KIO's. In Chapter 1 we defined the KIO as an organization with predominantly knowledge workers, which produce knowledge through learning, in order to achieve personal and organizational goals. In this section we further elaborate on the characteristics of the KIO.

The concept *organization* is often defined as a purposive collaborative practice, in which different stakeholders work together in a coalition, in order to pursue a shared collective goal, and to realize individual goals (Keuning & Eppink, 1998). This definition seems to be applicable to organizations in the knowledge economy too. However, more and more the concept of the KIO is used to refer to a distinct type of organizations. Based on a literature review the following characteristics were noted about KIO's.

- Knowledge creation is the vital task. Knowledge is the main resource of the organization. It is both input and output, and therefore, the essence of the KIO is the ability to create, transfer, assemble, integrate, protect and exploit knowledge assets (Drucker, 1993; Stewart, 1997).
- Focus is on continuous innovation. As the main challenge of knowledge-intensive organizations is to continuously adapt to the changing environment, the main concern is to build and maintain the capability to innovate (Nonaka & Takeuchi, 1995; Teece, 2000; Weggeman, 1997).
- Core to the KIO are the knowledge workers. As production of knowledge takes place through learning, the main production tool is the individual, or knowledge worker. Therefore, access to talented people is of eminent importance to KIO's (Drucker, 1993; Florida, 2002; Harrison & Kessels, 2004; Weggeman, 1997)
- The production process is circular, rather than linear. As knowledge outputs also serve as inputs in a new production cycle, the production process has become a learning cycle: production has become the equivalent of learning and the organization has become a site for learning. (Harrison & Kessels, 2004; Kessels, 1996, 2001b)
- The product, output, or outcome, of a KIO is intangible. Intangibles are non-rival assets, as they can be deployed at the same time at different places, for multiple purposes. Intangibles are characterized by large, fixed costs and minimal marginal costs. They profit from network effects, although it is difficult to secure ownership. Innovations in intangibles are often highly risky, and often they cannot be traded, there is no market. (Andriessen, 2004a; Lev, 2001).
- As a result of the previous, KIO's "travel light", they hardly possess any material assets (dematerialization). The traditional company was a collection of physical assets, bought and owned by capitalists who were responsible for maintaining them, and who hired people to operate them. The key assets of today's organization, however, are intangibles of which it is not clear who owns them, or who is responsible for taking care. For listed companies, this characteristic is reflected in a large market-to-book ratio. (Edvinsson & Malone, 1997; Jacobs, 1999a; Kaplan & Norton, 1999; Stewart, 1997).

Based on an analysis of 23 definitions of KIO's, Rylander (2006) concludes that there is no obvious or widely used and agreed definition. However, what they all seem to stress is the importance of knowledge, both as input and as output. If this is true, then the main function of the KIO is to process knowledge. Two definitions that explicitly stress this knowledge processing function are given by Weggeman and Harrison & Kessels when they define the KIO as:

- an organization with predominantly knowledge workers in the primary process and/or in the support staff, provided that they predominantly influence the functioning of the primary process. In a knowledge-intensive firm, knowledge workers develop, share, codify, apply and evaluate knowledge, in order to achieve organizational goals and satisfy customers as well as themselves. (Weggeman, 1997, p.68, translation CS)
- enterprises whose revenue depends on their ability to continuingly generate new knowledge and apply it successfully to clients. (Harrison & Kessels, 2004, p.47)

Based on the above characteristics and considering the two definitions, within the context of this research the KIO is defined as *an organization with predominantly knowledge workers that produce knowledge through learning in order to achieve personal and organizational goals*. Knowledge-intensive organizations can be either commercial enterprises or not-for-profit organizations. They can be either industrial or government-related enterprises: the concept of the KIO goes beyond the traditional (statistical) division in types of products (industries) and types of labour (occupations).

3.2.4 Knowledge workers

In the KIO knowledge is created by knowledge workers. In this sense, the knowledge worker has become the main production "tool" in today's organizations. This new type of employee has also been described as "information workers" (Porat, 1978), "symbolic analysts" (Reich, 1991), "professionals" (Maister, 1993; Weggeman, 1997), "gold-collar workers" (Groen & Vasbinder, 1999; Keursten, 1995), "creative class" or "no-collar workers" (Florida, 2002). Within this research we refer to this type of workers as knowledge workers. This section elaborates on the main characteristics of this type of workers. Based on a review of the literature, the three main characteristics of the knowledge worker can be described as:

- those who own valuable knowledge for the organization they work for;
- those who know how to make knowledge productive;
- those who are self-motivated.

Knowledge workers own valuable knowledge

Knowledge workers own valuable knowledge for the organization they work for. This knowledge is gained through extensive education and experience in the field of practice. Knowledge workers primarily work with their brains. Ideas, concepts and models are their tools. As knowledge is the organization's main asset, knowledge workers own and control the main means of production. Therefore, knowledge workers should not be considered as costs but as a "capital asset". They should not be controlled and reduced, but made to grow (Drucker, 1999). According to Reich (1991), being the owners of the means of production makes the knowledge workers a factor of power and influence. Contrary to Marx's supposition that capitalism would lead to alienation of the means of production, within the knowledge economy the employee owns and controls the most important means of production. Therefore, Drucker (1993) refers to today's society as a "society of employees" Considering that knowledge is embedded in the minds of employees, and considering that people cannot be owned (Universal Declaration of Human Rights), within the knowledge economy it is not about possession of production factors, but about getting access to their knowledge productive abilities (Weggeman, 1997).

Knowledge workers know how to make knowledge productive

Second distinguishing characteristic of knowledge workers is that they do not only own valuable knowledge, but that they also know how to make knowledge productive. Knowledge workers are those who know how to make knowledge productive like capitalists who knew how to make capital productive (Drucker, 1993). According to several authors (Kessels, 2001b; Senge, 1992), this second characteristic is more important and more valuable than the first. Therefore, they define knowledge as "an ability to act", rather than a transferable product.

As organizations continuously have to adapt to change, the ability to learn has become their main competence. "A knowledge worker is someone who, for the – good – execution of his primary task, should continuously and relatively learn a lot" (Weggeman, 1997, pp.81-82, translation CS). So learning has become the critical competence in the value creation process and knowledge workers are people that earn money by learning: knowledge workers are workers that learn for a living. In line with this, Harrison and Kessels define the knowledge worker as "any one who contributes to the core of economic activity in an organization whose profitability and progress depend primarily on effective knowledge work" (Harrison & Kessels, 2004, pp. 16-17).

Knowledge workers are self-motivated

Third characteristic of the knowledge worker is its high level of self-motivation. They are driven by personal interests and operate relatively autonomous. They do not only require the opportunity to give direction to their own tasks and professional development, they are also averse towards management involvement (Maister, 1993; Weggeman, 1997). The latter fits into the shift from management-driven, hierarchical organizations, towards an organization driven by personal responsibility (Drucker, 1993). According to Quinn et al., "self-motivated creativity" consists of will, motivation and adaptability for success (Quinn, Anderson, & Finkelstein, 1996).

When describing the "no-collar workers", Florida (2002) argues that traditional hierarchical systems of control have been replaced with new forms of self-management and intrinsic forms of motivation. Today's professional workforce is like artists and musicians. They set their own hours, dress casual, and work in stimulating environments. They cannot be forced to work, yet they are never truly not at work. As they carry their work with them all the time, the division between "at work" and "not at work" has faded. Some refer to this situation as a "passionate relationship" to work (Pyoria, 2005).

Different types of knowledge workers

As work has transformed to knowledge work, workers have transformed to knowledge workers. Referring to the different types of output, a distinction can be made between different types of knowledge workers. A useful distinction is made by Weggeman (1997), when he refers to "routine professionals" (r-profs) and "improvisation professionals" (i-profs). The former refers to a professional that performs a certain task in a more or less routine manner. The latter refers to a professional that continuously produces new knowledge. A similar distinction can be found in Walz and Bertels (1995), when they make a distinction between "adaptive" and "innovative" employees. Whereas the adaptive employee mainly contributes to generating incremental improvements to existing practice, innovative employees constantly search for possibilities to create radical innovations: different types of employees generate different types of results.

To summarize, in the context of this study we define knowledge workers as *workers that own and control valuable knowledge for the company they work for; that know how to make knowledge productive through learning; and that are to a large extent self-motivated*.

3.2.5 Learning: a social constructivist perspective

In both the definition of the knowledge-intensive organization, and the definition of the knowledge worker we emphasized that knowledge is made productive through learning. But what then is learning? In this section we will see that there is a relationship between learning and knowledge creation.

The learning we are referring to within the context of this research is not necessarily the learning through formal education (school, college, university). The concept of learning is interpreted in a much broader social constructivist perspective (Kessels, 1996, 2001b; Van Lakerveld, 2005), which claims that the construction of reality is a dynamic and social process. Social constructivism is often considered the opposite of cognitivism, since the attention is on learning as an inherent part of working together in social settings (Van Poucke, 2005). This broader interpretation of learning can be summarized as follows:

- Learning is a continuous process
- Learning is more than formal education
- The quality of learning is related to the circumstances

Learning is a continuous process

First, learning is not a temporary, but a continuous process. Whereas learning was considered to be a preparation for work, or to be a short interruption of work in order to prepare for future tasks, more and more learning has become an integral part of work. Learning is continuous and takes place in all domains of human activity. In our work, knowledge continuously has to be enriched in order to cope with changing circumstances, face new challenges and solve new problems. This type of work has the characteristics of learning processes (Kessels & Keursten, 2001). Therefore, "learning is the production process in which knowledge is created" (Weggeman, 1997, p.43, translation CS).

Learning is more than formal education

Second, learning is more than formal education. In fact, learning in the workplace can take place in different ways. Bolhuis and Simons (2001) make a distinction between four different modes of learning.

1. Learning through experience
   This type of learning is the result of acting, observing and experiencing what happens in a certain environment, how it is designed and how it works.
2. Learning through social interaction
   This type of learning is driven by interaction between people. It is a social activity. It is learning with, from, and through each other.
3. Learning through theory
   This type of learning is the result of translating abstract, generalized, and systemized information back to practice.
4. Learning through critical reflection
   This type of learning results from asking questions to one self and others.

An additional way of learning is through a combination of these different modes of learning (p.46). Important distinction between the former two ways of learning and the latter two is that the former more or less take place automatically, while the latter only take place as a result of a deliberate effort. The possibility of combining different modes of learning demonstrates the richness of the workplace as a place for learning. Therefore, the working situation is considered to be a powerful learning situation (Sprenger, Poell, & Boot, 2002). However this is not self-evident.

The quality of learning is related to the circumstances

Third, learning is a process and the quality of learning is related to the quality of the circumstances in which the learning takes place. This implies that improving the quality of the circumstances would improve the quality of learning. Therefore, organizations should take care of creating an effective learning environment.

Learning is a "situated activity": "What people learn, the pace at which they do so, the quality and depth of their understanding, are much related to the circumstances in which they have to live and work" (Garvey & Williamson, 2002, p.5). With regard to the vital role of learning in the process of knowledge creation, it would be unwise to leave the necessary learning to chance. Therefore, organizations should create an environment (a rich landscape) which supports learning (Kessels, 1996). In other words, a knowledge productive environment.

As we want to stress the relationship between learning and the process of knowledge creation, we follow Weggeman (1997) and define learning as *the production process in which knowledge is created*. In addition, learning is more than formal education. It is a continuous process and takes place in all domains of human activity. Learning is closely related to the working situation and it takes place in different modes. The workplace is considered to be a powerful learning situation, however, this is not self-evident. The quality of the conditions determine the effectiveness of the knowledge creation process. Whereas in the industrial economy working and learning were strictly divided, in today's knowledge economy, working and learning go together. Or maybe even more so, learning has become the equivalent of working.

3.2.6 Conclusion

In this section we further explored the context of this research. First we defined knowledge as a personal ability. Next, as we believe that knowledge is the main source of competitive advantage, we positioned this study in the knowledge-based view of the firm. In the following sections we explored the closely related concepts of the knowledge-intensive organization, the knowledge worker, and learning.

Consequence of the increased importance of knowledge as a source of competitive advantage is that organizations have become knowledge-intensive. As knowledge is both input and output, the main function of knowledge-intensive organizations (KIO's) is to process knowledge. Based on the literature review the KIO can be defined as an organization with predominantly knowledge workers, which produce knowledge through learning, in order to achieve personal and organizational goals.

As knowledge has become our main asset, and as knowledge is created through learning, the main production "tool" in today's organizations is the individual or knowledge worker. Distinguishing characteristics of knowledge workers are that they own and control valuable knowledge for the company they work for; that they know how to make knowledge productive through learning; and that they are to a large extent self-motivated.

In Chapter 1 we argued that KP relates to "the process of transforming knowledge into value". In the introduction of this chapter we further specified this description when we concluded that KP relates to "the management ability to generate knowledge-based results". In this section we learned that in knowledge-intensive organizations, knowledge is produced by knowledge workers through learning, therefore, at this point we would describe knowledge productivity as:

the learning ability to generate knowledge-based results.

In this study, *learning* is defined as the production process in which knowledge is created. This implies that learning has become of eminent importance in today's organizations. However, learning is more than formal education. It is a continuous process and takes place in all domains of human activity. Learning is closely related to the working situation and it takes place in different modes. The workplace is a powerful learning situation, however, this is not self-evident. Therefore, the process of learning, or knowledge creation, should be stimulated.

3.3 Knowledge management

In Chapter 1 we argued that the concept of knowledge productivity is subject to two different interpretations. On the one hand KP is interpreted as a process, on the other KP is interpreted as a result. These two interpretations were labelled *knowledge management* and *intellectual capital measurement*. In this section we further explore the concept of knowledge management (KM) in order to gain more insight in the concept of KP (Sub question 2). The main concern of this approach is to identify the conditions for the process of knowledge creation. The presumption is that improvement of the conditions will obviously lead to better performance.
In Chapter 1 we defined KM as "deliberate initiatives that aim at stimulating the knowledge creation process, in order to enable innovation". In this section we first describe how we came to this definition (3.3.1). Next we explore the concepts of *knowledge creation* and *innovation* (3.3.2). Then we explore the essence of KM (3.3.3) and different KM strategies (3.3.4). We conclude by answering Sub question 2: "What is meant by knowledge productivity?" (3.3.5).

3.3.1 Defining knowledge management (KM)

As knowledge has become the main resource in organizations, it seems inevitable that the focus of management – the process of leading and directing resources – shifts towards the process of systematically managing knowledge resources (Drucker, 1993; Weggeman, 1997). Or even stronger, the ability to manage "knowledge based intellect" will be the crucial management skill of our time (Quinn et al., 1996). This implies that managers become "knowledge managers". "The rise of the knowledge worker fundamentally alters the nature of work and the agenda of management. Managers are custodians; they protect and care for the assets of a corporation; when the assets are intellectual, the manager's job changes" (Stewart, 1997, p.47). As knowledge has become the *raison d'être* of the organization, stimulating knowledge creation has become the *raison d'être* of management and management has become equivalent to knowledge management. The concept of knowledge management has been described variously. Some definitions are:

- Systematically creating and recreating knowledge in order to innovate (Drucker, 1993)
- The capability of an organization to create new knowledge, disseminate it throughout the organization, and embody it in products, services and systems. (Nonaka & Takeuchi, 1995)

- Combination of knowledge creating activities in order to enable innovation (Leonard-Barton, 1995)
- The art of creating value from intangible assets (Sveiby, 1997)
- Design and control of the knowledge processes in such a way that the return and the enjoyment of the production factor knowledge increases (Weggeman, 1997)
- Secure the effectiveness of the knowledge flow (Bertrams, 1999).

From these definitions, we extracted three important elements. First, KM is not something that happens by chance: it is about deliberate initiatives. Second, these initiatives aim at stimulating the knowledge creation process. Third, stimulating the knowledge creating activities contributes to innovation. Considering these three elements, we define knowledge management as *deliberate initiatives that aim at stimulating the knowledge creation process*, *in order to enable innovation*.

In the previous section we rephrased our definition of KP into 'the *learning* ability to generate knowledge-based results. As knowledge creation is closely related to learning, and as innovation is closely related to knowledge-based results, it seems we can also refer to KM as *deliberate activities that aim at stimulating knowledge productivity.* This definition comes close to Weggeman (2001) when he argues that "knowledge management can be considered as a formal way of influencing knowledge productivity" (p.9, translation CS). Before elaborating on the *deliberate initiatives* part of our definition in section (3.3.3) we will first explore the concepts of *knowledge creation* and *innovation*.

3.3.2 Knowledge creation and innovation

In our search for a better understanding of the concept of KP we discovered that the concepts of learning, knowledge creation, innovation are used alternately. Therefore, in order to make sense of the concept of KP, these concepts deserve further elaboration. In section 3.2.5 we already elaborated on the concept of learning. In this section we explore the concepts of knowledge creation and innovation.

Knowledge creation

One of the characteristics of the knowledge economy is that, contrary to the relatively stable industrial economy, change has become the normal situation. Therefore, organizations should continuously enrich available knowledge, create new knowledge, and apply this knowledge to the renewal of products, services and processes. To be successful in the knowledge economy, continuous innovation is vital, and the effectiveness of the knowledge creation process determines the level of innovation.

Nonaka and Takeuchi (1995) were very clear about the importance of knowledge creation and innovation in relationship to organizational success. According to these authors, the specific Japanese way of knowledge creation and subsequent continuous innovation has been the secret of the Japanese economic success after World War II. Therefore, they concluded that not knowledge as such, but the effectiveness of the knowledge creation process is the driving force of innovation. The aim of knowledge creation is to generate continuous innovation, which subsequently leads to competitive advantage (Figure 3.2).

Figure 3.2: From knowledge creation to competitive advantage (Nonaka & Takeuchi, 1995)

According to Nonaka and Takeuchi, the process of knowledge creation has two dimensions: *ontological* and *epistemological*. The starting point of the ontological dimension of knowledge creation is that knowledge is solely created by people. An organization without people cannot create knowledge. Therefore, organizational knowledge creation is the process that enables knowledge creation by individuals and diffusion through the knowledge network. The starting point of the epistemological dimension is the distinction between tacit and explicit knowledge. Knowledge creation is the result of continuous interaction between tacit and explicit knowledge. The four different stages in this process are called Socialization, Externalization, Combination, and Internalization (Figure 3.3). Together, these four stages are called the knowledge-creation spiral, the knowledge conversion model, or the SECI-model (Nonaka & Takeuchi, 1995).

From/To	**Tacit**	**Explicit**
Tacit	*Socialization* Creates knowledge through the sharing of experiences	*Externalization* Creates knowledge through articulation and conceptualization of tacit knowledge
Explicit	*Internalization* Creates experiential knowledge through learning by doing	*Combination* Creates knowledge through synthesizing different (explicit) knowledge components

Figure 3.3: SECI-model and the knowledge creation spiral (Nonaka & Takeuchi, 1995)

The SECI-model has inspired many to develop similar models of knowledge creation. Important element of these models is that they make a distinction between different knowledge processes. The essence of knowledge processes is that they identify the different things we do with knowledge. Therefore, they are usually (but not always) expressed as verbs, like create, codify, share, evaluate. Taken together, the knowledge processes are labelled as a "knowledge value-chain" (Weggeman, 1997), a "knowledge flow" (Bertrams, 1999; Sprenger, van Eijsden, ten Have, & Ossel, 1995), a "knowledge transfer system" (Dixon, 2000), a "social learning cycle" (Boisot, 1998), and "knowledge-creating and –diffusing activities" (Leonard-Barton, 1995).

Another similar element within these models is that the process of knowledge creation is a cyclical process. Contrary to the linear industrial production model, the knowledge creation process is described as a continuous, spiral-shaped process that goes upwards (Nonaka & Takeuchi, 1995). Newly created knowledge is not only the result of the past process, but also

the starting point for a new process, in which it will be recreated again. In this sense, the knowledge-creation process is very similar to the process of learning.

To conclude, the logic of these models is that, in order to stimulate the knowledge creation process, all sub-processes should be activated. The division into different sub-processes helps to make the process of knowledge creation manageable, in the sense that they can be systematically monitored and controlled. As we will see below, this is the core idea behind the concept of knowledge management.

Innovation

Considering the pivotal role of innovation with regard to the concept of knowledge creation, it is striking to notice that only so little has been written about this concept in the knowledge management literature. Although (or maybe because), continuous innovation of products, services, and processes is generally accepted as the ultimate goal of knowledge creation, the concept is hardly elaborated upon. Elements of agreement seem to be that:

- today's competitive environment requires continuous innovation;
- innovation is the result of the process of knowledge creation;
- a distinction can be made between incremental and radical innovation.

Today's competitive environment requires continuous innovation

First, it seems to be generally accepted that in today's competitive environment, continuous innovation is a necessary precondition. Therefore, many authors, implicitly or explicitly equate the ability to innovate with competitive advantage (Davenport & Prusak, 1998; Dixon, 2000; Drucker, 1993; Jacobs, 1999a; Leonard-Barton, 1995; Nonaka & Takeuchi, 1995; Weggeman, 1997). So, knowledge creation and knowledge management are not a goal in itself, but support the economic goal of continuous innovation as a decisive factor of competitive advantage.

Innovation is the result of the process of knowledge creation

Second, innovation is acknowledged as the result of the process of knowledge creation. Therefore, Amidon (2003) defines innovation as "knowledge in action". According to Nonaka and Takeuchi (1995), innovation is the result of the combination of the ontological and epistemological knowledge spirals. Furthermore, innovation is the ability of organizations to connect internal and external knowledge: the process in which knowledge flows from the market into the company and back again in the form of new products and services. Within this process, both problems and solutions are redefined, in order to adapt to the changing environment. In line with Nonaka and Takeuchi and other knowledge management sources, Leonard-Barton (1995) also considers innovation to be the core capability of today's organization, and therefore stresses the importance of encouraging and combining knowledge creating and –diffusing activities. "It is this process that enables innovation, and it is this combination that managers manage" (Leonard-Barton, 1995, p.8).

A distinction can be made between incremental and radical innovation

Third, distinction can be made between incremental and radical innovation. Based on the paradigm of the punctuated equilibrium (Eldredge & Gould, 1972) and Kuhn's (1996) scientific revolutions, distinction is made between incremental improvements of existing practice and radical changes (Zegveld, 2000). Inspired by evolutionary biology, innovation is not seen as a process of gradual change, but as a process of intermitted

change. Relative long periods of relative stability are altered with relative short periods of radical change. This implies that we can make a distinction between two types of innovation: incremental and radical. This distinction is closely related to Hamel and Prahalad's (1993; 1994) distinction between "stretch" and "leverage". Stretch can be defined as "doing the impossible" or where ambition outpaces resources. It requires a total commitment to achieve the desired goal which is communicated to and accepted by the whole workforce. Leverage is about getting the most out of resources. The distinction between incremental and radical innovation can also be related to the exploitation/exploration dilemma (March, 1991; Zack, 1999). This dilemma represents the two strategic options a company has: exploitation of old certainties or exploration of new possibilities. Von Krogh et al. (1994) distinguish between an organization's need to survive (maintain its position in its current environment) and its need to advance (forge ahead in an emerging new environment). Abell (1999) summarizes these innovation strategies as "competing today while preparing for tomorrow".

Defining knowledge productivity

Knowledge creation and innovation are two sides of the same coin. They are inherently bound together. The inherent nature of the process of knowledge creation is that it leads to innovation, and innovation is the inextricable result of the process of knowledge creation.
In this section we learned that the knowledge creation process consists of several knowledge processes that together function as a learning cycle. We also learned that distinction can be made between incremental and radical innovation as two distinct types of knowledge-based results. Based on the exploration of the concepts of knowledge creation and innovation, we can now further define knowledge productivity as:

the process of knowledge creation that leads to incremental and radical innovation.

In KM literature the concepts of "learning" and "knowledge creation" are frequently used interchangeably. Although both concepts refer to the process in which knowledge is developed, we prefer to use the concept of knowledge creation, as it gives better expression to the combination of organizational knowledge processes as defined in the KM literature. Similarly, in KM literature the concepts of "innovation" and "knowledge" are frequently used interchangeably. Although both concepts refer to the result of the knowledge creation process, we prefer to use the concept of innovation, as we think that this better expresses the results of the knowledge creation process at an organizational level. In this sense we can make a distinction between knowledge as a personal ability to perform a task, and innovation as an organizational ability to create value.

3.3.3 Basic principles of knowledge management

In the previous we defined KM as deliberate initiatives that aim at stimulating the knowledge creation process. This section elaborates on the "deliberate activities" element of this definition. Based on a review of the knowledge management literature distinction can be made between three "basic principles" of knowledge management (Stam, 2004).

1. Knowledge management is grounded in strategy.
2. Knowledge management is enabling knowledge processes
3. Knowledge management is the design of a knowledge friendly environment

These principles seem to form the backbone of deliberate knowledge management initiatives, and they are used as a starting point of many knowledge management models and methods (Stam, 2004). This section further elaborates on each of these three basic principles.

Principle 1: Knowledge management is grounded in strategy

Within the KIO, knowledge has become the fundamental resource for gaining competitive advantage. However, this does not automatically imply that knowledge has entered the organizational strategy, or that knowledge management is based on strategy.

> Knowledge-based strategies begin with strategy, not knowledge. The new form of intellectual capital is meaningless without the old-fashioned objectives of serving customers and beating competitors. If a company does not have its fundamentals in place, all the corporate learning, information technology or knowledge databases are mere costly diversions. (Manville & Foote, 1996, p.66)

This quotation by two McKinsey consultants, more or less summarizes this first principle. Without strategy, there is no ground for knowledge management. Knowledge management is not a goal in itself. The rationality of knowledge management is in the strategic organizational (business unit, departmental) objectives. The aim of knowledge and knowledge management is to contribute to these objectives.

Hansen et al. (1999) are also very clear about this. Before choosing a knowledge management strategy, executives should be able to articulate the company's competitive strategy.

> What value do customers expect from the company? How does knowledge that resides in the company add value for customers? If a company does not have clear answers to those questions, it should not attempt to choose a knowledge management strategy. (p.114)

So, competitive strategy drives knowledge management strategy. In this respect Nonaka and Takeuchi (1995) refer to the need to develop a knowledge vision. This knowledge vision should contain a demarcation of the organizational knowledge focus or strategic knowledge domains. This knowledge vision serves both as a foundation for the organizational strategy in general and the knowledge objectives in particular. According to Nonaka, the essence of a strategy should be the development of the organizational ability to acquire, create, enlarge, and exploit knowledge, within the strategic knowledge domains. A knowledge strategy gives meaning to work and gives direction to the process of knowledge creation.

Many others confirm the need to explicitly relate knowledge and knowledge management to the organizational goals. Dixon refers to the need to clarify "the relationship between the knowledge to be transferred and the larger goals of the unit or organization" (Dixon, 2000, p.162). Van der Spek (2004) stresses the importance of a knowledge-based strategy and the challenge of "time-to-knowledge" as the foundation for a sustainable effectuation of the organizational strategy. Time-to-knowledge refers to the challenge of getting the knowledge that is needed to realize the strategy available at the right time, at the right place, and in the right form. "In general, this does not happen automatically, and therefore should be organized deliberately" (p.27).

In order to be successful, knowledge management should be integrated in the existing strategy (Davenport & Prusak, 1998; Drew, 1999). Formal integration in the strategy influences the way employees deal with knowledge (Bertrams, 1999). Appreciation of knowledge as a decisive factor of competitive advantage, to a large extent determines the effectiveness of knowledge management. Pfeffer and Sutton (2000) refer to the importance of "why before how". Important reason of failure of knowledge management initiatives is that too many managers focus on *how* in terms of detailed practices, behaviours and techniques, rather than *why* in terms of philosophy and general guidance for action.

Based on an extensive research among 25 firms, Zack (1999) concludes that the most important context for guiding knowledge management is the firm's strategy. "An organization's strategic context helps to identify knowledge management initiatives that support its purpose or mission, strengthen its competitive position, and create shareholder

value" (pp.125-126). According to Zack, a firm has two strategic options, either it can align strategy to what the organization knows (exploit), or it can develop the knowledge and capabilities needed to support a desired strategy (explore). Whatever the strategy, it should be translated into a plan for knowledge management. And for knowledge management to be successful, it should be grounded within the context of business strategy.
Supplementary to existing strategy tools, knowledge management methods explicitly introduce the knowledge dimension into organizational strategy. First step within these methods is the identification of the "knowledge gap". In order to do so, the organization should know what knowledge is available ("knowledge-in-use"), what knowledge is needed, and what knowledge is crucial, considering the desired strategy (Bertrams, 1999; Van der Spek & Spijkervet, 1994; Weggeman, 1997). The answer to these questions will be different in each organization, because each organization will set different strategic priorities. And that is why knowledge management differs per organization.

Principle 2: Knowledge management is enabling knowledge processes

The second principle of knowledge management arises from the process of knowledge creation and represents the essence of the concept. No matter what school, epistemology, or approach, all sources seem to agree that the knowledge creation process can be divided into different knowledge processes, which have to be controlled, managed, nurtured or enabled.
Knowledge processes are the operational processes in the knowledge creation process (Weggeman, 1997). As they refer to the activities related to knowledge creation, they are usually expressed in verbs, like develop, share, apply, evaluate. Taken together, each subset of knowledge processes represents the complete knowledge creation process. The core idea of knowledge management is, that improvement of the knowledge processes will enhance the knowledge creation process, which subsequently will lead to better organizational performance. Different authors divided the knowledge creation process into different subsets of knowledge processes (Table 3.1).

Nonaka and Takeuchi (1995) combine the four modes of knowledge creation (SECI-model) with a time dimension in order to create a dynamic five phase model of knowledge creation. Within this model, the different epistemological and ontological levels continuously interact in a cyclical movement. The result of this process is innovation.
The knowledge processes represent a series of, more or less, consecutive coherent activities, which have a begin and an end[4]. However, this does not mean that the knowledge creation process necessarily starts with the first knowledge process. The sequence of events in the knowledge creation process is not fixed. In reality it is more so that the different parts of the process can be tapped whenever necessary (Sprenger et al., 1995). Bertrams (1999) adds that knowledge creation is a dynamic process. Just putting knowledge in the process will not work. In order to create knowledge, it should flow through the organization. Energizing the knowledge flow is the *raison d'être* of knowledge management.

[4] In organization science, a process usually refers to a sequence of events which can be identified, because it has a clear starting point and a clear point at which it ends. The aim of a process is to transform some kind of input into some kind of output. In this sense, Weggeman (Weggeman, 1997) provides an overview of possible outcomes of each of the knowledge processes.

Table 3.1: Division of knowledge creation process into different knowledge processes

Author	Knowledge processes	Model
Nonaka and Takeuchi (1995)	sharing tacit knowledge, creating concepts, justifying concepts, building an archetype, cross levelling	Five-phase model of knowledge creation
Leonard-Barton (1995)	shared problem solving, implementing and integrating, experimenting and prototyping, pulling in expertise from outside	Knowledge creating and diffusing activities
Sprenger (1995)	absorption, diffusion, generation, exploitation	Knowledge flow
Kessels (1996)	create expertise, problem solving, reflection	Learning functions[5]
Weggeman (1997)	develop, share, apply, evaluate	Knowledge value chain
Boisot (1998)	scanning, problem-solving, abstraction, diffusion, absorption, impacting	Social learning cycle
Dixon (2000)	create, leverage (transfer)	Knowledge transfer process

The different activities in the knowledge creation process are also referred to as (core) competences (Leonard-Barton, 1995; Sprenger et al., 1995). Expressing the knowledge creation process in terms of competences stresses the pivotal role of the individual. According to Leonard-Barton (1995) it is *activities* that create a firm's capabilities. As knowledge creation is related to people, these activities do not have any meaning separate from the people who conduct them.

> Each person or team conducts the activity in a distinct manner.… Knowledge building for an organization occurs by combining people's distinct individualities with a particular set of activities. It is this combination that enables innovation, and it is this combination that managers manage. (p.8)

As discussed above, knowledge creation is closely related to learning. The process of knowledge creation is compared to a "learning cycle" (Van der Spek & Spijkervet, 1994) and it requires specific "learning competences" (Sprenger et al., 1995). The aim of knowledge management activities is to support the learning cycle in general and the learning abilities in particular (Van der Spek & Spijkervet, 1994). Based on similar reasoning, Kessels (1996) developed a set of "learning functions" which enable the knowledge creation process.
According to Boisot (1998), an organization is an "information space" (I-space) in which data are processed through codification, abstraction, and diffusion. Learning is the result of a particular sequence of events within the I-space, which he calls the "social learning cycle". However, the suggested sequence should be thought of as schematic, because different steps may run concurrently. Weggeman (1997) argues that the value of knowledge increases, the more it advances in the knowledge value chain. However, the knowledge value chain is mere a fragment within the knowledge creation and –exploitation process, which passes through time, and consists of a series of identically structured knowledge value chains.
Finally, Dixon (2000) focuses on "common knowledge" – the knowledge that employees learn from doing the organizational tasks – and makes a distinction between the translation of experience into knowledge (create) and transferring knowledge across time and space (leverage). Based on criteria related to the receiver, the nature of the task, and the type of knowledge, she makes distinction between five different types of transfer.

[5] In fact, Kessels identified seven learning functions. According to us, these learning functions combine knowledge processes and enabling factors. Therefore, we only mentioned those that predominantly refer to the knowledge processes. Those that predominantly refer to enabling factors will be covered in the next section.

Without having the intention to create another subset, we can make distinction between, at least, four different activities in the knowledge creation process.

- *Develop*
  Knowledge is created by individuals through education or through experience in the field.
- *Share*
  Within this process, individual knowledge is made available for others, in order to make leverage possible.
- *Combine*
  This is the process in which available knowledge is combined, in order to create value for the (internal or external) customer. In a sense, all other knowledge processes are subordinate to this process.
- *Reflect*
  Within this process, knowledge is created through systematically reflecting on action. This process is closely related to developing, and makes the knowledge creation circle round.

Enabling these these knowledge processes is the essence of the second principle of knowledge management. In addition, knowledge management is needed mostly for those activities, which are least productive (Weggeman, 1997). Knowledge management initiatives often start with diagnosing the quality of these processes, because better understanding of the performance of the knowledge processes gives a starting point for action.

Principle 3: Knowledge management is the design of a knowledge friendly environment

The third basic principle of knowledge management is that the quality of the (organizational) environment determines the effectiveness of the knowledge creation process in general, and the distinct knowledge processes in particular. Therefore, insight into what these specific determining characteristics are, and how *knowledge friendly* they are, provides another starting point for knowledge management actions. This principle is closely related to the third characteristic of the social constructivist perspective of learning as discussed above (section 3.2.5).

Within the knowledge management literature, these characteristics are usually expressed in terms of culture, structure, management style, etc. Frequently used models are the 7-S model (Pascale & Athos, 1983) and the ESH-model[6] (Weggeman, 1997). These models should be seen as a checklist, containing the most important dimensions of organizations. These models "pretend to be relatively complete, in the sense that when an organization is designed or analyzed with the model, only few relevant aspects will stay unnoticed" (Weggeman, 1997, p.85, translation CS). The 7s-model (Pascale & Athos, 1983) identifies seven dimensions of organizations: shared values, strategy, structure, staff, systems, skills, and style. The essence of this model is that it reduces complexity by identifying the main "levers" of organizations. However, although each lever is of greatest importance, the different levers cannot be treated independently. *"The central point is that the FIT among and between them has to be good to get long-term leverage"* (Pascale & Athos, 1983, p.202, italic in original): they are interdependent. Changing one of them affects the whole system. The *ESH-model* (Weggeman, 1997) identifies strategy, management style, systems, personnel, culture and structure as the main organizational dimensions. This model stresses that the organizational factors refer to both intended and unintended, formal and informal, measurable and non-measurable, implicit and explicit, internal and external determined aspects.

[6] ESH stands for Evenwicht, Samenhang and Heterogeniteit (balance, coherence and heterogeneity).

Managing knowledge requires designing an environment that encourages knowledge building activities. Leonard-Barton (1995) acknowledges four "knowledge assets" that support the growth of knowledge. First, the skills embodied in the people physical systems. Second, the managerial systems that enable and reward learning. Third, the underlying values, like respect, tolerance and openness. Fourth, the firm's unique interdependent system, which gives the organization distinctive advantage over others. Within these knowledge assets we clearly recognize dimensions of staff, systems, management style, shared values and culture. The latter stresses the interdependency of the dimensions.
It is the task of the organization to create a context that enables knowledge creation. In this respect, Nonaka and Takeuchi (1995) identify five "enabling conditions": intention, autonomy, fluctuation/creative chaos, redundancy, requisite variety. In addition, in terms of management style and structure, they explicitly refer to the importance of "middle-up-down" management and a "hypertext" structure. Boisot (1998) stresses the importance of culture as a "knowledge asset", and knowledge as an extension of culture. Culture operates through institutional structures, which themselves should be considered knowledge assets. "Over time, culture shapes these institutional structures and is in turn shaped by them" (p.119). This process of reciprocal influence takes place in the process of knowledge creation.
The importance of creating supporting conditions prior to knowledge management initiatives is stressed by Davenport and Prusak (1998). Based on practical experience, they argue that a knowledge-focused culture, a human infrastructure, and (top) management support, are the most important preconditions for knowledge management. Dixon (2000), however, warns for a too strong focus on a-priori organizational conditions, as these can lead to wrong assumptions, which eventually lead to a dead end. The first, "build it and they will come", refers to the myth that databases and incentive programs in itself will improve knowledge creation. The second, "technology can replace face-to-face", refers to the myth that it is no longer necessary to bring people together in order to share knowledge. The third, "first you have to create a learning culture", refers to the myth that a learning culture comes before the exchange of knowledge. Within these assumptions we recognize the dimensions of systems, management style, and culture.
The strong interdependence between knowledge processes and organizational dimensions is reflected in Kessels' (1996) seven *learning functions*, in which both are combined. Although we realize that it is difficult to separate these learning functions, three of these learning functions predominantly refer to the knowledge processes (acquiring expertise, problem solving, reflection). Next, two learning functions seem to refer predominantly to individual abilities (communicative and social skills, and self-regulation of motivation). The final two learning functions (peace and stability and creative turmoil) do not only refer to aspects in the organizational context, but also make the connection between the knowledge processes and the different types of knowledge that are created (incremental and radical innovation).

Based on the literature that has been reviewed, we can identify five key organizational dimensions (next to *strategy* which has already been covered in the first principle) that influence the process of knowledge creation in general and the individual knowledge processes in particular.

- *Organizational culture*
  The culture dimension refers to the shared values within the organization. Important values are trust, respect, and openness. A culture that is non-competitive and collaborative is in general seen as a knowledge friendly culture.
- *Individual skills*
  This second dimension refers to the skills that enable knowledge creation by and between

employees. Communicative and social skills are important enablers to get access to each others knowledge and networks.

- *Information systems*
  This dimension refers to the systems that enable codification and dissemination of knowledge throughout the network. As knowledge creation takes place between people, knowledge friendly systems are those that bring people (physically) together.
- *Management style*
  This dimension refers to the way in which the management facilitates, supports, nurtures its human capital. As knowledge workers are to a large extent self-motivated, a knowledge friendly management style leaves room for self control.
- *Organizational structure*
  This last dimension refers to the formal design of the organization. As knowledge tends to flow along the organizational lines, and as each structure has its advantages and disadvantages, knowledge friendly organizations create mechanisms that compensate the disadvantages of the chosen structure.

From the perspective of knowledge creation, these organizational factors can either contribute positively or negatively to the knowledge friendliness of an organization. For instance, a simple organizational structure, with a few hierarchical levels and an informal culture can contribute positively, whereas a complex structure and formal manners can hinder the process of knowledge creation. Therefore, the organizational environment should be designed in such a way that it enables knowledge creation. It is the aim of knowledge management to nurture stimulating conditions and to prevent that knowledge creation is disturbed.

To conclude the basic principles of knowledge management, we have found a multitude of dimensions. The interdependence of these dimensions, and the influence of all these dimensions on the process of knowledge creation, reveals the complexity of managing knowledge. Successful knowledge management requires a multi-disciplinary approach, which combines traditionally separated disciplines like human resource management and information management (Van der Spek & Spijkervet, 1994). This multi-disciplinary nature is reflected in the different strategies for knowledge management.

3.3.4 KM-strategies

KM literature seems to agree about two different KM strategies (codification and personalization). In this section we suggest to acknowledge a third *enabling* KM strategy. Although all KM strategies aim at enhancing KP, the latter seems to be of special interest in the context of this study.

Codification and personalization

When talking about knowledge management strategies, Hansen et al. (1999) is probably the most cited source. When analyzing the knowledge management strategies in different consultancy bureaus, they found that organizations in general employ two distinct types of strategies. In some companies knowledge management centers on the computer. Knowledge is carefully codified and stored in databases, where it can be accessed and used easily by anyone in the company. This approach is called the *codification strategy*. Other companies appeared to follow a more human-centred approach. Knowledge is mainly shared through person-to-person contacts, and the purpose of computers is to connect people. This approach is called the *personalization strategy*. It is argued that the choice between these two strategies is not arbitrary and is closely related to the competitive strategy. Only if the overall strategy is clear

(see first basic principle of knowledge management), and when the organization is able to formulate how knowledge can contribute to the overall goals, only then the right knowledge management strategy can be chosen. Choosing the right strategy is of eminent importance, because "emphasizing the wrong strategy or trying to pursue both at the same time can … quickly undermine business" (p.107).
In literature we find many examples of similar reasoning with regard to these two distinct knowledge management approaches. A distinction is made between a "system-oriented" and a "behavioral" approach (Van der Spek & Spijkervet, 1994), a "stock" and a "flow" approach (Weggeman, 1997), and an "objective" or "subjective" approach (Bertrams, 1999), a "hoarding" and a "sharing strategy" (Boisot, 1998): an approach that accepts that knowledge can be an objective entity, something that can be separated from people, captured in and shared indirectly through (ICT) systems, versus an approach that considers knowledge to be subjective, per definition related to people, and therefore sharing knowledge goes directly, from person to person. The choice for one of these strategies determines the solutions. Whereas the former approach can lead to solutions like systems, databases, handbooks, and protocols, the latter can lead to solutions like training, development programs, coaching, mentoring, and job-rotation. The widely divergent character of these solutions stresses the multi disciplinary nature of knowledge management.
These approaches seem to be inherent to the Cartesian dualism between object and subject, which led to the two opposing philosophical traditions of rationalism and empiricism. The distinction between explicit and tacit knowledge (Nonaka & Takeuchi, 1995), seems to have fed this dualism, in the sense that some authors stress the importance of choosing between them (Hansen et al., 1999). However, the initial aim of the distinction between tacit and explicit knowledge was to present a framework that could overcome this dualism (Nonaka & Takeuchi, 1995). In line with this reasoning we see more and more the acknowledgement of a third approach to knowledge management.

Enabling strategy

More and more authors acknowledge an alternative approach to KM (Davenport & Prusak, 1998; Rondeel & Wagenaar, 2001; Stam, 2004; Weggeman, 2000). The essence of this approach is that it combines elements of the other two approaches. In this sense Wenger et al. (2002) refer to the concept of "Communities of Practice", Davenport and Prusak (1997; 1998) refer to an "ecological approach", and Weggeman (2000) refers to the concept of "knowledge infrastructure engineering" – the synergetic combination of office layout, ICT, knowledge- and network management. "These disciplines are applied coherently, in order to create a productive work- and learning environment"(p.17, translation CS).
Similarly, Rondeel and Wagenaar (2001) refer to the concepts of "enabling contexts" (Von Krogh, Ichijo, & Nonaka, 2000) and the *Corporate Curriculum* (Kessels, 1996, 2001a), as important expressions of this approach. The Corporate Curriculum consists of seven learning functions that enable the process of knowledge creation.

> The policy and the activities that an organization develops to promote these seven learning functions form its *corporate curriculum*: the plan for learning to increase knowledge productivity, leading to constant improvement and radical innovation, and ultimately to economic advantage. (Kessels & Van der Werff, 2002, p.23)

As knowledge resides in people, the knowledge creation process takes place in the minds of people, and as knowledge workers are to a large extent self-motivated, it could seriously be questioned whether knowledge can be managed, because "you cannot be smart against your will" (Kessels, 2002b). Knowledge management, in the sense of planning and control, seems to be a remainder of the industrial economy, and will appear to be an anachronism – assigning

a phenomenon to the wrong time period – (Kessels, 1996) or an 'oxymoron' – an expression consisting of contrasting concepts (Malhotra, 2000). In this sense Kessels (1996; 2000; 2001b) prefers not to use the term knowledge *management,* but knowledge *productivity*.

> Knowledge productivity includes the ability to signal, to accumulate and to interpret relevant information; the development of new competencies with the help of this information; and the application of these competences to the incremental improvement and radical innovation of work processes, products and services. In fact it is about the way in which employees, teams and departments, based on knowledge, effectuate improvements and renewal. (Kessels, 2001b, p.7, translation CS)

Kessels argues that, within the knowledge economy, the capacity to create value rests with the knowledge workers, and therefore, the power shifts from the manager to the worker. "The question is whether the successful management approach from the past is fully applicable to promote knowledge development" (Kessels, 2002b). Therefore, in the knowledge economy, the organization becomes a site for learning (Harrison & Kessels, 2004). The question then will be, how to design a workplace that enables the necessary learning.
What is confusing about Kessels' work is that he mixes approach and purpose. As discussed above, KM refers to deliberate activities that aim at stimulating KP. Analogue to this reasoning Kessels introduces the Corporate Curriculum as an approach to stimulate KP. What is confusing however, is that he suggests not use the term knowledge management (which usually refers to the approach), but knowledge productivity (which usually refers to the purpose). Considering Kessels' work, we think we should make a distinction between the Corporate Curriculum as an approach and KP as the purpose. In this sense, the Corporate Curriculum could be considered as an enabling approach or *enabling strategy* to KM, next to the codification and the personalization strategy.

In this section we explored different KM-strategies. In the previous section of this chapter we defined KP as "the process of knowledge creation that leads to incremental and radical innovation". This definition to a large extent resembles Kessels' definition of knowledge productivity. In addition, as the Corporate Curriculum has been designed to stimulate KP, it provides a valuable starting point for the development of our management method.

3.3.5 Conclusion

In this section we explored the concept of knowledge management in order to gain more insight in the concept of knowledge productivity. Based on a review of the literature we defined KM as *deliberate initiatives that aim at stimulating the knowledge creation process, in order to enable innovation*. Based on the exploration of the concepts of knowledge creation and innovation, we further specified KP as: *the process of knowledge creation that leads to incremental and radical innovation* (Sub question 2). This implies that KM could also be defined as *deliberate initiatives that aim at stimulating KP*.

Based on a review of the KM literature distinction can be made between three 'basic principles' of knowledge management. These basic principles serve as a foundation for KM initiatives that aim at enhancing KP.

1. Knowledge management is grounded in ambition. Knowledge management is not a goal in itself. The rationality of knowledge management is in the strategic organizational (business unit, departmental) objectives. The aim of knowledge and knowledge management is to contribute to these objectives.
2. Knowledge management is enabling knowledge processes. This second principle represents the essence of KM. The reasoning of this principle is that improvement of

the knowledge processes will enhance the knowledge creation process, which subsequently will lead to better organizational performance.

3. Knowledge management is the design of a knowledge friendly environment. The logic of this principle is that the quality of the (organizational) environment determines the effectiveness of the knowledge creation process in general, and the distinct knowledge processes in particular.

These three principles uncover the process of knowledge creation. Insight in the strength (quality, performance, productivity) of the distinctive elements within a specific context provides a starting point for improving knowledge productivity. Therefore, knowledge management initiatives often start with diagnosing the quality of the knowledge creation process. As diagnosing the knowledge creation process is the aim of our study, these basic principles should be taken into account when developing our method (Sub question 3).

In general, two distinct approaches of KM are recognized. On the one hand an approach that accepts that knowledge can be an objective entity, something that can be separated from people, captured in and shared indirectly through (ICT) systems (*codification strategy, system oriented approach, stock approach,* etc.). On the other hand an approach that considers knowledge to be subjective, per definition related to people, and therefore sharing knowledge goes directly, from person to person (*personalization strategy, behavioral approach, flow approach,* etc.). In this chapter we suggested to acknowledge a third *enabling strategy* to KM. The essence of this strategy is that it combines elements of the other two approaches. Example of this approach is Kessels' (1996) Corporate Curriculum. As the Corporate Curriculum has been designed to stimulate KP it provides an interesting starting point for diagnosing KP from a KM perspective (Sub question 3).

3.4 Intellectual capital measurement

In Chapter 1 we labelled the second approach to knowledge productivity *intellectual capital measurement*. Core to this approach is the quest for indicators that can measure and value the output of knowledge-based work in terms of intangible resources. The presumption is that these measures will lead the way towards improving conditions for knowledge-based performance.
In this section we further explore the concept of intellectual capital (IC) and intellectual capital measurement. First we explore the meaning of the concept of IC (3.4.1). Next we will give a broad overview of the plethora of methods that have been developed to measure IC in order to search for methods that can contribute to our objective of diagnosing KP and planning for enhancement (3.4.2).

3.4.1 Defining intellectual capital (IC)

Different communities use different terms for expressing this phenomenon, and often these different terms are use interchangeably. Accountants predominantly use the term "intangibles" and "intangible assets" (PWC, 2002; Sveiby, 1997), economists use the term "knowledge assets" (Boisot, 1998), and (knowledge) management literature refers to this phenomenon as "intellectual capital" (Edvinsson & Malone, 1997; Stewart, 1997). When the asset is legally secured, through patents, trademarks, or copyrights, the asset is generally referred to as "intellectual property". In essence all these terms refer to strategic intangible resources or "a non-physical claim to future benefits" (Lev, 2001, p.5).
The concept of *intellectual capital* (IC) is grounded in several developments which are closely related to the characteristics of the knowledge economy. The first and main reason for the rise

of this topic comes from a wide-spread dissatisfaction with the five hundred year old accounting system (Edvinsson & Malone, 1997; Stewart, 1997; Sveiby, 1997). Already in the 1980's Karl-Erik Sveiby warns for the danger of this money-driven system, because financial indicators can give misleading signals about knowledge-intensive companies as long as the maintenance of intangibles cannot be treated as investments. "Profitability, or return on capital, is misleading. If it turns out to be the result of a failure to invest in the maintenance and expansion of the knowhow capital it may be a sign that something is going wrong" (Sveiby & Lloyd, 1988, p.70). The second explanation for the rise of IC as a management topic comes from the increasing difference between market- and book value (Edvinsson & Malone, 1997; Stewart, 1997; Sveiby, 1997).

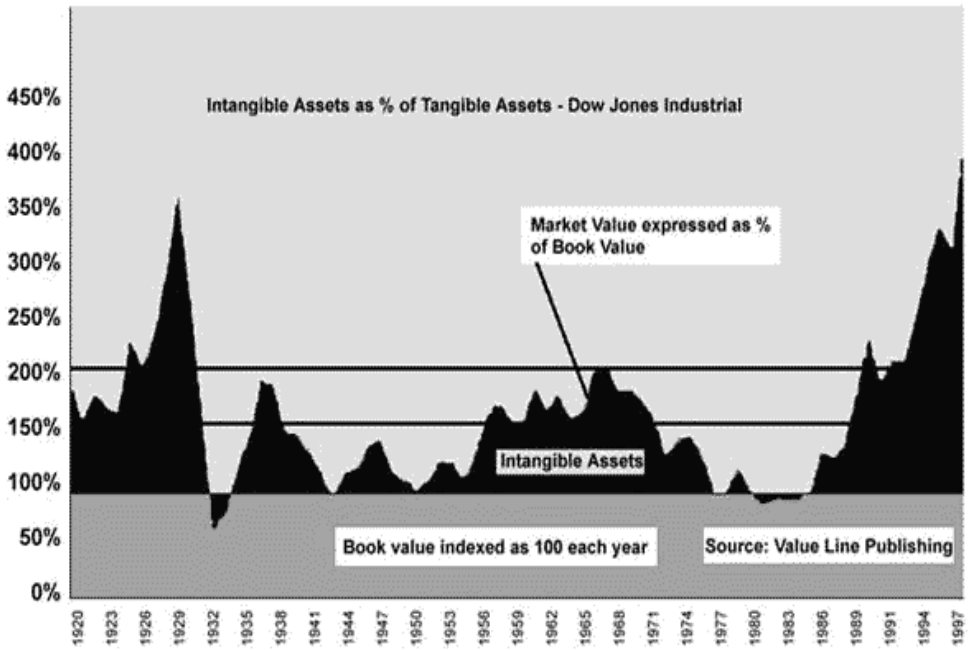


Figure 3.4: Intangible Assets as % of Tangible Assets - Dow Jones Industrial, 1920-1997 (Source: http://www.knowledgecreators.com)

The huge rise of stock prices led to a marginalization of the explanatory power of the traditional balance sheet. As a result, an increasing part of the value of listed companies could not be explained. This phenomenon, in combination with an increasing number of private investors at the end of the century, led to the awareness that something had to be done to explain the huge difference between the market value and the book value (Figure 3.4). A third explanation for the rise of IC, closely related to the second, was the effect of globalization and increasing need for transparency in business reporting. More and more organizations are doing business abroad. Different accounting principles make it difficult to compare and consolidate results and performance figures. IC measurement is an attempt to build a standardized performance framework. The fourth explanation for increased interest in IC is the developments in business automation at the end of the 1990s. The Y2K-problem and the introduction of the Euro forced many companies to invest heavily in their ICT-infrastructure. After the dust settled, companies discovered that they had bought applications with much more possibilities than before. IC and other reporting initiatives can be seen as an intelligent way of exploiting the new ICT infrastructure.

Even after more than a decade, the term intellectual capital has numerous interpretations and definitions. This divergence can be explained by the fact that the field is still in its "embryonic stage" (Bontis, 2002). Andriessen (2004a) adds to this that each author just wants "to convey a specific message that he thinks is important" (p.62). However, despite the differences, we

also see a great deal of agreement about the nature of intellectual capital. Core-elements of agreement seem to be (Stam, 2005):

- *Intellectual capital is about intangibles.*
  An intangible is something which is "hidden or not-material", which is "difficult to understand" and which "cannot be known by the senses", although "it is known to be real" (Longman Dictionary). Intellectual capital gives intangibles an object (Mouritsen et al., 2002), so that they can be recognized and understood.
- *Intellectual capital is the source of competitive advantage.*
  As described above, intellectual capital is a further specification of the resource-based view of the firm. The starting point of this intangible-based view of the firm is that intangibles are the main source of value creation and competitive advantage (Edvinsson & Malone, 1997; Stewart, 1997; Sveiby, 1997).
- *Intellectual capital gives structure to organizational resources.*
  Recognizing the importance of intangibles is one thing, but translating it into a theory is another. Intellectual capital is the movement that gives content to the challenge expressed by Drucker (1993) that we need a theory that puts knowledge (intangibles) into the centre of the wealth creating process. Intellectual capital makes it possible to communicate, interpret and control intangibles.
- *Intellectual capital is about human, and non-human resources.*
  Intellectual capital represents a holistic view of the firm. It is not only about the people (like Human Resource Accounting), but also about the non-human intangible resources, like organizational processes, structures, systems. Intellectual capital goes "beyond the brain" (Andriessen, 2004a).
- *Intellectual capital is about interaction between resources*
  Intellectual capital consists of different sub classes of intangibles (human capital, structural capital, relational capital). Value creation, however, is the product of interaction between the different classes of intangibles (Roos et al., 1997; Sanchez et al., 2000).

The word intellectual capital should not be taken too literally. Intellectual capital is a metaphor – a comparison between two seemingly unrelated subjects – because it describes the importance of all the intangible resources by comparing the ability to use the human mind (intellectual) with financial wealth (capital). However, it is not only about the ability to use the human mind as financial wealth because the word *intellectual* goes beyond the brain and *capital* goes beyond finance.
The word *intellectual* refers to intangibles in general. It refers to both human- and non-human resources. Therefore it is not only about the people, their knowledge and skills, but also about organizational processes and relationships with the customers. The word *capital* refers to financial wealth. However, the essence of the phrase intellectual capital refers almost to the opposite. Intellectual capital goes beyond the traditional accounting principles. It is no longer relevant whether resources can be expressed in monetary terms or not. It is also no longer relevant whether an asset is owned by the organization or not. What matters is whether the resource is available or not. Does the company have access to it in order to realize its strategic goals? That is the main qualifying characteristic of intellectual capital.
The phrase intellectual capital also makes a strong reference to the word "important" or "strategic". The literal meaning of both words refers to the importance of the "head". If we look at the use of the word *capital* in the language it distinguishes the important from the ordinary (e.g. capital city, capital punishment, capital letters, capital importance). In business language "important" is frequently translated by "strategic" (Jacobs, 1999b). In this sense intellectual capital refers to intangibles that are of strategic value to the company, strategic in

the sense that they contribute to the creation of organizational value and the achievement of organizational goals: intellectual capital refers to strategic intangible resources. Considering this review, we would define intellectual capital as *all intangible resources that are available to an organization, that give a relative advantage, and that in combination are able to produce future benefits*.

3.4.2 A plethora of methods

The main objective of this study is to develop a method that helps organizations to diagnose knowledge productivity. As the awareness about the increased importance of IC resulted in a large quantity of methods to measure knowledge-based performance, we made a comparison of these methods in order to find out if they could contribute to our objective of diagnosing KP (Sub question 3).

The problems IC measurement tries to solve

In general, it is acknowledged that the decreasing relevance of existing measurement techniques leads to, at least, two distinct classes[7] of problems (Andriessen, 2004a; Blair & Wallman, 2001; CEC, 2006; Lev, 2001; Mouritsen et al., 2002; Mouritsen, Bukh, & Marr, 2005; STI, 2003b). These problems can be summarized as "internal management problems" and "external reporting problems".

1. *Internal management problems*. Lack of awareness about, and not being able to identify the intellectual capital leads to poor (internal) communication about these resources, distorted resource allocation, and subsequently to under-performance, because, if you do not know what you have, you probably will not use it either.
2. *External reporting problems*. The loss of relevance of financial statements leads to poor valuation, because, if you do not know what you have, how can you report about it and how can external stakeholders (shareholders, clients, future employees) assess the value of your company.

These two types of problems have been the main reasons for the development of methods that measure intellectual capital. The idea of using an intellectual capital measurement method to improve internal management is that more knowledge (about intangibles) leads to a better understanding, which subsequently leads to better judgment and better decision making. According to Andriessen (2004a), this category ranges from the general need of raising awareness about intangible resources, to the specific problem of improving the management decision process. Within this category, further distinction can be made between measuring the results of past events (retrospective) and improving the strategy development process by creating resource-based strategies (prospective). The reasoning behind measuring intellectual capital in order to improve external reporting is that that a more complete disclosure of the resources leads to a better assessment of the value and the performance of the organization.

An emerging standard?

One of the main concerns of the intellectual capital movement in the past decade, has been the development of a so-called *taxonomy* – a branch of various classes of intangibles and their relationships (Andriessen, 2004a; Bontis, 2001, 2002; Bontis, Dragonetti, Jacobsen, & Roos, 1999; Guthrie, 2001; Marr, 2005; Petty & Guthrie, 2000; Stam, 1999; Sveiby, 1998).

[7] Andriessen (Andriessen, 2004a) adds a third type of problems: 'statutory and transactional issues'. Statutory reasons for valuing intangible resources are the result of situations in which it is mandatory to carry out a valuation exercise. Examples are transaction pricing, taxation planning and impairment testing.

Evaluating the state of the field (Bontis, 2002), there seems to be more and more agreement about an emerging standard, which has its roots in a series of "early" methods, like the Intangible Assets Monitor (Sveiby, 1997), the Skandia Navigator (Edvinsson & Malone, 1997), and the Intellectual Capital Index (Roos et al., 1997).

What all these methods have in common, is that they make a distinction between three types of intangibles. Although each author uses its own denotations, the different subsets make similar distinctions. More and more, these three sub classes are referred to as *human capital*, *structural capital*, and *relational capital* (Bontis, 2002; CEC, 2006).

- *Human Capital*: This first class represents anything related to the people within the organization, the employees, their tacit knowledge, skills, experience and attitude.
- *Structural Capital*: This second class represents the "tangible" intangibles. Everything of value that stays behind, after the employees have left the organization, like codified knowledge, procedures, processes, goodwill, patents, and culture.
- *Relational Capital*: This third class represents the relationship with customers, suppliers and other external stakeholders. The value of customer capital is mainly determined by the extent to which an organization is able to maintain confidence in its reputation.

Nowadays, the majority of models is based on this "taxonomy of three", or a further subdivision. The reasoning behind this subdivision is that the concept of intellectual capital is too broad, and therefore needs further specification. The subdivision provides a useful framework for arranging the indicators. Although the logic of the models is that value creation (i.e. intellectual capital) is the product of interaction between the three different classes of intangibles (Edvinsson & Malone, 1997; Roos et al., 1997; Stewart, 1997; Sveiby, 1997), most models only present static indicators related to the individual classes. The acknowledgement of this shortcoming was the main motive for the development of a radical new intellectual capital reporting model: the Danish Guideline. More about the Danish Guideline in the following sections.

Comparing IC methods

After a decade of classifying intangibles, the intellectual capital movement has now reached a phase of reviewing and classifying methods that classify intangibles (Alwert, 2005; Andriessen, 2004a; CEC, 2006; Mertins, Alwert, & Heisig, 2005; Sveiby, 2004). Distinguishing characteristics within these classifications are the purpose (e.g. internal or external) (Alwert, 2005; Andriessen, 2004a; CEC, 2006; Mertins et al., 2005) and nature (e.g. financial or non-financial) of valuation (Alwert, 2005; Andriessen, 2004a; Mertins et al., 2005). Others arrange the models according to their level of detail (division in different classes of intangibles) (Sveiby, 2004), the scope of reporting (organization or components) (Alwert, 2005; Mertins et al., 2005), or the reporting paradigm (governing or future paradigm) (CEC, 2006).

Based on these classifications we made a comparison of 26 methods with regard to their purpose (internal or external) and nature (financial or non-financial). Figure 3.5 demonstrates that the general purpose of intellectual capital measurement is to offer an alternative to the external, financial statements (which could be positioned in the upper right-hand corner). With regard to the nature of the measurements, we see that the majority of the methods (17) are based on non-monetary valuations. With regard to the purpose of measuring, we see that the majority of the methods (14) have been developed for both internal and external purposes.

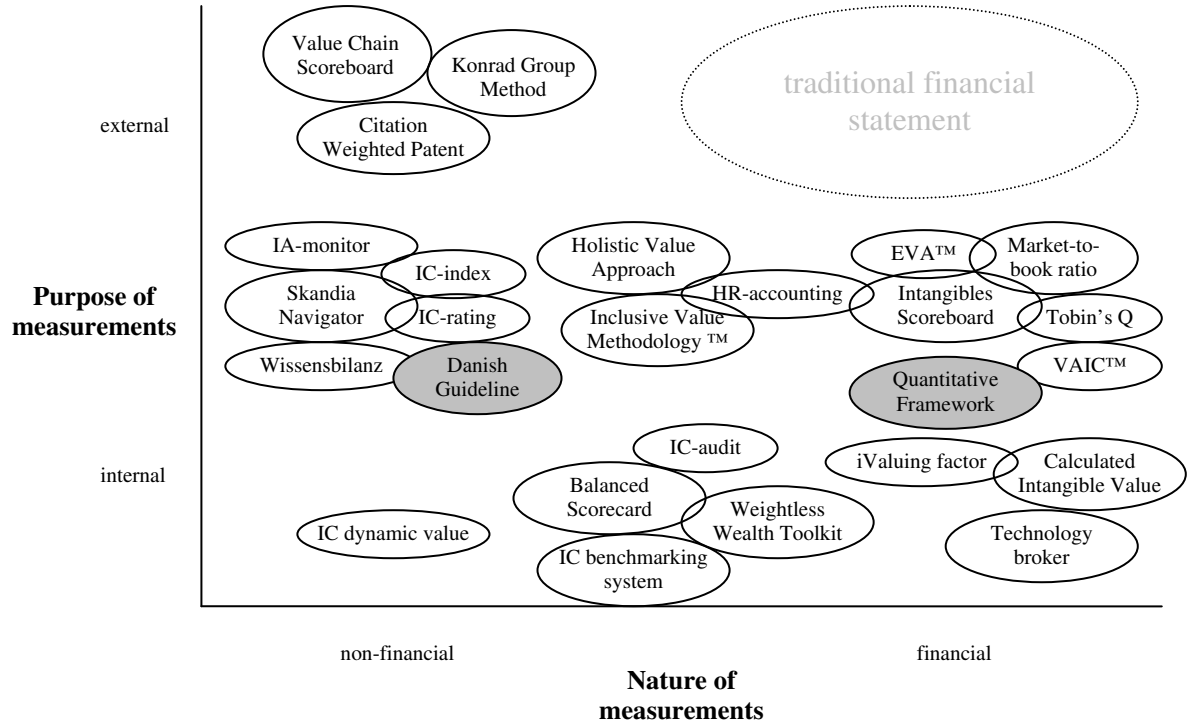


Figure 3.5: Comparison of 26 intellectual capital methods with regard to the purpose and the nature of the measurements. (Alwert, 2005; Andriessen, 2004a; CEC, 2006; Sveiby, 2004)

Considering the purpose of our research (diagnosing KP in order to plan for enhancement) and considering the characteristics of these methods, two of these methods seem to be of particular interest. First the Intellectual Capital Statement Model (Danish Guideline) as developed by the Danish Agency for Development of Trade and Industry in collaboration with researchers and 17 Danish firms (STI, 2003b). Second, the Quantitative Framework for detecting incremental and radical innovation (Zegveld, 2000).

Danish Guideline

An important driver for the development of the Danish Guideline was the acknowledgement that existing models did not pay respect to the nature of intellectual capital as they did not include the relationships between the different types of intangibles. Another point of criticism was that existing models did not provide any guidelines for handling issues or solving problems (Mouritsen, Bukh, Larsen, & Johansen, 2001a).
The resulting Intellectual Capital Statement Model (STI, 2003b) distinguishes itself from other IC methods because it explicitly aims at supporting knowledge management, in order to improve organizational performance (Andriessen, 2004a). The Danish Guideline provides a framework that helps organizations to plan KM initiatives. As this aim is closely related to the objective of this research (Sub question 4), further elaboration on the Danish Guideline seems to be justified.

Quantitative Framework

A completely different IC model is Zegveld's Quantitative Framework for detecting incremental and radical innovation. This model is different as it approaches intellectual capital from an economic perspective. This model can be compared to other models like Economic Value Added™ (EVA) as developed by Stern Stewart (Andriessen, 2004a), the Intangibles Scorecard as developed by Lev (2001) and Gu and Lev (2001), and the Value Added Intellectual Coefficient (VAIC) as developed by Pulic (Andriessen, 2004a). What they all

have in common is that they try to measure knowledge-based performance based on financial ratios.
What is interesting about Zegveld's method is that it provides a framework for measuring incremental and radical innovation. As our definition of knowledge productivity describes the result of the knowledge creation process as incremental and radical innovation, this method could be appropriate for diagnosing knowledge productivity from an intellectual capital perspective (Sub question 3).

3.4.3 Conclusion

Intellectual capital refers to strategic intangible resources and can be defined as all intangible resources that are available to an organization, that give a relative advantage, and which in combination are able to produce future benefits. Intellectual capital measurement refers to the discipline of identifying and measuring intangible resources.
The past decade a plethora of methods have been developed. The main aim of these methods is to uncover the intellectual capital of an organization, in order to solve either internal management problems, or external communication problems. Exploring the IC literature in general and the IC methods in particular, we came to two conclusions. First, we concluded that Zegveld's Quantitative Framework (2000) provides a framework for diagnosing incremental and radical innovation which might be of interest to the purpose of diagnosing knowledge productivity (Sub question 3). Second, we concluded that the purpose of the Danish Guideline (STI, 2003b) is closely related to the objective of planning for KP enhancement (Sub question 4).

3.5 Diagnosing knowledge productivity

In Chapter 1 we referred to knowledge productivity as the process of transforming knowledge into value. We argued that KP is subject to two different interpretations, of which one uses knowledge as a starting point, whereas the other uses productivity as a starting point. The former we labelled knowledge management and the latter we labelled intellectual capital measurement. In the previous sections we introduced the concept of KP and explored the concepts of KM and IC in order to further specify our definition of KP. Based on this exploration, we defined KP as: *the process of knowledge creation that leads to incremental and radical innovation.*
In this section we further elaborate on two of the concepts we found during our exploration of the literature, with regard to diagnosing KP (Sub question 3). First we elaborate on Kessels' (1996) Corporate Curriculum as a concept that can help to diagnose KP from a KM perspective (3.5.1). Next we elaborate on Zegveld's (2000) Quantitative Framework for detecting radical and incremental innovation as a concept that can help to diagnose KP from an IC perspective (3.5.2). Finally, we will combine the Corporate Curriculum and the Quantitative Framework in one conceptual framework for diagnosing KP (3.5.3).

3.5.1 The Corporate Curriculum

In this section we elaborate on diagnosing KP from a KM perspective. Closely related to Drucker (1993), Kessels (1996; 2001b) introduced the concept *knowledge productivity*. "Knowledge productivity concerns the way in which individuals, teams and units across an organization achieve knowledge-based improvements and innovations" (Harrison & Kessels, 2004, p.145). Whereas Drucker (1999) interpreted knowledge worker productivity as a

management challenge, Kessels puts the individual in the centre of his theory. The assumptions of Kessels' work are that:

> The character of labour is changing: routine work is more and more taken over by machines and computers. The work that remains requires independent decision-making and creative thinking; the physical activities of employees are being replaced by mental and social activities. In the economic context the value added to products and services is mainly due to the capability of applying knowledge. Constant incremental improvement and radical innovation are becoming critical in the endeavour of staying ahead or keeping up with competitors.
> As this change of the character of labour takes place, it is inevitable that the workplace turns into a learning environment. New work is to be described in terms of learning and work processes take the characteristics of learning processes. This implies not only to managerial work, but also to almost all work of every individual in the company. This transition is not only dependent on theoretical knowledge and formal schooling, but it is also based on adequate day-to-day learning in the social work environment. The conditions for good work become similar to the conditions for good learning. (Kessels & Van der Werff, 2002, p.20)

As a consequence knowledge productivity requires a good learning environment. In order to help organizations improve their knowledge productivity, Kessels introduced the *Corporate Curriculum*: "the plan for learning to increase knowledge productivity, leading to constant improvement and radical innovation, and ultimately to economic advantage" (Kessels & Van der Werff, 2002, p.23). The Corporate Curriculum should not be seen as a formal educational or training curriculum.

> Rather, it involves transforming the daily workplace into an environment where learning and working can be effectively integrated. It facilitates the creation of a rich and diverse landscape that encourages and supports employees in the learning they need to do in order to continuously adapt and to innovate. (Harrison & Kessels, 2004, p.155)

The Corporate Curriculum consists of all the intended and unintended conditions that affect the learning processes among workers in organizations (Van Lakerveld, Van den Berg, de Brabander, & Kessels, 2000) and identifies seven critical *learning functions* (Kessels, 1996):

1. Acquiring *subject matter expertise* and professional knowledge directly related to the organization's business and core competencies
2. Learning to identify and *solve problems* by using the acquired subject matter expertise.
3. Cultivating *reflective skills* and meta-cognitions that contribute to finding, acquiring and applying new knowledge.
4. Securing *communication skills* that provide access to the knowledge network of others and that enrich the learning climate within the workplace.
5. Acquiring skills for *self-regulation of motivation* and affection related to working and learning.
6. Promoting *peace and stability*, in order to enable specialization and incremental improvement.
7. Causing *creative turmoil* in order to stimulate innovation.

In section (3.3.1) we argued that KM can be defined as *deliberate initiatives that aim at stimulating KP*. As this definition is closely related to the essence of the Corporate

Curriculum, we further explored the seven learning functions from a KM perspective in general and the three basic principles as described above in particular.

Learning function 1: Subject matter expertise

The first learning function has been defined as acquiring *subject matter expertise* and professional knowledge directly related to the organization's business and core competencies (Kessels, 1996; Keursten, Verdonschot, Kessels, & Kwakman, 2006). In a sense, the first learning function covers the main part of the concept of knowledge management (Davenport & Prusak, 1998; Nonaka & Takeuchi, 1995; Stam, 2004; Weggeman, 1997). Subject matter expertise stresses the importance of "strategic grounding" (Stam, 2004) as it is about knowledge which is directly related to the main work processes and work-related objectives (Keursten, 2001; Keursten et al., 2006; Van Lakerveld, 2005). Furthermore, subject matter expertise is both about tacit and explicit knowledge (Kessels, 2002a; Polanyi, 1974), and it is about the way knowledge is developed, shared and codified throughout the organization (Kessels & Keursten, 2001; Keursten, 2001). Subject matter expertise refers to the strategic grounding and processing of knowledge and therefore asks for knowledge-based strategies and the support of the knowledge processes.

Learning function 2: Solving problems

The second learning function has been defined as learning to identify and deal with new problems using the acquired subject matter expertise (Kessels, 1996; Keursten et al., 2006). From a knowledge management perspective, solving problems refers to the process of applying (Davenport & Prusak, 1998; Weggeman, 1997), combining (Nonaka & Takeuchi, 1995; Van der Spek & Spijkervet, 1994) or exploiting (Sprenger et al., 1995) knowledge. Within these processes, which are at the "end" of the knowledge value chain, knowledge is put into use, or in other words "made productive". In this respect, all other knowledge processes support this second learning function.

The distinguishing characteristic of this learning function is that it stresses the gap between existing subject-matter expertise (as a result of the first learning function) and the knowledge that is needed in order to find solutions for new challenges. Solving problems is the competency with which this gap can be closed. However, the gap will never be closed entirely. New situations always require new interpretations of existing knowledge, therefore the need for the ability to solve problems will remain. Solving problems is a personal capacity and cannot be separated from its context (Sveiby, 1997). If the context is complex and dynamic, the professional's work should be based on a body of knowledge which has to be interpreted and applied depending on the specific circumstances (Weggeman, 1997). Solving problems refers to the ability to renew and stretch expertise and therefore asks for creativity and room for experimenting with new ways of working.

Learning function 3: Reflective skills and meta-cognitions

The third learning function has been defined as cultivating reflective skills and meta-cognitions to find ways to locate, acquire and apply new knowledge (Kessels, 1996; Keursten et al., 2006). The main message of this learning function is that we should not only learn how to develop, share and apply knowledge (first two learning functions), but also reflect on the effectiveness of these processes (Kessels & Keursten, 2001). Meta-learning reflects an organisation's attempts to learn about (and improve) its ability to learn (Argyris & Schön, 1978). The main questions related to this learning function are: Why are we good in solving problem A, and why is it that we do not know how to handle problem B? What can we learn from our experiences and can we do it better? Reflective skills are necessary in order to learn from past processes (Van Lakerveld, 2005). This learning function enables organizations,

teams and individuals to manage their own learning processes. “How can we improve our ability to develop, share and utilise knowledge in the workplace, and help others to do so” (Harrison & Kessels, 2004, p.156). From a knowledge management perspective, this learning function refers to the process of evaluation (Stam, 2004; Weggeman, 1997). In addition, this process makes the connection to the concept of the learning organization (Senge, 1992). Reflection stresses the idea that the output of the process also serves as input for a new (production) cycle (Nonaka & Takeuchi, 1995; Zack, 1998). Reflective skills are of vital importance for the development of meta-cognitions. Important preconditions for the development of reflective skills are open communication, constructive feedback and creating time and space to look backward (Kessels & Keursten, 2001).

Learning function 4: Communication skills

The fourth learning function of the Corporate Curriculum has been described as acquiring communicative and social skills that help people access the knowledge network of others, participate in communities of practice and make learning at the workplace more productive (Kessels, 1996; Keursten et al., 2006). Communication skills stresses that knowledge is processed through people. More and more research is being done to identify the critical skills of the knowledge worker (A. Abell & Ward, 2000; Sprenger et al., 1995; Tissen et al., 1998). Some important skills are the ability to communicate and collaborate, as it is through communication and collaboration that knowledge is developed and shared. Another aspect of this learning function is the extent to which the environment supports knowledge sharing. From a knowledge management perspective, this aspect refers to the preconditions for knowledge management in terms of structure and culture, as these aspects have an important impact on the knowledge processes and the knowledge friendliness of the company (Stam, 2004; Weggeman, 1997). Communication skills refers to the ability to communicate and collaborate and the knowledge friendliness of the organization in terms of structure and culture.

Learning function 5: Self-regulation of motivation

This fifth learning function has been defined as acquiring skills to regulate motivation, affinities, emotions and affections concerning working and learning (Kessels, 1996; Keursten et al., 2006). This learning function, also at the heart of the Corporate Curriculum, is the most implicit learning function (Keursten et al., 2006) and refers to the importance for knowledge workers to identify personal themes and ways to develop these. It is about skills that give meaning to learning and enhance commitment (Kessels, 1996), because “in a knowledge economy it is useless when a manager says: Be smarter, or show more creativity! Being smart and creative depend heavily on personal interest” (Kessels & Van der Werff, 2002, p.22). People are only smart if they want to be (Harrison & Kessels, 2004). Personal interest is closely related to the process of inspiration, passion or motivation and sense-making (Leenheers, 2004). In their reconstruction study, Keursten et al. (2004) conclude that “personal motivation and affinity with a particular topic was the driving force behind innovations and improvements” (p.167, translation CS). A positive correlation has been found between attention to intrinsic motivation and the performance of individuals in the learning process (Van Lakerveld, 2005; Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004). Self-regulation of motivation puts the locus-of-control with the individual, because it implies that the extent to which organisational objectives are achieved, heavily depends on personal entrepreneurship. “A personal entrepreneur works from an intrinsic passion and primarily strives for personal interest. He has the ability to organize his work in such a way that it suits his personal preferences. He sees himself as a firm, although he is an employee” (Rondeel & Wagenaar, 2002, p.123, translation CS). Although motivation cannot be “managed” in the

sense that it can be controlled, it can be supported by providing space for personal entrepreneurship.

Learning function 6: Peace and stability

The sixth learning function has been described as promoting *peace and stability* to enable exploration, coherence, synergy, and integration (Kessels, 1996; Keursten et al., 2006). This learning function refers to the need for incremental improvements through further specialization (Ansoff & Sullivan, 1993; Harrison & Kessels, 2004). Peace and stability gives employees the opportunity to explore existing knowledge and search for possibilities to apply this knowledge into their daily practice. Peace and stability also refers to the need for time for reflection, learning and knowledge sharing. Time and peace provide the opportunity to reflect on the efficiency and effectiveness of processes, products and services. Peace and stability provides a context in which people can experiment, without direct consequences. Peace and stability provides the certainty and the time which is necessary for specialization and improvement (Van Lakerveld, 2005).

From a knowledge management point of view, this learning function refers to the organizational need for a certain degree of redundancy in creating knowledge. Redundancy means that the knowledge level within the organization exceeds the minimum level of knowledge needed to perform the necessary tasks (Nonaka & Takeuchi, 1995). "Lack of redundancy and time to reflect exploit existing (intellectual) resources, and consume these without generating new knowledge. Lack of peace and stability results in impoverishment of intellectual assets" (Kessels & Van der Werff, 2002, pp.22-23). However, the drawback of this learning function is that "too much peace and stability might bring about overly one-sided specialization and an excessive internal focus" (Kessels, 2001b; Keursten et al., 2006). In this sense, Sveiby (1997) argued that stability should be seen as a counter balance of growth and renewal.

Peace and stability is an important precondition for knowledge productivity in general and incremental innovation in particular. Important elements of this learning function are specialization, time to reflect and redundancy.

Learning function 7: Creative turmoil

The seventh learning function has been described as causing creative turmoil, which leads to radical innovation (Kessels, 1996; Keursten et al., 2006). Creative turmoil refers to the need for creativity as a driver of innovation and improvement (Shapero, 1985). The cause of the turmoil is often "an existential threat: a matter of winning or losing, surviving or going under, being in or out of the game" (Harrison, 2004, p.156). Although Van Lakerveld (2005) found a positive relationship between work-pressure and learning, not all pressure is creative turmoil. Creative turmoil is mainly recognized by pressure which is caused by "the importance that is attached to the outcome of the process or because people themselves feel a strong urge to solve a particular problem" (Keursten et al., 2004, p.168).

Although described variously, many authors refer to the need for creative turmoil when they stress the necessity of a certain degree of "strategic ambiguity" (Nonaka & Takeuchi, 1995), "strategic imbalance" (Itami, 1991), "strategic distance" (Senge, 1992), "strategic confusion" (Stacey, 1995) or "strategic disorder" (Levy, 1994). According to Senge (1992) distance between vision and reality is the source of creative tension as distance makes it necessary to take action in order to come closer to the objective. Similar reasoning can be found in Itami (1991) and Nonaka and Takeuchi (1995). A certain degree of chaos, disorder or even failure may prevent complacency, and could stimulate organizations to stretch beyond their strategic focus. Creative chaos can stimulate individuals to fundamentally change their ways of thinking and create new knowledge.

Keursten et al. (2006) argue that external pressure is important to make a difference in daily work. However, not all unrest is creative turmoil and too much creative turmoil may yield many new ideas but leaves little opportunity to elaborate on them, thus limiting innovation. Creative turmoil without the time to reflect will lead to "destructive chaos" (Schon, 1983). This implies that the sixth and the seventh learning function should be in balance. Creative turmoil is seen as a precondition for creating radical innovation. The main prerequisite for this learning function is strategic ambiguity.

Three layers of the Corporate Curriculum

According to Van Lakerveld et al. (2000), a distinction can be made between those learning functions that directly refer to the learning processes (1 to 5) and those that refer to the conditions of learning (6 and 7). Within the five functions that refer to the learning processes we can make another distinction between those that predominantly refer to the knowledge processes (1-3), and those functions predominantly referring to the knowledge workers (4 and 5). The result is that we can make a distinction between three different kinds of learning functions: those related to the individual (competences and motivation), those related to the knowledge processes (subject matter expertise, solve problems, reflection), and those related to the organizational environment or conditions (calm and stability, creative turmoil). Together they can be visualized in a circle with three layers (Figure 3.6).

This model tries to pay respect to the human-centred definition of knowledge of Kessels. Therefore the inner circle represents the learning functions that are predominantly related to the individual. The outer circle represents the learning functions that are predominantly related to the organizational environment. The circle in between represents a combination of the inner and the outer circle and refers to the learning functions which are predominantly related to the knowledge processes as defined by the knowledge management literature (see section 3.3.3). These knowledge processes are both related to the people and the organization. They are both human and structural capital.

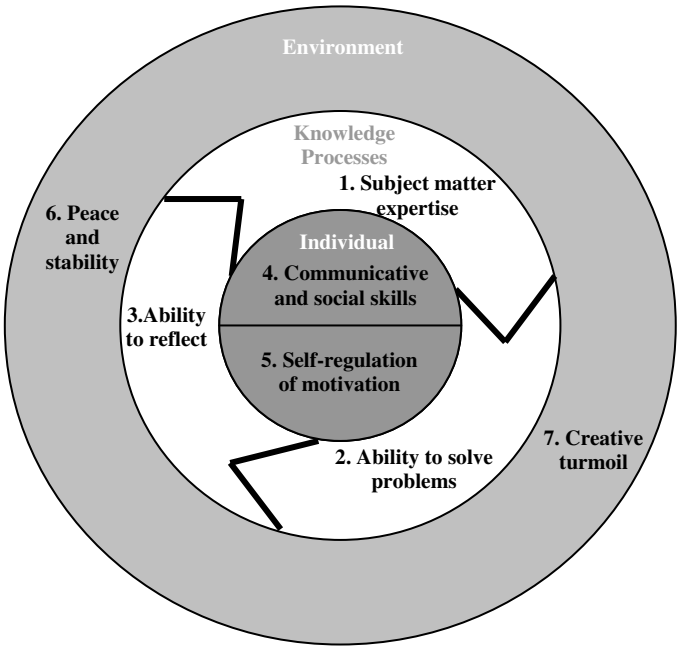


Figure 3.6: The three layers of the Corporate Curriculum

The effects of stimulating the Corporate Curriculum

In his definition of KP, Kessels does not only address KP as a process (the way in which), but also as a result (knowledge-based improvements and innovations) (Harrison & Kessels, 2004). Considering the seven learning functions as described above, the direct aim of the Corporate Curriculum is to stimulate the process (the way in which). The indirect aim of the Corporate Curriculum is to achieve knowledge-based improvements and innovation. In this sense, distinction can be made between direct results (enhancing the knowledge creation process) and indirect effects (incremental and radical innovation).

The underlying assumption of Kessels' (1996; 2001b) interpretation of knowledge productivity is that organizations in the knowledge economy, to be successful, should continuously improve their processes, products and services, and radically renew from time to time (Drucker, 1993; Nonaka & Takeuchi, 1995). Based on Walz and Bertels (1995), Kessels (2001b) makes a distinction between *gradual improvements* and *radical innovation*.

> Gradual improvement (involving adaptive learning) elaborates on what is already present and leads to additional refinement and specialization. Radical innovation (involving investigative and reflexive learning) involves breaking with the past and creating new opportunities by deviating from tradition. (Harrison & Kessels, 2004, p.157)

As we have seen in section 3.3.2 many authors refer to the distinction between incremental and radical innovation, others use different labels to refer to more or less similar distinctions. According to Leonard-Barton (1995), these two types of innovations are the essence of the core capabilities of the firm, because they can be either "competence-enhancing", or "competence-destroying". The former refers to possibilities to be combined into current products, the latter refers to, what she calls, innovations that "may wash away the technical foundation of the company" (Leonard-Barton, 1995, p.145). Similarly, Christensen (2005) makes a distinction between "sustaining"[8] and "disruptive" technologies. According to Boisot (1998) the two types of innovation can be explained in Kuhn's (1996) terms of shifting paradigms. The distinction between "cumulative" and "disruptive" knowledge evolution is that the latter involves a paradigm shift; a destruction of existing knowledge assets and the building up of new ones on different foundations. He describes disruptive knowledge evolution as an "edge of chaos" phenomenon out of which new knowledge structures suddenly emerge.

The distinction between incremental and radical innovation also stresses the close relationship between the concepts of innovation and learning as many distinct types of learning can be compared to these two types of innovation. Examples of this are "first order" and "second order" learning (Bateson, 1972), "single-loop" and "double-loop" learning (Argyris & Schön, 1978), "lower-level" and "higher-level" learning (Hedberg, 1981); "adaptive" and "reflexive" learning (Guile and Young [1999] in Harrison & Kessels, 2004). All of these distinctions refer to incremental improvements to existing practice on the one hand, and radical rethinking of basic goals, norms, and paradigms on the other.

Whereas Kessels is very clear about the effect of stimulating the Corporate Curriculum, most of the literature focuses on the seven learning conditions without taking the indirect effects into account. Some exceptions are the studies by Keursten et al. (2006) and Van Lakerveld (2005). In his research on the Corporate Curriculum, Van Lakerveld (2005) finds evidence for the positive relationship between the learning functions of the Corporate Curriculum on the one hand and quality improvements and innovative potential on the other. In a large

[8] According to Christensen (2005), sustaining technologies can be either radical or incremental, however, what they all have in common is that they improve the performance of established products. Therefore, within this context sustaining refers to incremental, and disruptive refers to radical innovation.

reconstruction research of sixteen case studies, Keursten et al. (2006) found a positive relationship between the quality of the Corporate Curriculum and successful innovation processes. Based on these findings, we could represent the relationship between the Corporate Curriculum and incremental and radical innovation as a flywheel (Figure 3.7). The better the wheel (the knowledge creation processes) functions, the stronger the ability to generate incremental and radical innovation.

The reasoning behind this interpretation of the concept of KP is that enhancement of the knowledge creation processes leads to an improved ability to produce incremental and radical innovation, which eventually leads to improved organizational performance (Kessels & Van der Werff, 2002). Important to note is that the relationship between KP and organizational performance remains implicit. The main focus of KP is on the lever, not on the effect (Stam, 2002). The assumption is that improvement of the conditions will obviously lead to better performance, however this link is not made explicit. In this respect, many sources suggest further research (Harrison & Kessels, 2004; Keursten et al., 2004; Van Lakerveld, 2005; Weggeman, 1997).

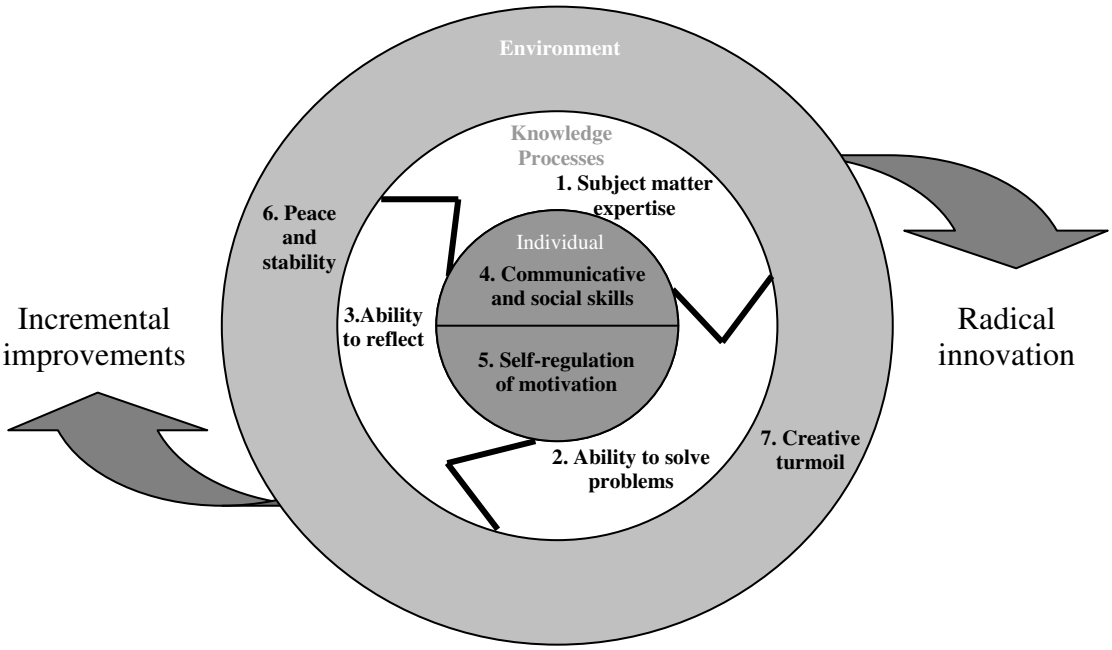


Figure 3.7: The KP-flywheel

To conclude, Kessels interprets KP as a process and aims at creating an environment that enables the process of knowledge creation. Within this approach the emphasis is on the word *knowledge*, and therefore, this approach is closely related to KM. The main aim of this approach is to improve the conditions, based on the belief that this will eventually lead to better results. In order to help organizations improve their knowledge productivity, Kessels introduced the *Corporate Curriculum*. The Corporate Curriculum identifies seven learning functions that affect the knowledge creation process. This concept provides a helpful framework for diagnosing the process of knowledge creation.

3.5.2 The Quantitative Framework

The *Quantitative Framework* (Zegveld, 2000) for detecting incremental and radical innovation provides a completely different perspective on KP. This model is based on

economic theories and measures knowledge-based performance based on financial ratios. What is interesting about Zegveld's method is that it provides a framework for measuring incremental and radical innovation.

Within this approach, the emphasis is on the word *productivity* – the amount of output created related to the amount of input used – and therefore this approach is mainly inspired by economic theories. The starting point of this approach is that measurement (explanation) of the rate of KP is a necessary precondition for management (improvement). So, KP is predominantly interpreted as a result that has to be measured, before it can be improved. In order to measure KP, Zegveld (2000) developed a Quantitative Framework. In this framework, distinction is made between incremental and radical change based on the paradigm of the punctuated equilibrium (Eldredge & Gould, 1972) and its application to organizational development (Tushman & O'Reilly III, 1996; Tushman & Romanelli, 1990). Essence of this paradigm is that knowledge creation is not a process of gradual change, but intermittent change. Relative long periods of relative stability are alternated with short periods of fundamental change.

> The essential difference between incremental and radical change is that incremental change is about aligning and can be related to the process of production and value creation, while radical change is about the process of forming a company's perspective and the process of forming resources. (Zegveld, 2000, pp. 26-27)

According to Zegveld (2000) incremental innovation is about "doing things better" and radical innovation is about "doing better things". This section elaborates on Zegveld's Quantitative Framework for detecting incremental and radical innovation.

Incremental innovation (exploitation)

Incremental innovation relates to single-loop learning and is about incremental improvements to existing practice. Within Zegveld's Quantitative Framework, incremental innovation is detected by measuring the (in)consistency of the application of a generic strategy. The logic of this is that different generic strategies result in different performance outcomes, which means that a shift from one to another strategy will be reflected in the financial data. A change in the focus from one to another generic strategy should be explained by the (implicit or explicit) desire to improve existing practice. Based on Porter (1980) and Karnani (1984), Zegveld makes a distinction between an efficiency strategy, an added-value strategy, and a volume strategy (Zegveld, 2000).

- An *efficiency strategy* implies the aim of continuously reducing costs and thus increasing value per unit turnover and therefore can be detected if most of the created value can be related to a decrease of company specific costs per unit turnover.
- Successful deployment of an *added value strategy* implies a trade-off between the premium price the customer is willing to pay and the increased cost development as the result of extensive research, product design and intensive customer support to gain additional margins. Therefore, an added value strategy can be detected if most of the created value can be related to an increase of added value per unit turnover.
- Finally, a *volume strategy* can be detected when most of the created value can be related to a higher turnover without changing the added value per unit turnover or company specific costs per unit turnover.

Companies are either volume or performance driven. If they are performance driven, they can either have a focus on added value or on efficiency.

The aim of the Quantitative Framework is to detect stability or instability of strategic focus on a longitudinal basis. In order to do so "financial data has been chosen since it can be related to specific developments in the value chain and since financial data is widely available" (Zegveld, 2000, p. 50). This financial data is used to detect a change in the selection of one of the three generic strategies (volume, efficiency or added value). The two excluding aspects of exploitation are defined as:

1. Stability in exploitation
   Stability implies that a substantial part of the development of the total operational value of a company can be related to a single generic strategy.
2. Change in exploitation: incremental innovation
   Incremental innovation implies that no one single generic strategy realises a substantial part of the development of the total operational value of a company.

According to Zegveld (2000) stability and change of strategic focus are two excluding aspects of exploitation; companies can either be categorized as stable (related to a single generic strategy) or as *incremental innovation* companies. Only if the figures detect a change in the focus from one to another strategy, then we speak about incremental innovation.

> Incremental innovation can be the result of a change of deployment from one generic strategy towards a different generic strategy or can be the result of an absence of a generic strategy within the period of analysis. A discontinuity in the deployment of a generic strategy can be the result of explicit or implicit choices by management or by core stakeholders and will affect the process of production and the process of value creation. (Zegveld, 2000, p.49)

Based on Luehrman (1997), Zegveld proposes to measure the development of exploitation by measuring Operational Cash Flow (OCF) and the contribution of the three generic strategies to the build up of OCF. If the figures reveal a shift in the contribution to OCF from one to another generic strategy, the company qualifies as an incremental innovation company.

Radical innovation (exploration)

Radical innovation relates to double loop learning and is about the process of forming resources that leads to a radical new perspective for the company. According to Zegveld, a sudden positive shift in the development of company specific resources implies radical innovation or a radical change in the perspective of the company. "This change of perspective is related to the development and successful initial deployment of residual value or intellectual capital related to this new perspective" (Zegveld, 2000, pp.103-104). This logic follows the resource-based view of the company that argues that innovation is about new combinations of resources.

> Within Zegveld's model, "residual value is defined as 'intellectual capital' … or company specific knowledge which is developed by combining and recombining resources" (Zegveld, 2000, pp.70-71).

Based on the calculation of residual change we can determine whether a firm qualifies as a radical innovation firm or not.
In his research, Zegveld (2000) investigates the relationship between the company's perspective and the development of resources. Based on several studies he concludes that the build up of resources is stable when, from the company's perspective, no fundamental changes occur within the firm's basic orientation towards its resources (customers, employees, partners and shareholders). However, a different perspective on resources leads to a situation where a different and new positional advantage and different competencies are

developed, which subsequently leads to a different build up of resources. This new perspective or radical innovation can be detected by measuring the stability of the build up of resources.
According to neo-classical theory, growth is driven by exogenous changes in the different factors of production (Zegveld, 2000). However, using only two factors of production (labour and capital) could not fully explain economic growth. Therefore, more and more economists focused on innovation and the development of knowledge as the (endogenous) source of continuous productivity increase in order to explain the productivity gap (Romer, 1990; Solow, 1957). Nowadays, the assumption that changes in productivity that cannot be explained through changes in labour or capital, are caused by knowledge seems to be generally accepted.

> Starting with the neo-classical model by Solow, different authors have developed different models for calculating the surplus or residual value and hence the *Total Factor Productivity* (TFP).… The residual value is defined as the creation of additional output above the level of the different inputs or resources. (Zegveld, 2000, p.65)

In economic theory a change in the build up of residual value is a determinant of change of perspective. Based on Solow, Zegveld proposes to use the concept of TFP to calculate the residual value caused by knowledge.

Table 3.2: Translating TFP into TRP (Zegveld, 2000)

Model	***Total Factor Productivity (TFP) (Solow)***	***Total Resource Productivity (TRP) (Zegveld)***
Output	Private non-farm GNP	Added value of companies defined as: Turnover minus all outsourcing intermediate goods and services. Output is defined as: Employment costs + Depreciation + Net profit.
Capital	Employed capital	Depreciation
Unity	Manhour	Employees (fte)
Periodicity	Yearly	Yearly
Correction	Inflation	None

The contribution of Zegveld has been that he applied the concept of TFP to companies instead of countries by translating the concept of TFP to *Total Resource Productivity* (TRP) (Table 3.2). “By adapting the TFP model to companies, the residual value is defined as knowledge or intellectual capital” (Zegveld, 2000, p.53). TRP measures the accumulation of knowledge and the build up of the residual within the company and may provide insight into how well a company allocates and exploits its resources. According to Zegveld, the build up of the residual is a determinant of change of the perspective. The logic of this is that discontinuity in the residual build up at company level should be interpreted as a shift in the deployment of knowledge or intellectual capital. A radical shift in the development of the residual build up implies a more radical change in the build up of resources due to the deployment of new intellectual capital and can therefore be defined as radical innovation. Radical innovation is defined as a new combination of resources which leads to a new perspective for the organization. The aim of TRP is to detect stability or change in the perspective of the organization. The two excluding aspects are defined as:

1. Stability in exploration
   Continuity of the perspective of a company and hence continuity of the different

stakeholders in relation to the company. Results in a longitudinal continuous build up of total resource productivity.

2. Change in exploration
   Change of the perspective of a company and hence a discontinuity in the importance of the different core stakeholders in relation to the company.

To detect radical innovation, a change in build up of knowledge should be observed, whereas "a discontinuity of the company's perspective results in a longitudinal discontinuous build up of the total resource productivity" (p.59). Like exploitation, radical innovation is a neutral concept and can lead either to creative accumulation or creative destruction. Like exploitation, radical innovation may be the result of explicit or implicit developments.

To conclude, core to the Quantitative Framework is that it interprets KP as a result and aims at uncovering this result. Within this approach, the emphasis is on the word *productivity* – the amount of output created related to the amount of input used – and therefore this approach is mainly inspired by economic theories. The starting point of this approach is that measurement (explanation) of the rate of KP is a necessary precondition for management (improvement). Like Kessels, Zegveld also defines the result of the knowledge creation process in terms of incremental and radical innovation. In order to detect these different types of innovation, Zegveld developed a Quantitative Framework. Whereas incremental innovation is detected by calculating the contribution of a generic strategy to the build up of OCF, radical innovation is detected by calculating the build up of the residual. This framework provides a valuable starting point for diagnosing incremental and radical innovation.

3.5.3 Conclusion

We explored the concept of the Corporate Curriculum and the Quantitative Framework for detecting incremental and radical innovation. The aim of this exploration was to investigate the usability of these concepts with regard to our method for diagnosing knowledge productivity (Sub question 3).
In this research, KP is defined as the process of knowledge creation that leads to incremental and radical innovation. In order to diagnose KP we decided to take both the knowledge creation process and the two types of innovation into account. As the Corporate Curriculum focuses on (the conditions for) knowledge creation, and as the Quantitative Framework focuses on incremental and radical innovation, the combination of these two models is the most valuable starting point for the development of our method for diagnosing KP.
The connecting elements between the two models are the concepts of incremental and radical innovation. In Figure 3.8 we combined the Corporate Curriculum and the Quantitative Framework in one Knowledge Productivity Framework. On the left hand side we see the seven learning functions of the Corporate Curriculum as preconditions for incremental and radical innovation. On the right hand side we see Exploitation and Exploration as two measures for detecting the two types of innovation.

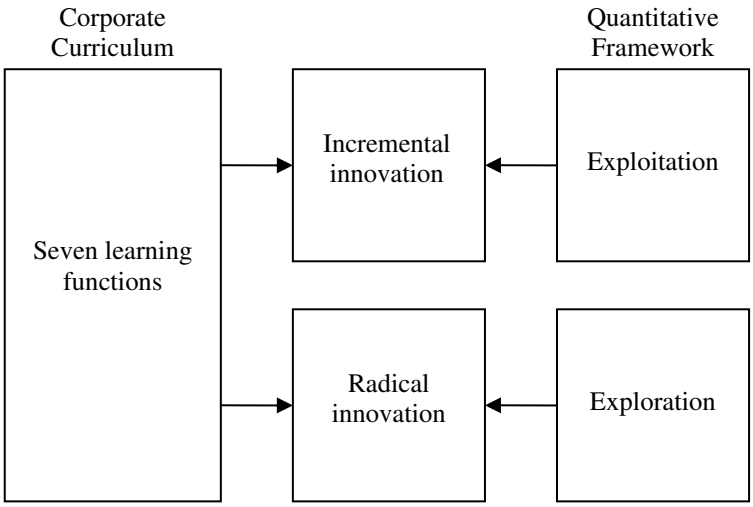


Figure 3.8: The Knowledge Productivity Framework

This KP-framework will serve as a starting point for developing a method that helps organizations to diagnose knowledge productivity.

3.6 Planning for enhancement

In section 3.4.2, based on a comparison of different intellectual capital measurement methods we concluded that the Danish Intellectual Capital Statement Model (Danish Guideline) (STI, 2003b) distinguishes itself from other IC methods as it provides a framework that helps organizations to plan KM initiatives.
Considering Sub question 4 (How can we plan knowledge productivity enhancement?) further elaboration on the Danish Guideline seems to be justified. First we further introduce the Danish Guideline (3.6.1), then we explore the theory (3.6.2) and the practice of how it works (3.6.3). In the concluding section (3.6.4) we will return to the usability of the Danish Guideline for the purpose of our study.

3.6.1 The Danish Guideline

The *Intellectual Capital Statements – The New Guideline* (STI, 2003b) (Danish Guideline) are the result of a project, organized by the Danish Agency for Development of Trade and Industry in collaboration with researchers and 17 Danish firms. The aim of the project, which started in 1998, was to develop a set of guidelines for the development and publication of intellectual capital statements. The Danish Guideline is based on the experiences in, and the feedback from this project. The first guideline was published in November 2000. The latest, and revised version dates from February 2003 (STI, 2003b).
What is interesting about the Danish Guideline, is that it is very well documented, in both primary and secondary resources. Experiences within the project with the 17 firms were recorded and eventually resulted in a guideline and other supporting material (STI, 2002, 2003a, 2003b). Furthermore, the group of researchers that assisted the companies did not only record the findings, but also took care of scientific foundation of the results (Mouritsen et al., 2001a, 2002; Mouritsen, Larsen, & Bukh, 2001b; Thorbjornsen & Mouritsen, 2003). Another interesting point about the Danish Guideline is that it is grounded in practice and has extensively been tested. The guideline was not imposed on practice, but emerged from reflecting on practice. Whereas it started with 17 firms, during 2001-2002 around one hundred

Danish organizations participated in the test of the guideline. Furthermore, the Danish experiences inspired many to continue experimenting in other contexts (Alwert, 2005; Mertins et al., 2005). Together, this has resulted in a valuable source for further research.

3.6.2 Theory

In the Danish Guideline, the measurement of intellectual capital and the management of knowledge resources are seen as two sides of the same coin, aiming at enhancing competitive advantage. Whereas knowledge management aims at making knowledge productive through combining resources, intellectual capital statements make the object of knowledge management clear, which makes it manageable and communicable.

Important motive for the development of the Danish Guideline was the acknowledgement of the shortcomings of the existing static intellectual capital models. According to Mouritsen et al. (2001a), the "three-way split"[9] neither *de*scribes, nor *pre*scribes the development of intellectual resources well since it tends to draw the indicators away from the context they represent. First (*de*scribing problem), the three-way split presents the different classes of intangibles as autonomous functional entities, whereas in fact they are interdependent, they are connected, they are complements, and thus they cannot be separated. "They are part of a network of things and people that co-produce the effects of the whole network" (Mouritsen et al., 2001a, p.362). Even when it is stressed that value is created through interaction, most methods present the three elements separately. Second (*pre*scribing problem), the taxonomy of three has no management agenda. It does not prescribe managers what to do, because indicators are not related to activities.

With respect to the objective of this research, the theory about the Danish Guideline is based on several interesting principles. First, knowledge is always related to something, and cannot be isolated. Second, value creation is the result of combining knowledge resources. Therefore, knowledge management is the practice of combining knowledge resources. Third, indicators are attached to the implementation of knowledge management.

The first principle of the Danish Guideline is that knowledge is interpreted as a subjective "thing", which is never something by itself, but always in relation to something (Mouritsen et al., 2002; Mouritsen et al., 2001b). Knowledge cannot be isolated from the bearer or the practice. It is related to a person and an issue, which makes it useful. This view is closely related to the autopoietic approach (Von Krogh & Roos, 1995). "Here, the person is the very locus of knowledge, but it is a particular kind of individual, namely the performing or creative individual, who is the 'production function' of knowledge and the central place for knowledge management" (Thorbjornsen & Mouritsen, 2003, p.560). Consequence of this view is that the individual is the starting point for improvement of a firm's (knowledge) performance.

This interpretation of knowledge is closely related to the resource-based view of the firm and the concept of core competences (Mouritsen et al., 2002). Because, "a competence is a bundle of skills and technologies rather than a single discrete skill or technology.… A core competence represents the sum of learning across individual skill sets and individual organizational units" (Hamel & Prahalad, 1994, p.223). Consequence of this interpretation is that the classification into different types of intangibles is problematic, because all types are related. Besides, the classifications do not provide any guidelines for handling issues or solving problems.

This brings us to the second underlying principle of the Danish Guideline. If it is true that knowledge is related to people and that value creation is the result of combining resources, then knowledge management is the practice of combining knowledge resources in order to

[9] The "three-way-split" refers to the distinction between human, structural and relational capital.

make the knowledge worker productive. “The management part of knowledge management is a practice of combination – combination of technologies and skills, or generally all the interdependent elements that are necessary in order to accomplish organizational knowledge as a phenomenon” (Mouritsen et al., 2002, p.12). Therefore, knowledge management strategies are integrally part of intellectual capital measurement (Roos et al., 1997). The aim of intellectual capital reports is to support knowledge management in the sense that it helps to make the object of knowledge management clear. “Intellectual capital statements show the activities that the firm ‘has’ to put in place to enhance its knowledge resources to improve ‘value’ for a user or a customer” (Mouritsen et al., 2001a, p.378).

The third interesting underlying principle of the Danish Guideline is related to the function of the measures. As knowledge is a social activity, it cannot be measured (Mouritsen et al., 2001a; Mouritsen et al., 2001b). However, managers do try to “identify” and “manage” knowledge. An IC statement makes knowledge management activities objects for management control and intervention (Mouritsen et al., 2002). Therefore, the function of the indicators is to report about the effectiveness of combining and exploiting knowledge resources through knowledge management activities.

> Counting and numbering are means by which knowledge may be drawn forth as an object that has features, attributes and aspects. It is by counting the development of these aspects that knowledge management activities get a form – and a practice. Only when attached to numbers is it possible to identify and communicate, in a reasonable form, what knowledge is all about. (Mouritsen et al., 2002, p.19)

The function of the indicators in an IC statement is to check the degree to which the firm’s knowledge management strategy has been made real. The indicators do not correlate, they are related as far as they all give expression to the progress of implementing the knowledge strategy.

The motive for measuring is that it adds to the seriousness of knowledge management. Furthermore, through measurement the complexity of the object (knowledge management) is reduced and can be better appreciated. It makes the knowledge management clear and precise. As a result, knowledge becomes manageable and communicable (Mouritsen et al., 2002). Intellectual capital statements help to make the object of intangibles clear by creating a language for thinking, talking and doing something about the drivers of companies’ future earnings (Mouritsen et al., 2002; Roos et al., 1997). “If measurement does not make management – or intervention – possible there is no need for it” (Mouritsen et al., 2001a, p.360). However, there is much more to an intellectual capital statement than the indicators. Participating in the process and preparing the statement is at least equally important as the outcome (Mouritsen et al., 2001a).

Contrary to the financial statement, the intellectual capital statement is not an institutionalized reading. People are not used to reading and interpreting IC statements. “The logic of reading the indicators can therefore not be ‘outside’ the document but it has to be made part of it” (Mouritsen et al., 2001a, p.360). The IC statement is a “managerial technology” that works as a “centre of translation” (Mouritsen et al., 2001b). IC statements translate the knowledge strategy, via activities into indicators. As firms do not make a distinction between functions of human, structural, and relational capital, these functions are not represented in the indicators. Indicators are all about actions and effects of activities. (Mouritsen et al., 2002) The actions refer to a firm-specific purpose, rather than to generic functions of intellectual capital.

3.6.3 How it works

In the Danish Guideline intellectual capital statements are presented as an integral part of knowledge management. They are as well a management as a communication tool, and can be used for both internal and external purposes. Like any other accounting statement, intellectual capital statements monitor initiatives and results and show whether companies are developing in the right direction. They show whether a company has improved the development and management of its knowledge resources (STI, 2003b). Intellectual capital statements help to develop and communicate knowledge-based strategies.
The Danish Guideline for intellectual capital statements consists of four elements (STI, 2002, 2003a, 2003b) (See Figure 3.9).

1. The first element is the *knowledge narrative*. "A narrative is a plot about a certain phenomenon. It shows the sequence of a set of events, it dramatizes the linkages between these events, and it points out not only the 'good' things that characterize the phenomenon but also the crucial 'bad' elements that have to be avoided to make the point of the narrative succeed" (Mouritsen et al., 2002, p.14).
2. The second element are the *management challenges*, which are the challenges that have to be overcome in order to implement the knowledge narrative.
3. The third element are the *initiatives*, which are the actions that can be taken to do something about the management challenges.
4. Finally, the fourth element are the *indicators*, which monitor the progress of initiatives. They make knowledge management initiatives visible and manageable.

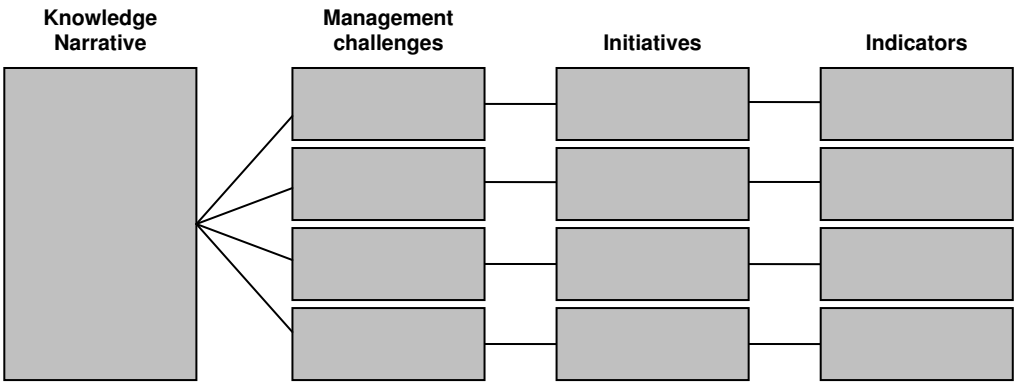


Figure 3.9: The Danish Guideline for Intellectual Capital Statements (STI, 2003b)

Thus, the intellectual capital statement is a mix of strategy, management and reporting, which cannot be separated because the statement needs a justification for the indicators, and the indicators have to report on something. The IC statement model is a two-way model. The narrative sets out the "knowledge intent" and the indicators make it possible to evaluate the implementation of the knowledge strategy. "This does not mean that the intellectual capital statement is necessarily correct. However, it may allow readers to form their own opinions about the value of the firm. Both negative and positive readings may come out of an intellectual capital statement" (Mouritsen et al., 2001a, p.380). The value of making an IC statement is in the process of producing or reading the statement, not in the measures.
Generating an intellectual capital statement means filling in the different elements of the model. Whereas it seems the process of creating such a model is linear, it has been designed as an iterative process. "Preparing intellectual capital statements is a creative activity where a

meaningful whole is gradually developed. The important thing is not to get locked in one place" (STI, 2003b, p.19). In order to avoid the work stagnating to a halt, the Danish Guideline suggest to work with the entire model at the same time. "The work is completed when you have a coherent explanation. You should be continuously critical of all the elements, and they should be reassessed until everything is coherent" (STI, 2003b, p.22). As it is often difficult to immediately determine the knowledge narrative, the guideline suggests to start with the existing activities and underlying objectives, before determining the narrative. However, more important than the sequence of activities is to be open for surprises and new insights. Another important aspect of working with this model is coherence between the different elements. The Danish Guideline suggest to use words like "therefore" and "because" to illustrate coherence. In addition, at each stage of the process it is important to ask the question "why?", because the answer to this question illustrates the relationship with the other elements.

3.6.4 Conclusion

Within this section we investigated the usability of the Danish Guideline for Intellectual Capital Statements (STI, 2003b) for the purpose of our study. Considering the objective of planning for enhancement, the Danish Guideline seems to fit the purpose of our study very well because it is developed to support knowledge management. As we concluded before, knowledge management are the deliberate initiatives that aim at improving knowledge productivity. Furthermore, the functioning of the Intellectual Capital Statement Model fits the purpose of planning for KP enhancement for several reasons. First, intellectual capital statements give knowledge an object, which makes it possible to monitor and manage knowledge resources. This aspect contributes to the aim of this research to make sense of knowledge productivity. Second, this model is designed to translate strategy into knowledge-based action. Intellectual capital statements create an infrastructure for knowledge management. This aspect supports the aim of this research to help organizations to plan knowledge management initiatives. Third, the lack of existing models for monitoring knowledge resources asks for a model that includes the logic of reading. The step-by-step approach of the model guides the manager through the process of formulating a statement, and it helps the reader to interpret the meaning of both strategy and indicators. To conclude, the Danish Guideline provides a valuable model for planning for KP enhancement (Sub question 4).

3.7 Reflection literature review

The aim of this literature review was to make sense of the concept of knowledge productivity and develop a conceptual framework for designing a management method that can help organizations to diagnose their KP and plan for enhancement. In order to do so, we had to answer the following sub questions:

2. What is meant by knowledge productivity?
3. How can we diagnose knowledge productivity?
4. How can we plan knowledge productivity enhancement?

In this section we reflect on the literature review through answering these questions.

Sub question 2: What is meant by knowledge productivity?

The starting point of this research is that KP refers to the process of transforming knowledge into value. Based on our literature review we define KP as *the process of knowledge creation that leads to incremental and radical innovation* (Figure 3.10).

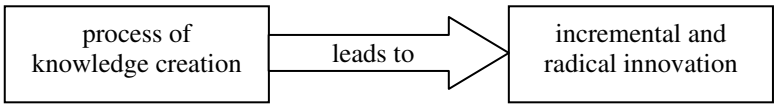


Figure 3.10: Knowledge productivity

The three core elements in this definition are "the process of knowledge creation", "incremental and radical innovation", and "leads to". First, "the process of knowledge creation" refers to a combination of related activities in which knowledge is created. The activities in the knowledge creation process are referred to as knowledge processes such as: developing knowledge; sharing knowledge; applying knowledge; and evaluating knowledge. Second, "incremental and radical innovation" refers to the results that follow from applying the knowledge that was created in the process of knowledge creation. Incremental innovation refers to improvements of existing practice (doing things better). Radical innovation refers to radical changes that deviate from existing practice (doing better things). Third, "leads to" refers to the application of knowledge in the sense of personal abilities. This implies that the process of knowledge creation does not automatically lead to innovation. Knowledge creation leads to knowledge that is used to generate incremental and radical innovation.

Sub question 3: How can we diagnose knowledge productivity?

Considering the above definition of KP, in order to diagnose KP we decided to take both the knowledge creation process and the two types of innovation into account. As the Corporate Curriculum (Kessels, 1996) focuses on the process of knowledge creation, and as the Quantitative Framework (Zegveld, 2000) focuses on incremental and radical innovation, the combination of these two models provides a valuable starting point for the development of our method for diagnosing KP. In section 3.5.3 we combined the two concepts in one conceptual framework (***Figure 3.8***) that can serve as a starting point for developing a method that diagnoses KP.

Sub question 4: How can we plan knowledge productivity enhancement?

Based on a comparison of different intellectual capital measurement methods we concluded that the Danish Intellectual Capital Statement Model (Danish Guideline) (STI, 2003b) is a useful method to support the process of planning for enhancement. The Danish Guideline distinguishes itself from other IC models, as it is explicitly developed to support knowledge management. Further investigation of the Danish Guideline learned that it fits the concept of knowledge productivity and the aim of this research. Therefore, this model will be used as a starting point for the process of planning for enhancement in our method.

A first sketch of the method

To conclude, we define knowledge productivity as the process of knowledge creation that leads to incremental and radical innovation. In order to diagnose knowledge productivity we

decided to use Kessels' Corporate Curriculum and Zegveld's Quantitative Framework. In order to plan for enhancement, we decided to use the Danish Guideline. Combining these elements results in a first sketch of our method (Figure 3.11).

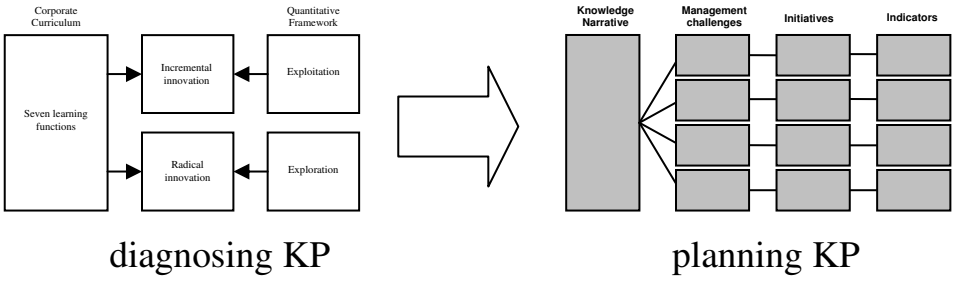
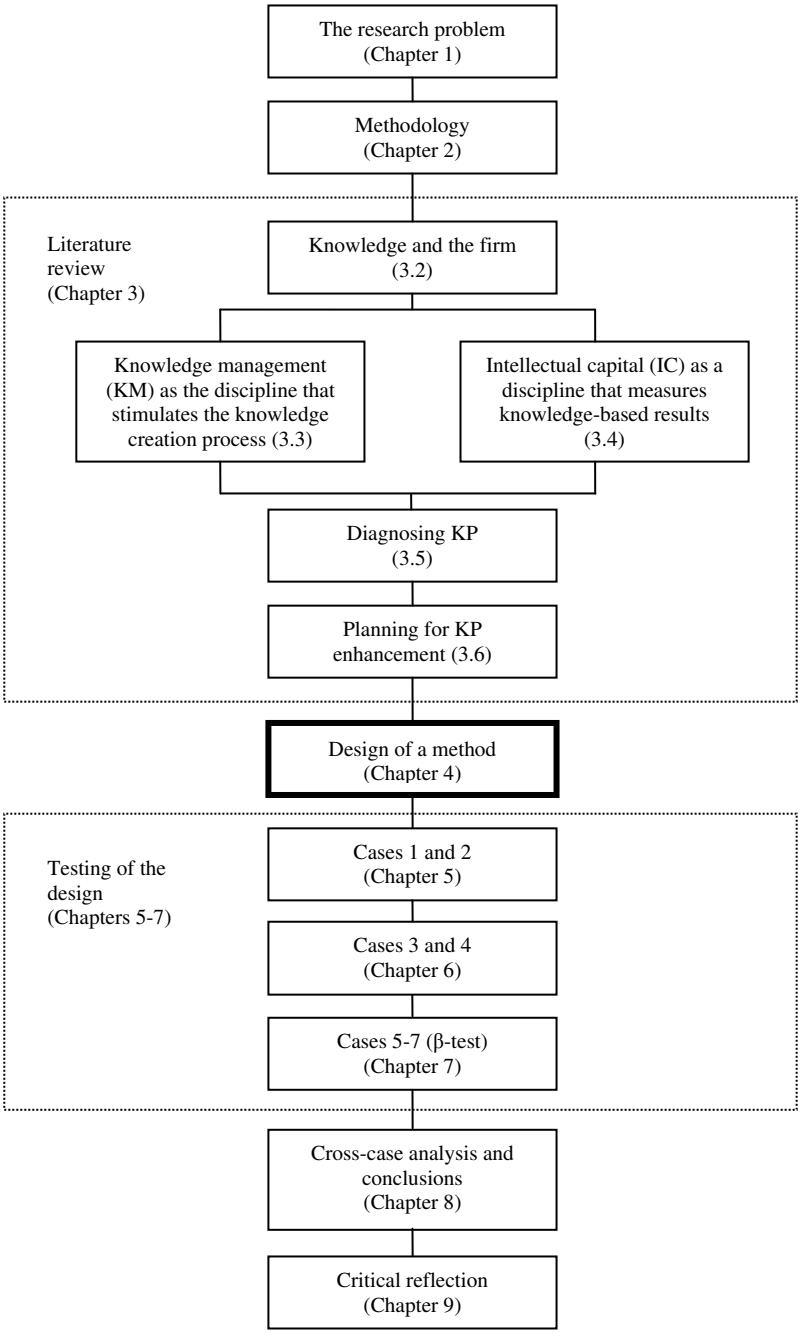


Figure 3.11: A first sketch of a method that diagnoses and plans KP

In the next chapter, this sketch serves as a starting point for the design of a method that helps organizations to diagnose knowledge productivity and to make a plan for knowledge management.



Sub questions
to be answered:

1. How can we design and test a management method?

2. What is meant by knowledge productivity (KP)?

3. How can we diagnose knowledge productivity?

4. How can we plan KP enhancement?

5. What does the initial design of the management method look like?

6. What can we learn from testing the method in practice?

Main Question:
How can organizations diagnose KP and plan for enhancement?

4 Design of the KP-enhancer

The design objective within this research is to develop a practical method that helps organizations to make a diagnosis of their knowledge productivity and develop a plan to enhance it. After exploring the literature, we can now design our method. This initial design gives an answer to Sub question 5: What does the initial design of the method look like?
The process of designing and testing the method consists of four phases (Andriessen, 2004a): defining the application domain; creating a list of requirements; designing the method; and evaluating the design. This chapter follows these steps in designing a first draft of the method, which is called the *Knowledge Productivity Enhancer* or KP-enhancer.

4.1 Defining the application domain

When designing a management method, the first step is to define the context of application, which consists of a *class of problems* and a *class of contexts*. Relevant distinctions between different types of problems are given in the Danish Guideline (STI, 2003b), Andriessen (2004a), and RICARDIS-report (CEC, 2006). As we have seen in the previous chapter, all these sources make a distinction between at least two types of problems: *internal management problems* and *external reporting problems*. As the aim of this research is to uncover the effectiveness of the knowledge-based production process in order to help organizations to develop a plan to enhance it, the method contributes to solving internal knowledge management planning problems (class of problems). The method is designed for medium-sized (50-250 employees) knowledge-intensive service firms (class of contexts).

4.2 Creating a list of requirements

The second step of the design cycle is to create a list of requirements for the new method. Van Aken (1996; 2004b), and Andriessen (2004a) make a distinction between four types of requirements. *Functional requirements* are the performance requirements related to the problems that should be solved by applying the method. *Operational requirements* are the requirements from the perspective of the user. *Design limitations* are the boundaries set by the preferred solutions. *Limiting conditions* are the technical requirements the environment places on the method when applied. Whereas this method is not subject to limiting conditions, an overview is given of the first three types of requirements.

4.2.1 Functional requirements

Functional requirements define the results the method needs to produce. These requirements follow primarily from the problem definition of this research. Therefore, the main requirement of the method is that it should help to diagnose knowledge productivity and help to make a plan for initiatives that enhance knowledge productivity. In order to do so, the KP-enhancer should:

1. Create awareness about the importance of knowledge productivity for improving organizational performance.
2. Assess the quality of the process of knowledge creation.
3. Measure incremental and radical innovation.
4. Generate possibilities for improvement.
5. Develop a plan for knowledge management.
6. Improve communication about knowledge management and knowledge productivity.

4.2.2 Operational requirements

Operational requirements define the ease of use of the method from the perspective of the users of the method. First of all, the method should be practical and user-friendly. The method should "speak for itself", should be easy to understand and easy to apply. Second, as organizations are reluctant to invest in new concepts or methods, implementing the KP-enhancer should require a limited amount of time (3-4 months).

4.2.3 Design limitations

Finally, the design limitations are the boundaries of the method set by the preferred solutions. The designer of the method often sets these boundaries. This method, following the outcome of the literature review (Chapter 3), has three design limitations. First limitation is that the assessment of the process of knowledge creation will be based on the concept of the Corporate Curriculum (Kessels, 1996). Second limitation is that the measurement of incremental and radical innovation is based on the Quantitative Framework (Zegveld, 2000). Third design limitation is that the process of planning for improvement will be based on the Danish Guideline for Intellectual Capital Statements (STI, 2003b).

4.3 Design of the method

The Knowledge Productivity Enhancer combines the concepts of the Corporate Curriculum, the Quantitative Framework and the Danish Guideline for Intellectual Capital Statements and consists of three phases (Figure 4.1). The aim of the first phase is to identify problems to be solved and set the objectives for applying the method. The main aim of the second phase is to gather data and diagnose the current situation with regard to knowledge productivity. The aim of the third phase is to formulate a plan for knowledge productivity enhancement (KP-statement). An additional fourth phase (in which the suggested initiatives are implemented) is added to stress that applying the method is only the start of a longer process, which is not part of this research project.

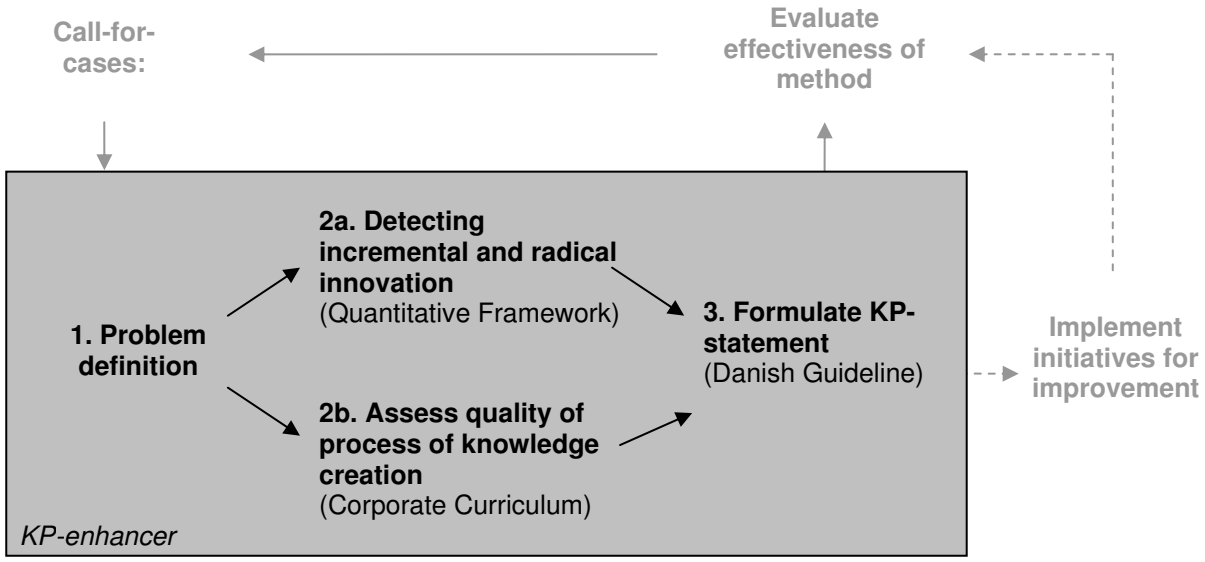


Figure 4.1: The design of the Knowledge Productivity Enhancer (KP-enhancer)

Each case study is preceded by a *call for cases* and each case study is concluded with an assessment of the effectiveness of the method. These two steps make the connection between

the application of the method in practice (practice stream or problem solving cycle) and the theoretical reflection (knowledge stream or reflective cycle) as described in Chapter 2 (Andriessen, 2007; Van Aken, 2004a). The remainder of this chapter elaborates on each of the elements within this figure.

4.3.1 Call for cases

The aim of this step is to find a suitable context of application. In order to qualify as a case study within this research, organizations should fit into the class of contexts for which the method is designed and the problem at hand should fit into the class of problems for which the method is designed (see section 4.1). If both criteria are met, then the organization qualifies to serve as a case. The result of this step is a strong indication that the organization qualifies as a case study and is willing to apply the method.

4.3.2 Phase 1: Problem definition

If an organization seems to qualify as a case study, the next step is to verify this assumption. The intake is based on a semi-structured interview (Mador, 2003) with the client. The answer to the following questions should be affirmative in order to qualify as a case study:

1. Does the organization fit into the class of contexts for which the method is designed?
2. Does the problem at hand fit into the class of problems for which the method is designed?
3. Is this the right moment to apply the method and do we get the necessary support?

For the method it is important that it is likely that the organization can benefit from it. If the organization qualifies as a case study, the intake is used to make a formal planning for applying the method. In this sense, the call-for-cases and the intake can be compared with the acquisition of a consultancy assignment. In addition, these steps provide the opportunity to establish a good working relationship with the client. The intake takes about one hour and the interviewees do not have to prepare for the interview. The report of the interview is verified by the informants and serves as a reference point for evaluating the effectiveness of the method (see section 4.4).

4.3.3 Phase 2: Diagnosing KP

The aim of this phase of the method is to diagnose the current situation with regard to knowledge productivity. The output of this phase serves as input for the next phase in which we make a plan for knowledge management in order to enhance KP. The analysis of the current situation is based on Zegveld's Quantitative Framework (Zegveld, 2000) and Kessels' Corporate Curriculum (Kessels, 1996). The former detects incremental and radical innovation. The latter presents a framework for assessing the quality of the process of knowledge creation.

Detecting incremental and radical innovation (2a)

Based on a calculation of Operational Cash Flow (OCF), a change in the selection of one of three generic strategies (volume, efficiency and added value) is detected (Box 4.1). A change in the focus from one to another generic strategy should be explained by the (implicit or explicit) desire to improve existing practice, which can be defined as incremental innovation.

Box 4.1: Detecting incremental innovation (Zegveld, 2000)

Calculating generic strategies

- Volume (V) = turnover
- Efficiency (E) = turnover/employment costs
- Added Value (A) = added value/turnover

(Added value is defined as employment costs, plus depreciation, plus tax, plus interest and other financial costs, and net profit.)

Calculating Operational Cash Flow (OCF)

- Performance = A-(1÷E)
- OCF = V*(A-1/E)
- Change in OCF = $OCF^{t1} - OCF^{t0}$

Calculating Cash Impact (ci)

- $ciV = (V^{t1}*(A^{t0}-1/E^{t0}))-(V^{t0}*(A^{t0}-1/E^{t0}))$
- $ciA = (V^{t0}*((A^{t1})-1/E^{t0}))-(V^{t0}*((A^{t0})-1/E^{t0}))$
- $ciE = (V^{t0}*(A^{t0}-1/(E^{t1})))-(V^{t0}*(A^{t0}-1/(E^{t0})))$

Based on the calculation of the residual, a change in the perspective of the organization is detected (Box 4.2). Discontinuity in the residual build up at company level should be interpreted as a shift in the deployment of knowledge or intellectual capital, which can be defined as radical innovation.

Box 4.2: Detecting radical innovation (Zegveld, 2000)

Data needed

- Output = added value (O)
- Capital = depreciation (C)
- Number of employees (e)

Calculate labour and capital productivity

- Output/employee (Oe)
- Capital/employee (Ce)

Calculate residual change

- Change of output/employee ($dOe = Oe^{t1} - Oe^{t0}$)
- Change of capital/employee ($dCe = Ce^{t1} - Ce^{t0}$)
- Capital/Output (C/O)
- Residual change (dR=1+(dOe-C/O*dCe))

The aim of the Quantitative Framework is to detect stability or instability on a longitudinal basis. Therefore, the two excluding aspects in both calculations are defined as *stability* or *change*. Only if the figures detect a change in the focus from one to another strategy, then we speak of incremental innovation. Only if the figures detect a change in the residual build up, then we speak of radical innovation.

Due to practical reasons (availability of figures, aim of developing a practical method), within this research Zegveld's analysis has been simplified in the sense that the number of years has

been reduced from twelve to five. According to Zegveld (interview September 2005), a series of five years would be the minimum to recognize a pattern.

Assessment of the quality of the process of knowledge creation (step 2b)

Parallel to measuring incremental and radical innovation data is gathered about the quality of the process of knowledge creation. The aim of this step is to reveal the sources of knowledge productivity and get better insight in the current situation. Assumption is that the quality of the process of knowledge creation determines the extent to which incremental and radical innovation will be achieved. The assessment of the quality of the process of knowledge creation is based on Kessels' Corporate Curriculum (1996). As we have seen, the Corporate Curriculum consists of seven learning functions. Based on the literature review (Chapter 3), each of the learning functions has been operationalized in ten statements, which resulted in a questionnaire of seventy statements (Table 4.1).

Table 4.1: Survey Corporate Curriculum[10]

Item	Statement
1. Subject matter expertise	
MD1	We know which knowledge we need (to be successful)
MD2	We systematically build up knowledge about topics that are of strategic importance
MD3	We know what we know
MD4	We know what we do not know (but should know)
MD5	In our organization, knowledge is developed purposefully, based on an inventory of knowledge shortages
MD6	In our organization, knowledge and experiences are easily accessible
MD7	The importance of sharing knowledge is widely acknowledged
MD8	In our work, we deliberately create opportunities to share knowledge and experiences
MD9	Employees do not have difficulties with sharing knowledge
MD10	In our organization, sharing knowledge is sufficiently facilitated (e.g. by meetings or automated systems)
2. Ability to solve problems	
PO1	Our organization is prepared for the future (whatever may happen)
PO2	In new situations, our employees are able to utilize available knowledge in a creative manner
PO3	We are given sufficient room to experiment with new insights
PO4	My work provides me with room to choose my own approach
PO5	We are stimulated to experiment with unconventional approaches
PO6	We are given sufficient room to renew existing procedures
PO7	In our work, we are challenged to solve problems on our own
PO8*	New ways of working are hindered by habits and routines
PO9*	New ways of working are hindered by structures and procedures
PO10	We deliberately work on the development of new ways of working
3. Ability to reflect	
VR1	We know what our strengths and weaknesses are
VR2	We understand why we excel in certain areas and why we do not excel in other areas
VR3	We continuously search for better ways of working
VR4	Activities/projects are systematically evaluated (e.g. by evaluation forms or evaluation meetings)
VR5	The outcome of evaluations regularly result in a change of the way we work

[10] See Appendix 7 for original Dutch version.

Table 4.1 (continued): Survey Corporate Curriculum

Item	Statement
VR6	We are stimulated to regularly reflect on our current activities
VR7	We are given room to reflect on our personal functioning (e.g. through training, coaching, etc.)
VR8	We are used to discussing the quality of our work together
VR9	We discuss the quality of our work with our clients regularly
VR10	In our organization, we deliberately pay attention to improving knowledge exchange
4. Communicative and social skills	
CS1	It is not difficult to access each others' knowledge
CS2	In our organization, proper manners (such as respect, politeness and collegiality) are well thought-of
CS3	In our organization, collaboration is seen as an opportunity to learn from others
CS4	Our organizational structure is simple, with few hierarchical levels
CS5*	Our structure hinders communication and collaboration between different departments/business units, etc.
CS6	In our organization, people feel free and safe to share knowledge with each other (knowledge is not misused)
CS7*	Our culture is characterized by strong internal competition (e.g. between individuals, departments, units)
CS8	In our organization, a strong team spirit prevails
CS9	We discuss the quality of our work with our clients regularly
CS10	In our organization, there is an informal atmosphere. This is seen in such things as open doors and easy access to colleagues
5. Self-regulation of motivation	
ZM1	In our organization we are given sufficient room to pursue our personal ambition
ZM2	We are given sufficient room to make our personal preferences known
ZM3	When dividing tasks, personal preferences are taken into account
ZM4	In our organization we are used to clearly indicating what it is that motivates us
ZM5	We are expected to give direction to our own activities
ZM6	In our organization, employees influence the tasks that are given to them
ZM7	We are given more than enough room to utilize our capacities
ZM8	In our organization, "personal entrepreneurship" is stimulated
ZM9	In our work, we get room to decide for ourselves what is important
ZM10	Our employees are characterized by intense personal involvement with our work
6. Peace and stability	
SR1	In our organization, employees get sufficient time to perform their tasks
SR2	It is possible to concentrate on a certain task
SR3	We are given sufficient time to keep abreast with current developments in our field
SR4	In our organization, personal and professional development is sufficiently facilitated
SR5	My work offers me sufficient opportunities for deepening my knowledge and expanding my experiences
SR6	In our organization, we allocate sufficient time for reflection on ongoing or finished projects/activities
SR7	New insights are broadly disseminated throughout the organization (in order to benefit others)
SR8	The way we have organized our work, offers sufficient opportunities to integrate new insights (e.g. from professional literature or colleagues) into our approach
SR9	Our way of working offers sufficient room for moments of relaxation
SR10	We are focused mainly on improving our processes (ways of working), products and services

Table 4.1 (continued): Survey Corporate Curriculum

Item	Statement
7. Creative turmoil	
CO1	Our organization is characterized by a high level of ambition
CO2	We realize that continuous renewal is a necessary precondition for survival
CO3	We continuously keep an eye on our competitors
CO4	The developments in the market force us to renew (processes, products, services)
CO5	In our work, exciting things frequently happen (e.g. new assignments that require a great deal of attention)
CO6	Our strategic objectives force us to take new routes
CO7	In our organization, changes are implemented continuously
CO8*	It is not certain if our organization will still exist in its current form in a few years time
CO9	Our organization has high work pressure
CO10	We stimulate each other to explore unconventional ways of working

** reversed items*

All employees within the organization are invited to participate in an electronic survey (NetQuestionnaires) and give their perception about these statements on a five-point Likert scale (Swanborn, 1988). The aim of the survey is to measure the perception of the employees about the quality of the learning functions of the Corporate Curriculum. The outcome will be used to analyze the current situation and generate input for the next phase, in which the findings are translated into a Knowledge Productivity Statement.

4.3.4 Phase 3: Formulating a KP-statement

The main aim within the third phase of the KP-enhancer is to generate a plan (KP-statement) for enhancing KP. The process of formulating this KP-statement is based on the process of generating an Intellectual Capital Statement, as developed by the Danish Ministry of Science Technology and Innovation (STI, 2003b).

Knowledge Productivity Statement

Although this phase follows the Danish Guideline (see Chapter 3.4.3), some minor modifications have been made. The main difference is that the process does not start from the concept of intellectual capital and its different types of intangibles, but from Kessels' (1996) Corporate Curriculum and Zegveld's (2000) Quantitative Framework. Furthermore, the starting point of the process is the output of the analysis of the current situation (phase 2), based on the diagnosis of KP in terms of process and results. Generating a KP-statement takes place in several workshops with a selection (max. ten) of the employees. Developing a KP-statement is a process that consists of four steps:

1. Make an inventory of existing initiatives and underlying challenges related to enhancing KP.
2. Translate the organizations strategic objectives into a knowledge strategy.
3. Reconsider challenges and initiatives. Based on our diagnosis of the current situation and the knowledge strategy as formulated in Step 2, we now can reconsider the challenges and initiatives (Step 1). Questions are: Which initiatives deserve priority? Which initiatives should be launched? Which can be eliminated?
4. Define indicators. Finally, after the strategy, challenges and initiatives have been completed, indicators are defined to monitor the progress of the initiatives.

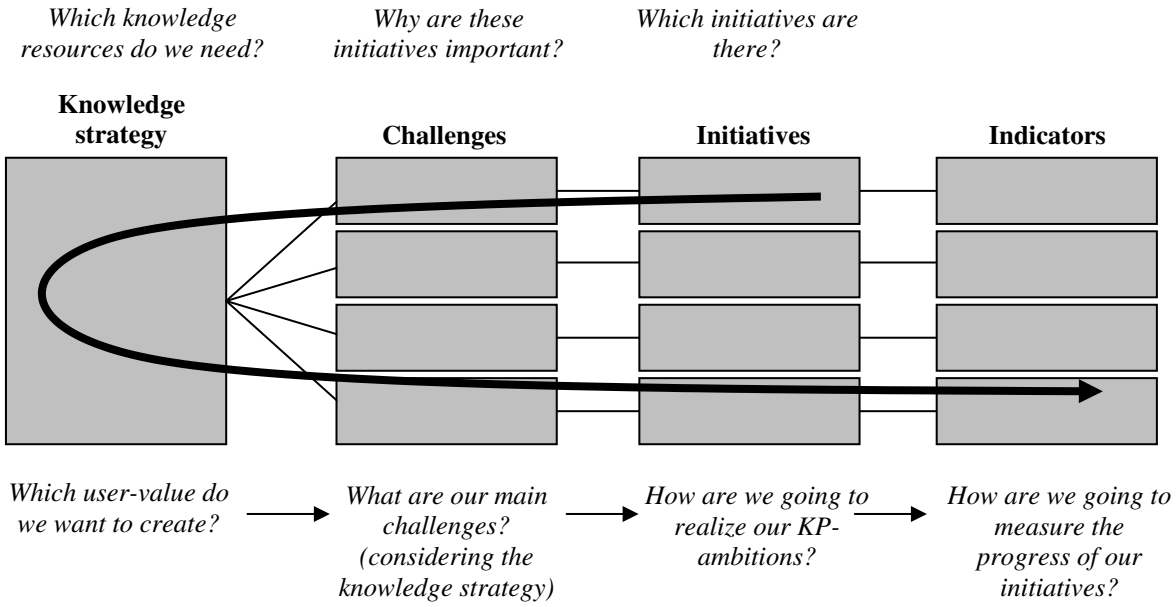


Figure 4.2: The Knowledge Productivity Statement Model (based on STI, 2003b)

Together, these steps should result in a coherent KP-statement, analogue to the Intellectual Capital Statement Model, as described in the previous chapter. This KP-statement serves as the main result of applying the KP-enhancer.

4.4 Evaluating the design

Within this research, the development of the method is an iterative process. After each case study the effectiveness of the method will be evaluated. The lessons learned will be used to improve the design, before applying it in the next case study. The evaluation will be based on the experiences of the researcher, a semi-structured interview with the client and a reliability analysis of the survey.

4.4.1 Semi-structured interview

Semi-structured interviews are variously described as informal, unstructured, narrative or non-directive and are in essence a conversation between two or three people – the interviewer and the informant(s) (Mador, 2003). Semi-structured interviews are a particularly useful method of collecting data where the nature of the research is exploratory and the focus is upon gaining understanding from the perspective of the actors involved.

Outline of the interview

The main elements within the evaluation are the effectiveness (results) of the method, the design of the method, and the application domain (class of problems and class of contexts).

Effects of the method

Reference points for evaluating the effects of the method are the requirements of the method as described in this chapter (section 4.2), and the specific expectations of the client as formulated in the first phase (problem definition). The interview will not only focus on intended effects, but also on unintended effects.

Design of the method

The starting point for the evaluation of the design of the method, is the initial design as described in this chapter (section 4.3). The main elements in the initial design are the Quantitative Framework, the survey based on the learning functions of the Corporate Curriculum, and the process of formulating a KP-statement based on the Danish Guideline. As the method can be described as eclectic – composed of selections from various sources – specific attention will be paid to the coherence between the different elements.

Context of application

The starting point for the evaluation of the context of application is the application domain as described in section 4.1. When evaluating the context, attention will be paid to both the *class of problems*, and the *class of contexts* for which the method has been developed.

The interview takes place with the main person(s) involved. The duration of the interview will be one hour and takes place at the office of the customer. The informants do not have to prepare for the interview.

Processing the data

The data from the interview will be used to evaluate the performance of the method and identify opportunities for improvement. The complete case-description will be send for verification to the client. After completing the case studies, a cross-case analysis (Yin, 2003) will be performed. This cross-case analysis will be based on the same three elements as described above: effects, design, and context of application. The case-descriptions and the cross-case analysis are used to answer Sub question 6 (What can we learn from applying the method in practice?).

4.4.2 Statistical analysis of survey

In order to find out if we can improve the questionnaire, a statistical analysis will be performed. The main elements of this analysis will be inter-item analysis, reliability analysis and a missing value analysis.

Item analysis

An item analysis will be performed for each set of items related to the different learning functions. This analysis will be based on a correlation matrix. Supposing that the majority of the items within a subset are related to the same continuum, we will consider removing the items that correlate poorly with the majority of the items (Swanborn, 1988).

Reliability analysis

Homogeneity or internal consistency of the items is a precondition for validity (Baarda & de Goede, 2001). Therefore, in order to test the internal consistency of the items related to a single learning function, we will perform a reliability analysis (Cronbach α) (Swanborn, 1981). As the learning functions are rather complex concepts, we will aim at reliability scores of 0.70.

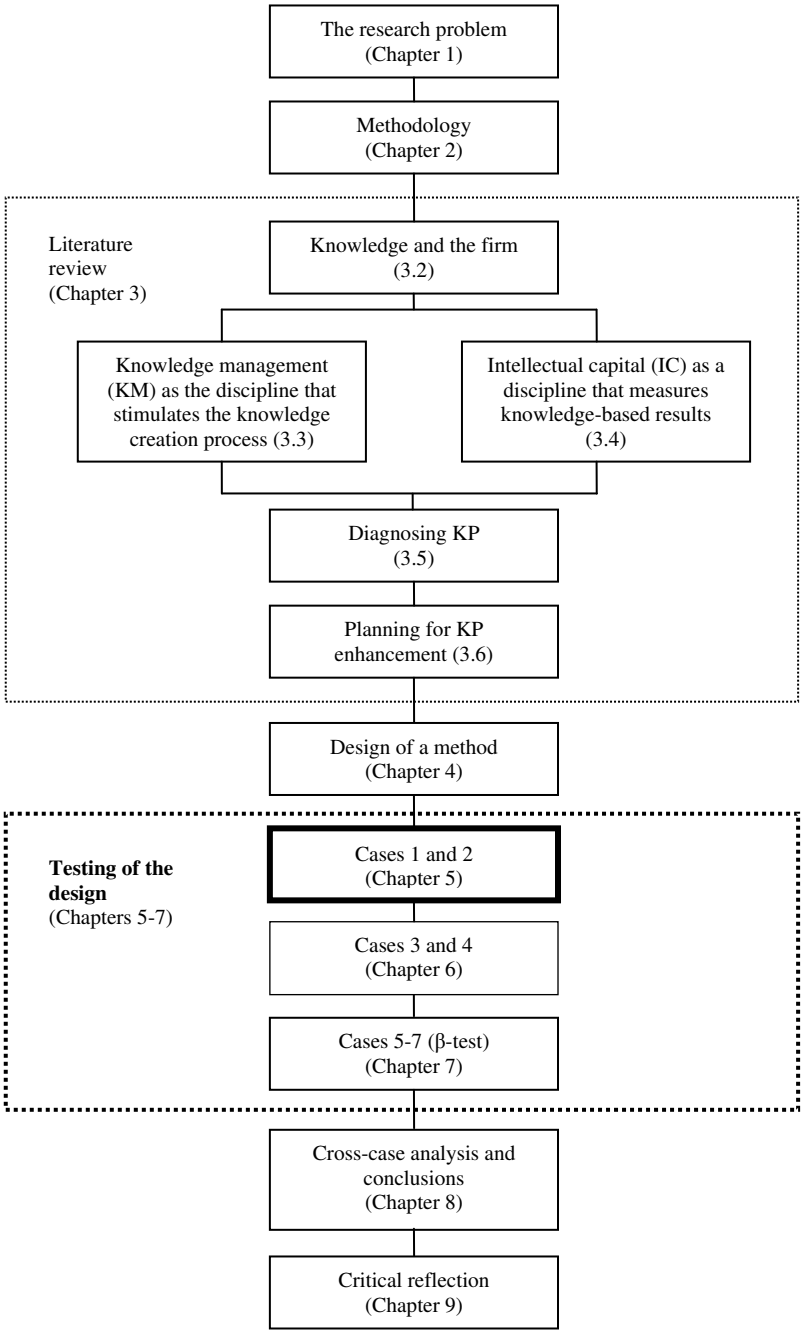
Missing value analysis

Missing values can be an indicator of an unrepresentative survey. The response of a survey is the part of the sample that generates the required information; non-response is

the part that does not ('t Hart, van Dijk, de Goede, Jansen, & Teunissen, 1998). Although respondents within this survey are obliged to respond to all items (otherwise they cannot proceed with the survey), they have the option to select “not applicable” or to stop answering questions somewhere halfway. Choosing these options leads to missing values. These missing values will be analyzed to find out the representativeness of the survey.

The data needed to perform these analyses is automatically generated by NetQuestionnaires[11], the ASP-tool in which the survey is made. The data will be processed in SPSS.

[11] www.netquestionnaires.nl



Sub questions
to be answered:

1. How can we design and test a management method?

2. What is meant by knowledge productivity (KP)?

3. How can we diagnose knowledge productivity?

4. How can we plan KP enhancement?

5. What does the initial design of the management method look like?

6. What can we learn from testing the method in practice?

Main Question:
How can organizations diagnose KP and plan for enhancement?

5 Testing the initial design: Case 1 and 2

This chapter is the first of three chapters in which we report about the empirical tests of the KP-enhancer. This chapter reports about the first two cases. The first case where we applied our method was Transfer Solutions bv, an ICT service provider with 107 employees. The second case where we applied the method was Midfield Consultants[12], a consultancy bureau for SME's with 43 employees. These two case studies took place between October 2005 and May 2006. The aim of these iterations was to test and improve the initial design of the method, as described in Chapter 4.

5.1 Case 1: Transfer Solutions bv

5.1.1 Introduction

The first case where we applied the KP-enhancer was Transfer Solutions bv. Transfer Solutions, which was founded in 1995, is a Dutch ICT service provider specialized in Oracle database systems and Java-technology. The company delivers services in the field of automation with Oracle software. Its mission is to transfer knowledge and experience to customers in order to solve Oracle software related problems.[13] At the time of application of the method, Transfer Solutions counted 107 employees divided over four business units: Education, Internet Solutions, Consultancy and DBA Solutions. Together, the company can be qualified as a Dutch medium-sized knowledge-intensive service firm.

Reason for selecting Transfer Solutions as the first case was the fact that the CEO had shown her interest in the main concepts of this research and her interest to participate in a research program related to these concepts. As the first case study was the first confrontation of the method with practice, some prior personal contact was believed to be convenient. Finally, the CEO explicitly indicated that she did not object being a "guinea pig". In this sense the selection criteria for this first case study resemble the criteria for selecting a pilot case, as suggested by Yin (2003).

Whereas the CEO agreed to participate and acted as the formal sponsor, the project was delegated to the Financial Controller, who was particularly interested in the concept of knowledge productivity. Furthermore, at that time he considered to write a paper about this concept for his MBA studies.

The method was applied between October 2005 and January 2006. Within this section we report about the application of the KP-enhancer per phase, and finally we reflect on the effectiveness of the method within this context.

5.1.2 Phase 1: Problem definition

In order to define the problem at hand, an interview took place with the CEO and the Controller. The main aim of this interview was to verify whether the method seemed to be the right solution to the problem at hand.

The main problem within this company appeared to be an internal control issue. According to the Controller, "the main asset of Transfer Solutions is knowledge. However, we do not know the value of this asset, and we do not know the extent to which it has been made productive. We want to know when and how to intervene." To conclude, Transfer Solutions wanted to improve internal management, through better understanding of the sources and the

[12] Fictitious name

[13] Annual reports 2003 and 2004 and www.transfer-solutions.com

development of knowledge productivity. Transfer Solutions expected that applying the KP-enhancer would not only lead to better understanding of the sources of knowledge productivity, but also reveal possibilities to improve the current situation. This expectation was in line with the functional requirements for which the method was designed (Chapter 4).

5.1.3 Phase 2: Diagnosing KP

After defining and verifying the problem at hand, we started diagnosing KP. Based on Zegveld's Quantitative Framework we detected incremental and radical innovation, and based on Kessels' Corporate Curriculum, we assessed the quality of the process of knowledge creation. The aim of this phase was to gather data that supports the analysis of the current situation in the workshops.

Detecting incremental and radical innovation

The aim of this element is to detect a possible change in the selection of one of the three generic strategies and a possible change in the strategic perspective of the organization. The former is detected by calculating OCF, the latter is detected by calculating the residual. As the organization could only generate the required data over a limited period of time, we decided to limit our calculations to the past five years.

First we detected incremental innovation by calculating OCF and the cash impact of the three generic strategies (volume, added value and efficiency) on the change of OCF (Appendix 11). In the period 2000-2004 the overall contribution to OCF was 76% for volume, -35% for added value (increase added value per unit turnover) and 9% for efficiency (reduce costs per unit turnover).
According to Zegveld, organizations are either volume-driven or performance-driven. When they are performance-driven, they can be either focused on reducing costs (efficiency) or on increasing value added per unit turnover (added value). Therefore, when reporting about incremental innovation, we compared volume to performance (Figure 5.1) and added value to efficiency (Figure 5.2).

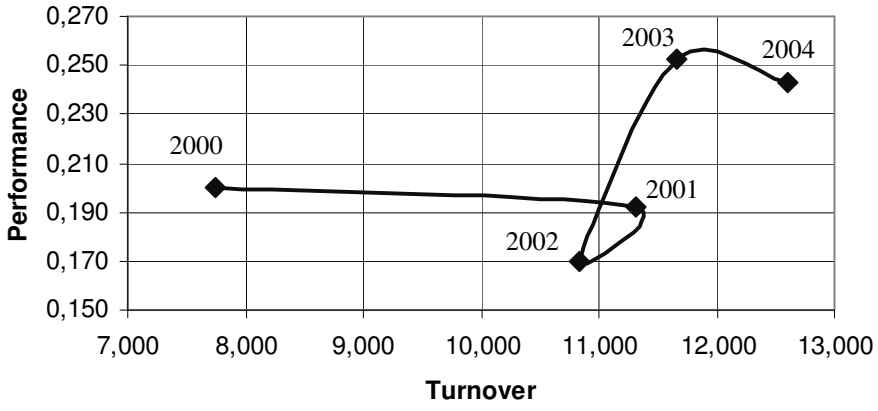


Figure 5.1: Detecting incremental innovation (cash impact Performance vs Turnover in mln. €), Transfer Solutions, 2000-2004

Figure 5.1 shows that all years but one, the cash impact of volume increased. All years but one, the cash impact of performance (added value and efficiency) decreased. Although management focus seemed to be predominantly on increasing volume, the other two strategies

do have their impact on OCF. When comparing the two performance strategies (Figure 5.2), we see a dominant focus on improving efficiency (reducing costs per unit turnover).

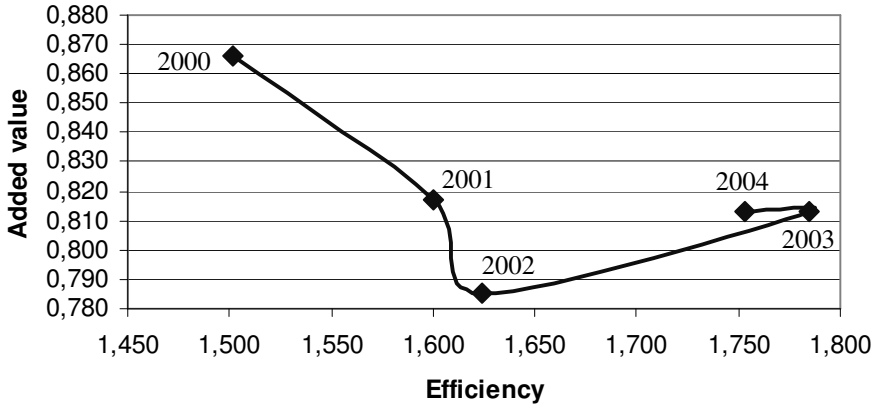


Figure 5.2: Detecting incremental innovation (cash impact added value vs efficiency in mln. €), Transfer Solutions, 2000-2004

Based on these figures we concluded that the management of Transfer Solutions in the period 2000-2004 had a stable focus on increasing volume. Although 2003 shows a sharp increase in the contribution of the performance strategies (mainly reducing costs), 2004 shows a very strong focus on volume again. Therefore, based on these figures, we could not detect a (implicit or explicit) change in management focus. In other words, the cash-impact analysis in the period 2000-2004 did not reveal incremental innovation.

Next we detected radical innovation by calculating residual change. Based on the traditional productivity figures (efficiency of labour and the effectiveness of capital investments) we calculated the residual change (Appendix 12).
Because radical innovation is defined as a new combination of resources which leads to a new perspective for the organization, this new perspective can be recognized by a significant change in the residual build up. So, in order to detect radical innovation, we should detect a radical change in the build up of the residual.

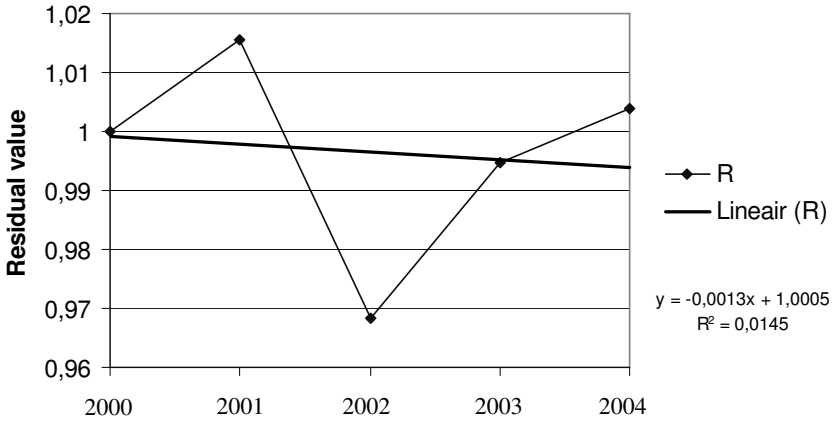


Figure 5.3: Detecting radical innovation (build up residual value compared to year 1), Transfer solutions, 2000-2004

Based on these figures (Appendix 12) it seems Transfer Solutions qualifies as a radical innovation company. This conclusion is illustrated by Figure 5.3, which shows a (very) low correlation (R2) between the linear regression line (R) and the calculated average build up (γ). The fact that the linear regression line within this figure crosses the period line, could be another indicator of radical innovation. Therefore, based on these figures, there seemed to be an unstable build up of the residual and thus radical innovation.

Assessment of the process of knowledge creation

Parallel to applying Zegveld's Quantitative Framework, we also diagnosed the process of knowledge creation by assessing the seven learning functions of Kessels' Corporate Curriculum. All employees were asked to participate in an electronic survey about the seven learning functions of the Corporate Curriculum. The respondents were asked to give their perception (1-5 Likert-scale) about seventy statements related to the quality of the learning functions. The questionnaire generated a response of 69% (n=74). The average time for completing the survey was 13 minutes (±8 min.). We calculated the average scores per item (Table 5.1) and per learning function (Figure 5.4).

Table 5.1: Average scores per item, Transfer Solutions bv (n=74; 69%)

Learning function	Item*	1	2	3	4	5	6	7	8	9	10
Subject matter expertise	**MD**	3.93	3.45	3.53	3.35	2.86	3.53	4.28	3.88	4.15	3.78
Ability to solve problems	**PO**	3.53	3.77	3.42	3.90	3.11	3.57	4.18	3.31	3.66	3.14
Ability to reflect	**VR**	3.59	3.70	3.47	2.39	2.32	2.72	3.42	3.25	3.18	3.62
Communicative and social skills	**CS**	3.50	4.20	4.23	4.41	3.80	4.34	4.07	3.70	3.64	4.46
Self-regulation of motivation	**ZM**	3.84	4.03	3.61	3.53	3.63	3.66	3.64	3.56	3.49	4.00
Peace and stability	**SR**	3.58	3.50	3.23	3.45	3.54	2.46	3.34	3.20	3.39	3.19
Creative turmoil	**CO**	3.92	4.03	3.37	3.99	3.68	3.39	2.86	2.84	3.08	2.84

** these codes refer to the item codes in the questionnaire (Table 4.1)*

These figures revealed a remarkable list of high scores related to the ability to communicate and collaborate (CS). Six out of ten statements resulted in an average score above four, which resulted in the highest average score (4.04) for this learning function compared to the other six learning functions. The second highest score (3.70) was for self-regulation of motivation (ZM). The low scores (<3) mainly referred to the ability to reflect (VR) and creative turmoil (CO). The response to these two learning functions, together with the peace and stability function (SR), resulted in the lowest average scores per learning function.

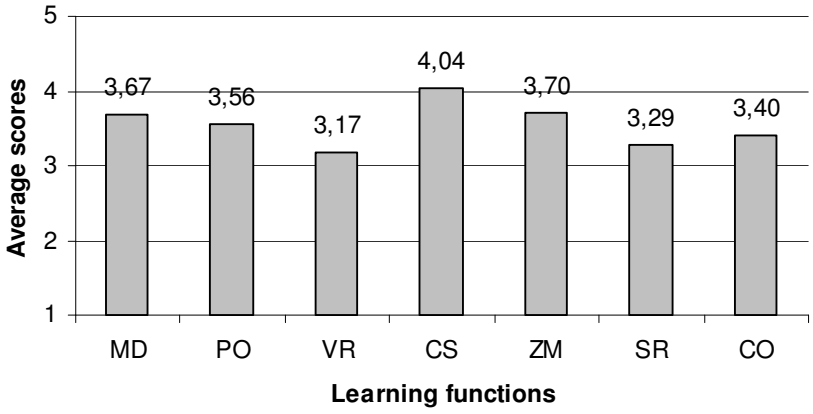


Figure 5.4: Average scores per learning function, Transfer Solutions

After gathering the data, we could start analyzing the current situation. As described in Chapter 4, a series of workshops was organized. These workshops were attended by the CEO and the Controller, several management consultants and members of the support staff. The main aim of the first workshop was to introduce the concept of knowledge productivity and analyze the data (Quantitative Framework and survey) in order to gather input for formulating the KP-statement in the next phase.

5.1.4 Phase 3: Formulating a KP-statement

The process of generating a Knowledge Productivity Statement was based on the so-called Danish Guideline for generating intellectual capital statements, as described in Chapter 4. This means that we started by identifying current initiatives aiming at improving the process of knowledge creation. This resulted in a list of 37 initiatives, varying from educational activities to technical improvements related to knowledge exchange. The next step was to identify the underlying challenges. Why are these 37 initiatives important to our organization? This resulted in a list of 19 challenges. Next we asked the participants to answer the following three questions:

1. What are the products/services that we provide?
2. What is the use value of these products/services?
3. What knowledge resources do we need to provide our products/services?

The responses to these questions were brought together by the researcher in a draft knowledge strategy, and presented to the participants at the beginning of the second workshop. After some discussion, this resulted in agreement about a knowledge strategy. The next step was to use this strategy as reference point in order to reconsider the firm's challenges and subsequently its initiatives. Together these steps resulted in a (draft) Knowledge Productivity Statement (Table 5.2).
Although this statement was accepted as final product at that moment, it was also generally acknowledged that further fine tuning was necessary. The main points of concern were:

1. Initiatives should be formulated more specific. Sometimes it is not clear what the initiative/action is. The more specific the action is, the better the progress can be monitored.
2. The number of initiatives could be too large to be realistic. Therefore it is suggested to make a selection of a feasible number of actions. Although all actions seem relevant, which actions should we focus on now?
3. Finally, the indicators should be reconsidered. Which indicators are SMART and are a good indication of success and progress of the selected actions?

These points of concern were taken over by the management and the intention was to involve the management team in finalizing the statement in order to grow commitment for further implementation.

Table 5.2: KP-statement Transfer Solutions

Knowledge strategy	Challenges	Initiatives	Indicators
Transfer Solutions delivers a flexible extension of the ICT competence of the customer through … … (temporary) deployment of knowledge and capacity in the areas of Oracle and Java, in the form of training, consultancy, system building and maintenance. Therefore we need: • State of the art knowhow in the areas of Oracle and Java • Competent and satisfied employees • Solid knowledge infrastructure • Knowledge about the customer and issues he has to deal with • Good reputation and a network of loyal customers • A family culture in which everyone can thrive	Motivate employees and stimulate them to develop themselves continuously	• Report about personal development in half year review • Take care that employees vary in type of tasks • Make alternatives in knowledge development explicit • Stimulate knowledge development through SIG's, MBA's, etc. • Acknowledge knowledge activities as a formal activity (through code for time writing)	# review forms # SIG's, MBA's, etc. # hours spend on knowledge processes
	Create commitment and fascination among employees	• Introduction program for new employees (incl. follow up) • Make connection between experienced and new employees (buddies) • Lunch meetings management-employees • Meet and greet meetings • Make personal development programs (pop's)	% intro programs # buddies # lunches # meet and greet meetings % pop's
	Awareness about the importance of knowledge	• Organize workshop about importance of knowledge • Publish success stories • Reward knowledge activities (e.g. publications) • Assess employees w.r.t. sharing / codifying knowledge • Report about reusing knowledge • Set the example (management)	# workshops # publications # assessments # reusing knowledge
	Improve accessibility of available knowledge	• Make index of library • Make distant working possible • Improve usage of existing Q&A-system (Einstein) • Give direction to, and order competence matrix • Report customer data in existing system • Capita Selecta • Buddies	Yes/No Yes/No Yes/No # competence profiles # customer profiles # CapSel + # visitors/users # buddies
	Create sufficient peace and space to learn from the things we are doing	• Evaluate projects (include in budget!) • Report to organization about knowledge acquired in trainings • Report about relevant experiences (in comparable projects) before starting a new project • Codes and budget • Make ways of working explicit	% projects that have been evaluated % trainings that have been reported to the organization % plans with section about learning points from earlier projects

5.1.5 Evaluating the effectiveness of the method

Immediately after completing the KP-statement, the method was evaluated together with the CEO and the Controller. The interview focused at the effects of the method and the design of the method as perceived by the client. Eighteen months later (July 2007) we interviewed the client again about his perception of the effectiveness of the method.

Effects of the method

The aim of applying the KP-enhancer in this case study was to get a better understanding of the sources and developments of knowledge productivity. It was expected that better understanding would reveal possibilities to improve the current situation. After completion of the method, the CEO and Controller indicated that the main effects of the application were (in order of importance):

- increased awareness about the importance of KP;
- increased involvement of employees in the strategic dialogue;
- a set of initiatives that aim at improving knowledge productivity.

Based on these effects, it seemed the method had been effective within this case. However, during the evaluation it also appeared that the CEO and the Controller had expected that the method would have provided more objective measures of knowledge productivity. Although the method had generated some progress in the thinking about the process of knowledge creation, it had not, or only very limited, given insight in the way knowledge productivity could be measured. At that point, it was expected that continuous application of the concept of knowledge productivity would eventually lead to better understanding, which would subsequently lead to more insight in measuring and improving knowledge productivity.

Effects as perceived after 18 months

In this case we had the opportunity to reflect on the application of KP-enhancer after 18 months. In a short interview with the Controller we asked how he looked back upon the application of the method, what he thought had been the main results, and what happened with these results since the completion of the method.
According to the Controller, the main achievement of the KP-enhancer had been that it succeeded in the strategic alignment of knowledge initiatives and a framework for monitoring these initiatives. After completion of the method, Transfer Solutions further developed the KP-statement (which they renamed in "Knowledge Score Card").[14] Several meetings were held with the management team in order to make a realistic selection of initiatives to be taken, and indicators to be measured. Eventually, this resulted in a list of ten initiatives and related indicators, which were published (internally) for the first time mid-2007. Objective is not only to use this Knowledge Score Card as an internal document to support knowledge management, but also as a document that can be used for external reporting about the knowledge performance of the company. In this sense the method would not only contribute to improving internal management, but also to improving external communication.

Design of the method

The three main parts of the initial method were Zegveld's Quantitative Framework, a questionnaire based on Kessels' Corporate Curriculum and a Knowledge Productivity Statement based on the Danish Guideline for Intellectual Capital Statements.

[14] They even received financial support (loonkostensubsidie) from Senter Novem for this project.

When applying the method, the main difficulties were caused by applying the Quantitative Framework to detect incremental and radical innovation. A distinction can be made between "technical" problems and problems related to language issues, misunderstanding, etc. Both kind of problems resulted in questions raised by the participants regarding the validity of the method. Due to limited availability of data, we had to limit our calculations to a period of five years. As a result, the outcome was seriously disturbed by one deviating accounting figure (2002). Although it seemed the figures revealed radical innovation (Figure 5.3), the sudden change in the build up of the residual in fact was caused by depreciation of a questionable debtor. This resulted in a strong rejection of the outcome of the calculations with regard to radical innovation. Due to a lack of availability of more annual figures and a lack of time (of the Controller) to generate mid term or quarterly figures as an alternative, we were not able to extend the number of measures. Increase of the number of figures would probably have reduced the disturbing effect of 2002.

The rejection of the outcomes by the participants was the result of some difficulties related to the interpretation of the concepts used. The first difficulty was caused by Zegveld's neutral interpretation of the concept of innovation. According to Zegveld, innovation can have a positive or a negative impact on the performance of a company. Some of the participants had difficulties with this interpretation, because they associated innovation with a per definition positive impact on performance. Another problem was related to the interpretation of the concept of incremental innovation. Whereas Zegveld refers to a change in management focus, most participants associated this concept with everyday improvements. Although the stable focus on increasing volume was recognized, the conclusion that Transfer Solutions could not be characterized as an incremental innovation company in the period 2000-2004 was not accepted. Finally, the fact that Zegveld's analysis aims at detecting a (change in a) trend also caused difficulties. Not the figures itself, but the development of the figures over a long period of time, determine whether a company qualifies as incremental and/or radical innovation, or not. When interpreting the data, the question should be, do we detect a stable or an unstable development over a longer period of time? Many participants had difficulties with looking beyond the individual figures.

Together, all these difficulties reduced the acceptance of the conclusions by the participants dramatically and as a consequence the focus in the workshop shifted from detecting incremental and radical innovation, to assessing the validity of the Quantitative Framework. Therefore, after the first presentation of the outcome we decided to ignore the outcome of this analysis and solely focus on the analysis based on the outcome of the survey.

Contrary to the outcome of the Quantitative Framework, the outcome of the survey at first seemed to be completely recognized and accepted. Later on, however, the outcomes of the survey were also questioned. According to the CEO and the Controller, the main difficulty with analyzing the outcome of the questionnaire was that the scores could not be compared to a benchmark. The fact that some learning functions generated a lower score than others did not automatically mean that these learning functions performed worse than others. According to the CEO and the Controller, the only objective way to assess these scores would be a comparison with scores in similar firms. Therefore, according to the CEO and the Controller, the comparison of the scores of the learning functions had been subjective and arbitrary.

The most appreciated element of the method was the KP-statement. This appreciation was confirmed by the fact that it was introduced in the management team. Furthermore, the intention was to make this statement part of internal and external communication about the performance of the organization (see *effects of the method* above).

Although not perceived as a problem within this case, the time needed to implement the method was longer than expected. The main reason for this was the time needed for generating a Knowledge Productivity Statement. This was mainly due to the large number of

steps that had to be taken and the time that was needed to get agreement about the outcome per step.
Finally, although the different parts (Quantitative Framework, Corporate Curriculum and KP-statement) were suggested to form a coherent method, the relationship between the three had not been clear to the participants. Plausible explanation for this could be the difficulties we had with combining the Quantitative Framework and the Corporate Curriculum, due to the different interpretations of the concepts of incremental and radical innovation. Another explanation could be that the outcome of the analysis of the questionnaire had not sufficiently and explicitly been taken into account when formulating a KP-statement.

5.2 Improving the method

Based on the experiences in the first iteration we decided to change the initial design of the method on three points. First, based on a statistical analysis, we increased the alpha scores per learning function by deleting several items. Second, we developed a set of additional questions about incremental and radical innovation, in order to bridge the gap between the Corporate Curriculum and the Quantitative Framework. Third, we developed a "board game" to collect input for the process of generating a KP-statement in order to increase coherence between the diagnosing and the planning phase.

5.2.1 Improving the questionnaire

In order to find out if we could improve the questionnaire, we first conducted a reliability analysis (Cronbach α) in which we tested the homogeneity of each learning function (Table 5.4). Each learning function represents a set of ten statements. Although these scores already indicated high reliability (α1), the statistical analysis also revealed some possibilities for improvement through deleting items. Deleting items might contribute to improving reliability of the weakest learning functions (*ability to reflect* and *creative turmoil*). Furthermore, deleting items would create room for additional questions about incremental and radical innovation (see below), without increasing the total number of questions too much. We decided to delete seven items (Table 5.3).

Table 5.3: Items deleted after first iteration

Learning function	Item code	Statement
2	PO 10	We deliberately work on the development of new ways of working
3	VR 1	We know what our strengths and weaknesses are
3	VR 2	We understand why we are successful in certain areas, and why we are less successful in others
3	VR 10	In our organization, we deliberately pay attention to improving knowledge exchange
4	CS 1	It is not difficult to access each others' knowledge
7	CO 8	It is not certain that our organization will exist in its current form in a few years
7	CO 9	Our organization has high work pressure

In order to raise the alpha score of the third learning function (ability to reflect) we had to delete four items (VR1, VR2, VR3 and VR10). However, as deleting all these items would reduce the number of items too much, we decided to accept a slight decrease of the alpha score of this learning function by deleting only three items. We decided not to delete VR3 (we are continuously searching for better ways of working), because we believed this item to be closely related to the core of this learning function. In order to raise the alpha score of the seventh learning function (creative turmoil) we had to delete two items (CO8 and CO9).

Together, deleting these items resulted in an overall improvement (α2) of the reliability scores (Table 5.4).

Table 5.4: Alpha coefficients (Cronbach α) per learning function before (α1) and after (α2)deleting items

	Learning function	n	α1	α2
1	Subject matter expertise (MD)	74	.8377	.8377
2	Ability to solve problems (PO)	65	.8571	.8636
3	Ability to reflect (VR)	62	.7898	.7807
4	Communicative and social skills (CS)	72	.8477	.8592
5	Self-regulation of motivation (ZM)	68	.9000	.9000
6	Peace and stability (SR)	70	.8507	.8507
7	Creative turmoil (CO)	65	.7563	.7960

5.2.2 Connecting Corporate Curriculum and the Quantitative Framework

Although the KP-framework (see final section Chapter 3) suggests that the Corporate Curriculum and the Quantitative Framework are connected through the concepts of incremental and radical innovation, within the first case study we had not been able to make this connection. Within the first design of the KP-enhancer this connection remained implicit. In order to more explicitly connect process and results, we developed an extra set of questions that assesses the company's ability to realize incremental innovations and radical innovations. The additional questions exist of three parts. First, two open questions ask for examples of incremental innovations and radical innovations (Table 5.5). These two open questions serve as an "advanced organizer" (Ausubel, 1960) in the sense that they direct attention to what is important in the following questions. Next, a set of five questions asks for the respondent's perception about the company's ability to realize incremental innovations (Table 5.6). Finally, a set of five questions asks for the respondent's perception about the company's ability to realize radical innovations (Table 5.7). In order to make the questions more concrete, and in order to reduce the risk of non-response, we decided to ask for concrete results in the past year.

Table 5.5: Open questions

Item	Question
VV1	Which measures have been taken the past year, in order to improve the quality of work in your organization?
VV2	Which radical improvements have been realized the past year in your organization (e.g. introduction of new products and/or services)?

Table 5.6: Statements about incremental innovations (IV)

Item	Statement
IV1	The past year our work processes have been optimized
IV2	The past year, our existing producst and/or services have been improved
IV3	The past year we really worked hard to improve the quality of our services
IV4	The past year was characterized by the improvement of the efficiency of our working processes
IV5	The past year, our focus was on realizing existing strategic objectives

Table 5.7: Statements about radical innovations (RI)

Item	Statement
RI1	The past year, our organization introduced new products and/or services
RI2	The past year, our focus was on renewing our products and/or services
RI3	The past year, our employees were stimulated to explore new areas (for our organization)
RI4	The past year, our organization has made radical strategic choices, which will have far reaching consequences for the future
RI5	The past year was characterized by a strong focus on the future

5.2.3 Enhancing coherence

Another conclusion after the first iteration was that the different elements within the method lacked coherence. In order to strengthen coherence the method should generate more "tangible" output through collective analysis of the outcome.
In order to discuss the outcome and to collect shared findings, we developed a "board game", based on the KP-flywheel (Figure 3.7) as presented in Chapter 3. The main questions within this game are: "what result are you aiming at (incremental innovations or radical innovations)?" and "which learning function(s) need to be improved in order to realize this result?" The game is played after the presentation of the outcome of the survey.
The game is played in several rounds. The first round each participant is asked to put a *result* card on either incremental or radical innovation. Everyone is asked to elaborate on his/her choice. At the end of this round everyone is asked to reconsider his/her choice. The second round, each participant is asked to put *priority* card number one on the learning function which needs to be improved first. Again everyone is asked to elaborate on his/her choice and finally everyone is asked to reconsider. The third and fourth round are repetitions of the second round.
The objective of the game is a shared vision on the result that the company is aiming at (incremental or radical innovations) and the kind of improvements which are needed to achieve this result, given the outcome of the analysis of the learning functions. These collective findings serve as input for generating a KP-statement.

5.3 Case 2: Midfield Consultants

5.3.1 Introduction

The second case where we applied the KP-enhancer was Midfield Consultants, a Dutch consultancy firm that specifically aims at small and medium sized enterprises (SME's). At the moment of the application of the method, the firm counted 43 employees (36 consultants and seven support staff), of which the majority was located at its headquarters in Delft. General consultancy areas of Midfield are strategy & management, personnel & organization, management systems, logistics and computerization. Specific SME-related topics are company succession & transfer, franchise & commercial co-operation, expropriation & real estate consultancy and project & subsidy management. According to their mission statement, the main concern of Midfield is to help improve the performance of SME's. "The focus of Midfield is at the interest and the policy of the individual enterprise. Our relative advantage is based on our profound knowledge of entrepreneurship, SME's and our networks. Together with our customers we investigate issues, formulate solutions and implement them" (mission statement Midfield, translation CS). The mission statement is very clear about the importance of knowledge for Midfield: "our relative advantage is based on our profound knowledge". According to the CEO, "knowledge is a threshold value". Without knowledge, Midfield would have had no right to exist. Customers expect the knowledge to be there, so it is self-evident that customers select Midfield for their knowledge and experience and it is also self-evident that the value of Midfield is mainly based on the knowledge and experience of its employees. Taken together, Midfield qualified as a medium-sized, knowledge-intensive service firm and thus met the criteria of the class of contexts for which the KP-enhancer was designed.
The first contact with Midfield was via a former colleague who indicated to be willing to introduce me to his new employer, as he thought that the KP-enhancer could contribute to the

specific challenges this firm was facing. This expectation was confirmed during an interview with the CEO, who immediately gave his approval and delegated the project to my former colleague, who had just entered the firm as a Management Consultant (MC).
The KP-enhancer was applied between February 2006 and May 2006. Within this section we report about the application of the method per phase, and finally we reflect on the effectiveness of the method within this context. Based on the experiences in the previous iteration, within this case study special attention was paid to enhancing coherence between the different elements of the method.

5.3.2 Phase 1: Problem definition

In order to define the problem at hand, a formal interview took place with the CEO and the MC. During this interview, the CEO and the MC agreed that the reason to apply this method was a combination of both internal and external reasons. By applying this method, Midfield expected to contribute to the following internal management issues:

- Creating awareness of the importance of knowledge productivity
- Integrating knowledge productivity in the process of strategy development
- Give direction to initiatives for improvement of knowledge productivity

The latter issue – make a plan for improvement – served as an important driver to apply the method. Applying the KP-enhancer was seen as an opportunity to further advance two existing internal (knowledge) management projects (“securing knowledge and networks” and “age conscious personnel management”). Next to these internal issues, Midfield also wanted to communicate the outcome of the method to the outside world in order to:

- Improve the ability to attract new employees
- Enhance the reputation of the organization

According to the CEO, Midfield had an image problem. The outside world did not perceive Midfield to be a knowledge-intensive firm. “We are perceived as low quality report producers.” Publishing the outcome of the method might contribute to enhancing the image of Midfield as a high quality knowledge-intensive firm.
Although the main aim of the KP-enhancer is to diagnose KP in order to support organizations to make a plan for KM initiatives in the form of a KP-statement, it was expected that the KP-statement could also contribute to solving the two external communication problems. These problems are closely related to the class of external problems for which the Danish Guideline for IC statements had also been developed. As the KP-statement is based on this model, it might serve these causes too.

5.3.3 Phase 2: Diagnosing KP

After qualifying the case study nomination and after defining the problems at hand we started diagnosing KP, by detecting incremental and radical innovation and assessing the quality of the learning functions of the Corporate Curriculum. Based on the experiences of the first iteration, the questionnaire had been extended with items that assess the extent to which incremental and radical innovation have been achieved in the past year. In order to enhance coherence between the different elements of the method, the KP board game was introduced to generate conclusions about the current situation. These conclusions serve as input for formulating a KP-statement in the next phase.

Detecting incremental and radical innovation

The first step in the analysis was to detect incremental and radical innovation, based on Zegveld's Quantitative Framework. As a result of the radical restructuring of the company in 2001 and because of difficulties with generating the necessary data, we could only start our analysis in 2002. Whereas the 2005 financial statement was not yet ready, we only had a set of three annual statements for our analysis. This limited availability of financial figures confronted us with the dilemma of founding our analysis on a (too) small amount of data or including mid term figures with the risk of disruption due to seasonal influences. When using mid term figures we would have to make estimations about "tax" and "interest & other financial costs", because these data are only calculated once a year. Despite these deficiencies, we decided to include the mid term figures, which increased the data series to seven. The two missing data (tax and interest) were calculated by dividing the end-of-year figures by two. The final period (31-6-2005) is an estimation based on the previous year.

First we calculated incremental innovation by calculating Operational Cash Flow (OCF) and the cash impact of the three generic strategies (volume, added value and efficiency) on the change of OCF (Appendix 13). In the period 2002-2005 the overall contribution to OCF was -154% for volume, 13% for added value and 52% for efficiency. Based on these figures we concluded that the dominant management focus of Midfield in the period 2002-2005 was on Efficiency (reduce costs per unit turnover). Again, like in the first iteration, the figures were strongly influenced by radical financial restructuring in 2001. Judged by the percentage of OCF that is not explained, apparently the effect of this operation continued throughout the whole period. Only towards the end of the series, the figures seem to get more stable (i.e. the percentage of OCF that is not explained gets smaller).

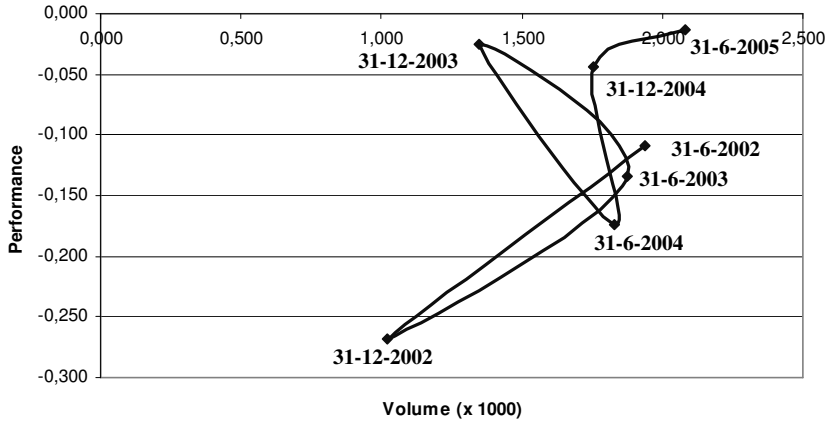


Figure 5.5: Detecting incremental innovation (cash impact volume vs performance in mln. €), Midfield Consultants, 2002-2005

The graphical representation of Figure 5.5 shows the effect of including mid term figures. Although we expected the seasonal impact to be minimal, the figure indicates the contrary. In 2002-2003 Volume is clearly higher in the first six months, compared to the last six months. If we would have taken only end-of-year figures, we would have seen a stable increase in volume. Striking is that the performance figures (combination of differentiation and efficiency) are negative for all seven periods. Over the whole period, however, we see that volume increases and the differences in volume between the first and second period get smaller. We also see that the performance figures are increasing (getting less negative). It seems the restructuring of 2001 begins to pay off.

Even more than the previous graph, the graphical representation of added value vs efficiency (Figure 5.6) shows that the performance of Midfield is literally "circling around". The management does not seem to have a clear focus on the one or the other. Only the final three periods we see a stable focus on efficiency.

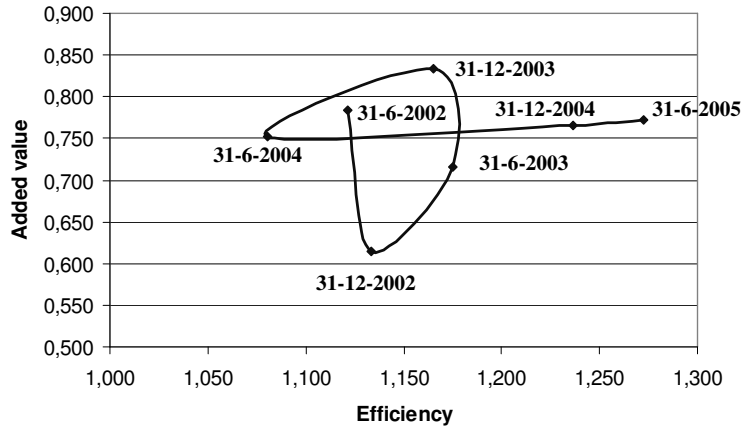


Figure 5.6: Detecting incremental innovation (cash impact Added Value vs Efficiency in mln. €), Midfield Consultants, 2002-2005

However, based on these figures it is difficult to draw any conclusions about the dominant management focus of Midfield. Sometimes it is adding value, sometimes it is increasing efficiency. If we would ignore the mid term figures, we would see an increase of volume, however the number of years is too small to draw any conclusions about the stability of this generic strategy. Therefore, based on these figures it is impossible to say anything about incremental innovation at Midfield in the period 2002-2005.

Next we detected radical innovation by calculating residual change. Based on the traditional productivity figures (efficiency of labour and the effectiveness of capital investments) we calculated the residual change (Appendix 14). Within these figures we see the seasonal pattern even better than before (Figure 5.7). Residual value seems to be created in the first half year. We also see that this pattern decreases over the years. The gap in the build up of residual value gets smaller and smaller. Based on these figures Midfield would qualify as a radical innovation company. However, the low correlation (R^2) primarily seems to be the result of the seasonal pattern. If we would ignore the mid term figures, the number of years would get too small to draw any conclusions about the stability of the change in residual build up. Therefore, based on these figures it is impossible to say anything about radical innovation in the period 2002-2005.

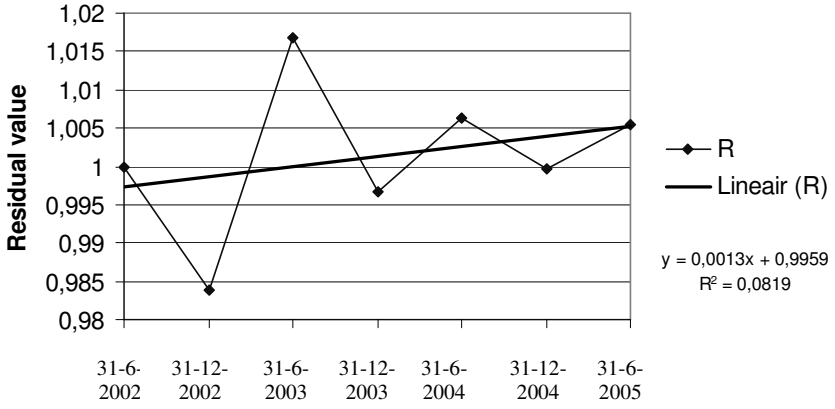


Figure 5.7: Detecting radical innovation (build up residual value compared to year 1), Midfield Consultants, 2002-2005

Assessment of the process of knowledge creation

Parallel to applying Zegveld's Quantitative Framework, we also diagnosed the process of knowledge creation by assessing the seven learning functions of Kessels' Corporate Curriculum. All employees were asked to participate in an electronic survey about the seven learning functions of the Corporate Curriculum. The respondents were asked to give their perception (1-5 Likert-scale) about statements about the quality of the learning functions. The questionnaire generated a response of 93% (n=40). The average time for completing the survey was almost 22 minutes. The increase in time needed to complete the survey was probably the result of the extra (open) questions about incremental and radical innovation.

Table 5.8: Average scores per item, Midfield Consultants (n=40; 93%)

Learning function	Item*	1	2	3	4	5	6	7	8	9	10
Subject matter expertise	**MD**	3.71	3.11	3.61	3.39	2.37	3.21	3.39	2.87	3.53	2.87
Ability to solve problems	**PO**	2.87	3.74	3.86	4.43	3.28	3.83	4.38	3.22	3.22	
Ability to reflect	**VR**			3.39	2.08	2.12	2.53	3.03	3.14	3.11	
Communicative and social skills	**CS**		4.16	3.63	4.42	3.71	3.66	3.53	3.08	2.95	4.29
Self-regulation of motivation	**ZM**	4.05	4.16	3.67	3.45	4.28	4.22	4.03	4.08	4.13	4.38
Peace and stability	**SR**	3.33	3.79	3.22	3.24	3.66	2.35	2.55	3.05	3.29	2.87
Creative turmoil	**CO**	3.53	3.50	3.13	3.74	3.89	3.24	2.61			2.39

** these codes refer to the item codes in the questionnaire (Table 4.1)*

Table 5.8 shows the average scores per item. The blank spaces are the result of removing questions in order to increase alpha after the first iteration. The average scores per learning function (Figure 5.8) shows that the ability to communicate and cooperate (CS), self-regulation of motivation (ZM), and the ability to solve problems (PO) score the highest averages. The ability to reflect (VR) and peace and stability (SR) score the lowest averages.

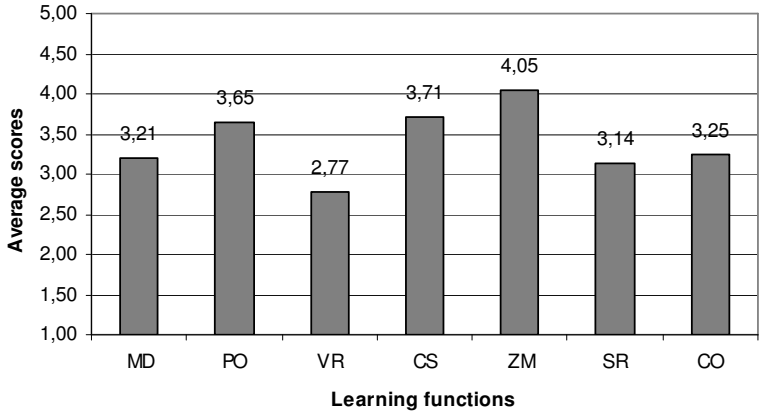


Figure 5.8: Average scores per learning function, Midfield Consultants

Survey about radical and incremental innovation

As discussed above, we added a series of statements to the survey about incremental and radical innovation (see section 5.2.2). The aim of these statements was to explore the possibility of connecting the learning functions and the concepts of incremental and radical innovation.

Based on the response to the open questions, we made an inventory of incremental and radical innovation of the past year. The first question generated 61 initiatives aiming at incremental improvements. Eleven responses were not valid and seven respondents could not think of any initiatives, therefore 43 initiatives could be divided over six different types of incremental innovations (Table 5.9). The second question generated 43 answers. 18 responses were not valid (of which 12 referred to incremental innovations) and 22 respondents could not think of any radical innovation. Therefore, at first sight, only three seemed to qualify as radical innovation. However, after verification with the client, they appeared to refer to improvement of existing practice and thus did not qualify as radical innovations.

Table 5.9: Inventory of incremental innovations, Midfield Consultants

	Improvements	**Frequency**
1	Automation (SBC, Locatus, reports)	15
2	Standardization of reports, proposals, contracts	8
3	Improvement internal consultations (a.o. regional teams, file meetings)	6
4	Improvement organizational structure (a.o. new way of constructing teams, regional support desks, backoffice)	6
5	Knowledge management (knowledge centre, knowledge project)	3
6	Other (acquisition, finance, workplaces)	5

In addition to the inventory we investigated the perception about incremental and radical innovation within the past year. The respondents were asked to give their perception (1-5 Likert-scale) about a series of ten statements. This resulted in an average score of 3.03 for incremental innovations and 2.62 for radical innovations.

Presenting the outcome and generating collective findings

The next step in the process was to present the outcome of the diagnosis and gather collective findings in order to generate a KP-statement in the next phase. In order to create more coherence between the different steps in the process and the different elements in the method, more attention was paid to this phase.

The process of generating a KP-statement requires time to digest the new way of thinking, to verify observations, to discuss the topics with colleagues and to create commitment. However, because of the tight agenda related to the topic of knowledge management and the wish to present some first results within a few months, three meetings of three hours were planned in two weeks. The meetings would be attended by six people, four Management Consultants, one secretary and the CEO.
The main topic of the first meeting was to introduce the concept of knowledge productivity, to present the outcome of the diagnosis, to discuss the outcome and to set some general priorities in order to give initial direction to the KP-statement. As in the first case study, we presented the average scores and the high and low scores per learning function. The interpretation and discussion about the scores led to three main observations:

1. The ability to reflect is not adequate;
2. We lack the ability to renew our services;
3. We have a lot of potential, but we fail to utilize it.

The first observation was the most obvious and was recognized by all participants. In between different assignments, hardly any time is taken to reflect on past activities. According to all participants, this results in poor knowledge sharing. The second observation led to an interesting discussion about the question: should we do things better (improve), or should we do better things (renew)? The third observation was also recognized by all participants. The perception was that the individual consultants were highly qualified, although Midfield as a collective is not.

The next step after the first discussion of the findings was to collect some shared findings in order to give direction to the process of creating a KP-statement in the next phase. All participants were asked to play the KP board game, which resulted in the following findings:

1. three out of five participants thought that Midfield should aim at improving existing processes, products and services;
2. four out of five participants gave first priority to enhancing the ability to reflect in order to achieve these improvements;
3. all participants agreed that something had to be done to enhance creative turmoil in order to strengthen the ability to renew products and services.

On the one hand Midfield wanted to improve, and on the other it wanted to radically renew its processes, products and services. This dilemma appeared to reflect the internal strategic discussion. Although everyone seemed to agree about the fact that the company should renew (deliver new services, enter new markets), some thought that renewal should be the result of incremental improvements, while others thought that renewal demanded radical change.

However, at this point (at the end of the first meeting), one of the participants burst into anger. He thought the method was all too scientific, too experimental, lacking validity, based on nothing, childish, a waste of time, and repeating things they had already done a long time ago. The meeting had not given him any new insights. He already knew what had to be done. He wanted action. This eruption of emotions came as a surprise and led to a discussion about the results of the first meeting and the question “how to continue?” The options discussed varied from meeting two more times (as agreed before) to asking the researcher to produce a KP-statement for Midfield. The outcome of this discussion was something in between. Based on some input from the participants we would prepare a first draft of a Knowledge Strategy, which we would discuss and translate into actions in a second (and last) meeting. In practice this meant a speed up of the process of generating a KP-statement. We would skip the inventory of actions and challenges and immediately go to the knowledge strategy. It was

agreed that we would provide some questions to speed up the process. However, when formulating the questions that needed to be answered to formulate a knowledge strategy (see Chapter 4), the same person burst into anger again. He felt the first question "what products/services do you deliver?" confirmed all the things he had said. The day after, he repeated his arguments in an email and said that he did not want to participate anymore.
What this outburst of anger uncovered was that there had been a series of similar initiatives (over the years), of which none had ever led to satisfactory results. "We have dozens of plans; we should just take one and implement it." The method was perceived as a repetition of earlier initiatives. A lack of confidence that this initiative would come further than just another (strategic) plan seemed to have resulted in a lack of willingness to cooperate.
Another way of looking at it could be that this incident was illustrative for the main problem at hand in this context, namely an inadequate ability to reflect. The strong desire for action seemed to hinder the process of reflection (with hindsight we have to acknowledge that this was also the case in the first iteration, although not so strong). Applying this method requires the willingness to invest in a new way of thinking and to reflect on the current situation. The question then is, how to use a reflection method if reflection is the problem?

5.3.4 Phase 3: Formulating a KP-statement

Despite the incident at the end of the first workshop, we decided to continue the process. As agreed, the second meeting started with a draft knowledge strategy based on the input of the participants. After discussion and adjustment we combined the knowledge strategy and the findings of the first meeting into four challenges and 18 actions. Based on this outcome we decided to plan a third meeting in which we would prioritize actions and formulate indicators. In between the second and third meeting all participants were asked to answer the following questions:

1. Do you recognize yourself in the knowledge strategy?
2. Do you agree that these four challenges are the most important challenges at this moment?
3. Which of the actions should get the highest priority?

The response to these questions revealed that the participants wanted to make a more explicit connection between the results of the method, the organization's strategy and the outcome of earlier strategic sessions. Therefore we added an extra column to the KP-statement, including the mission statement, strategic goals and the shared findings of the first meeting (see Table 5.10). The added value of this column is that it shows that the KP-statement is a combination of strategic goals and the outcome of the analysis of the current situation. Each initiative is reducible to either a strategic objective or to one of the conclusions about the current situation.
The main goal of the third meeting was to reduce the number of actions to a realistic amount. In order to do so, we made a distinction between existing and new initiatives. The idea was that we should not initiate too much new initiatives, because this would endanger the success of all activities. Embedding existing initiatives seemed to be at least as important as initiating new actions. The result was a list of seven existing and five new initiatives. Finally, each of these initiatives were translated into one or more indicators, which resulted in a completed KP-statement (Table 5.10).

Table 5.10: KP-statement Midfield, 2006

Mission, objectives and KP-diagnosis	**Knowledge strategy**	**Challenges**	**Initiatives (bold = new)**	**Indicators**
Mission: The focus of Midfield is at the interest and the policy of the individual enterprise. Our relative advantage is based on our profound knowledge of entrepreneurship, SME's and our networks. Together with our customers we investigate issues, formulate solutions and implement them. Our main concern is to help improve the performance of SME's. **Strategic objectives:** - From departments to topics - Improve collaboration between consultants - Rejuvenation of employees - Acquire new type of assignments (from solutions to coaching and support) - Acquire larger assignments - Improve reputation - Collaborate with partners, based on reciprocity **Conclusions diagnosis KP:** - Enhance the ability to reflect - Enhance the ability to (radically) renew our services - Beter utilization of potential (available knowledge)	Midfield offers solutions for SME-related problems, through … …utilization of knowledge and capacity in the field of entrepreneurship, people & organizations, collaboration, growth, succession and housing, in the form of consultancy, coaching, project management, training and mediation. To achieve this we need: - Knowledge and experiences related to entrepreneurship in SME's - Entrepreneurial consultants, coaches, project managers, etc., who speak the language of SME's (being generalists with a specialism) - Good knowledge infrastructure (both technical and non-technical) which provides access toe ach others knowledge and experiences - Good reputation to secure existing customers and to acquire new customers - Up-to-date and powerful network of associate partners, that are willing to give and take	Stimulate the learning cycle, in particular the ability to reflect (learn from the things we do)	• Stimulate usage of intranet • Improve quality customer relationship management (CRM) • Stimulate shared file management system (SBC) • Organize (informal) internal meetings • Disseminate internal monthly magazine	• # resume's on intranet • # consults on intranet • # potential customers in target group • # shared files • # meetings • # participants • # monthly magazines
		Enhance creative turmoil through creating a movement from solution-oriented services to coaching and support (stretching)	• Organize round tables with customers • **Improve participation in networks and collaboration with third parties** • **Appoint and develop right competences**	• # round tables • # participants • # networks • # collaborative projects • Turnover collaborative projects • % match between current and desired competences
		Enhance reputation through improvement of external communication	• Build second generation website • **Develop structured communication policy**	• Phase of the project • % turnover from large customers (>20 employees) • % turnover from new type of assignments (e.g. coaching)
		Shared view on entrepreneurship (values and ways of woking)	• **Develop book with templates related to topics** • **Organize "value meetings"**	• # available templates • # value meetings

5.3.5 Evaluating the effectiveness of the method

After completion of the KP-statement, the effectiveness of the method was evaluated in a semi-structured interview with the CEO and the MC. The main focus of the interview was at the perceived effects and the design of the method. The reference point for evaluating the effectiveness were the functional requirements as formulated in the design of the method and the specific expectations of the outcome of the method within this case. Fifteen months later (September 2007) we interviewed the client again about his perception of the effectiveness of the method.

Effects of the method

First and most important reason for applying the KP-enhancer within this iteration was that it contributed to two internal (knowledge) management projects ("age-conscious personnel management" and "securing knowledge and networks") and the desire to increase awareness among the employees about the importance of these projects. Secondary motive for applying the method was the expectation that the outcome could contribute to improve the corporate reputation and improve the ability to attract new employees.

Asked after the perceived effects with regard to the first motive (contribution to internal management projects), it was acknowledged that the method, in line with the expectations, contributed to raising awareness about the importance of these projects. However, perception was also that after completion of the method, it had only increased awareness of those people involved in the workshops. Therefore, in order to broaden involvement, the KP-statement was presented at a meeting with all the employees. During this meeting all employees were asked to pledge commitment to the KP-statement, and sign up with the projects as proposed. According to the CEO, this worked out very well because "the message was very clear: there is no way back". It seemed Midfield had achieved a breakthrough, in the sense that it did not only make a plan for improvement, but also started implementation.

Asked after the effects related to the secondary motives (improve reputation and improve the ability to attract new employees), it appeared that the KP-statement had already been used in interviews with potential employees in order to introduce the company and the challenges they were facing. In this sense the method had also contributed to improving communication. Although this usage of the KP-statement had proven to be effective, the CEO hesitated about the usefulness of the KP-statement for other external purposes (e.g. publication in the annual report). According to the CEO, the KP-statement was too much internally focused to be of interest for external publication.

Again, like in the first iteration, the KP-statement was seen as the most valuable result of the application of the method. It was perceived valuable, because Midfield finally managed to get its strategic goals on paper. The fact that it fitted on one page and that it was action oriented was also highly appreciated. According to the CEO, the most important contribution of this statement was "that it shows what we are going to do, and how it is related to the strategic ambitions." However, it was remarked, the method did not contribute to strategy development. It merely made the strategy explicit in such a way that it raised awareness about the challenges Midfield was facing, and created commitment to contribute to the management initiatives.

According to the CEO and the MC, applying the KP-enhancer created more commitment to the company in general. According to the MC, applying the method gave him an experience that made him feel more engaged, because he got "better insight in who we are, and what we stand for". This was also acknowledged by the CEO, who stressed that the effect of the method went beyond raising commitment to the two knowledge management projects. Applying the method had raised awareness about the challenges Midfield was facing in

general. With regard to this increased awareness, the CEO remarked that "if we would not have applied this method, we would not have come this far".
A positive side-effect for Midfield was that applying this method "improved our knowledge repertoire, from which we can benefit in conversations with customers". In particular the concept of the Corporate Curriculum appeared to be useful.

Effects as perceived after 15 months

In this case we had the opportunity to reflect on the application of KP-enhancer after 15 months. In a short interview with the CEO we asked how he looked back upon the application of the method, what he thought had been the main results, and what happened with these results since the completion of the method.
Looking back upon the application, the CEO was satisfied with the method and the outcome. According to him, the most important result had been the fact that the method succeeded in relating existing initiatives to strategic objectives. Immediately after completion, the KP-statement was presented to, and discussed with, all the employees. A year later (June 2007) the KP-statement was presented again in order to discuss the progress of the initiatives that had been proposed. According to the CEO, the KP-statement provided a valuable framework to hold on to in everyday practice. In addition, the logic of the statement and the one-page format helped to improve the communication about (knowledge) management initiatives. Finally, although initially the CEO concluded that the statement had not contributed to strategy development, he now remarked that the KP-statement was used as a starting point for a new strategy development process.

Design of the method

The three main elements of the method were Zegveld's Quantitative Framework, the survey about the learning functions of the Corporate Curriculum and the series of workshops aiming at generating a Knowledge Productivity Statement. In order to increase coherence we added two elements. First, we added an extra set of items to the survey related to incremental and radical innovation in order to bridge the gap between the Quantitative Framework and the Corporate Curriculum. Second, we added a board game after analyzing the current situation to facilitate the generation of collective findings.
To start with the latter, within this case the coherence between the different elements was not an issue. The KP-statement was perceived as a very "natural next step" after the questionnaire about the Corporate Curriculum. Despite the incident in the first workshop, the KP-game seems to have played an important role in generating collective findings and shift gear from passive to active participation. The extra column in the KP-statement emphasized the coherence between (the outcome of) the survey and the actions to be taken.
Again, like in the previous iteration, the correct application of the Quantitative Framework was hindered by the limited availability of financial data. Therefore, the Quantitative Framework had only been applied pro forma. Although incremental and radical innovation had been detected, the outcome of these calculations had not been used for creating the KP-statement. As the participants explicitly declared not to be interested in these measurements, the presentation of the outcome had been skipped. Although inclusion of this element was based on the assumption that detecting incremental and radical innovation would contribute to diagnosing KP, it appeared that the method worked well without these calculations. Within this case study the outcome of the survey generated sufficient input for diagnosing KP and the creation of a KP-statement.
The survey was perceived as clear and to-the-point. According to the CEO and the MC, the theoretical framework was very helpful to understand the problems at hand. In particular the Corporate Curriculum was seen as a solid starting point for the process of creating a KP-

statement. However, the theoretical framework of the method also created distance in the first workshop, because participants had difficulties applying the theory to their practice. As some of the participants had hesitations about the effectiveness of the method beforehand, this theoretical approach confirmed their hesitations, and probably contributed to the outburst at the end of the first workshop. According to the CEO, a more practical (action-oriented) approach would probably have contributed to overcome the initial hesitations more quickly. The second and third workshops, in which we formulated the KP-statement, were perceived as being much more effective because we were working on something tangible. Moreover, these workshops were less reflective and more action oriented, which appealed more to the participants.
Like the first iteration, the KP-statement was highly appreciated for its communicative power. The fact that it made the implicit strategy explicit, that it fitted on one page, and that it gave an overview of actions to be taken, made that it was very useful within this context. According to the CEO the KP-statement "does not present anything new, but it brings existing elements together in a convenient arrangement". In order to stress the relationship between organizational ambitions and the results of the method, an additional column was added that included the mission statement and strategic objectives. In different meetings with people that had not been involved in the workshops, the KP-statement proved to be useful in communicating the results of applying the method. During the final interview, the CEO expressed the intention to distribute the final version among the employees.
Finally, both the CEO and the MC acknowledged that it had been counterproductive to mention the fact that applying the method also contributed to a Ph.D. research. Initial communication about the motives for applying this method should stress the organizational agenda and ambitions. It should be clear that the subject of inquiry is of vital importance to the organization. The main reason for applying the method should be that it improves personal and organizational effectiveness. The fact that it also contributes to a Ph.D. research is not relevant to the participants and may have been the cause of the initial reluctance to participate in this project.

5.4 Reflections Case 1 and 2

The aim of this section is to reflect on Case 1 and 2 and reveal possibilities for further improvements to the method. This reflection will focus on the initial objectives within both cases, the effects of applying the method, the design of the method, the context of application, and possible consequences for further testing of the method.

Objectives and effects

Although the starting points in both cases had been different, the results of applying the method appeared to be similar. Whereas the problem in Case 1 was a control issue (we do not know to what extent knowledge has been made productive), the main problem in Case 2 was the further advancement of two existing internal knowledge management projects. Despite these different starting points, the effects of applying the method in both cases were similar. In both cases increased awareness (about the importance of KP) and a concrete plan for KM initiatives were seen as the main results.
Although in both cases the motives for applying the method were mainly internal the possibility of using the outcome to improve external communication was not ruled out. After applying the method in Case 2, the outcome had been used to communicate to potential employees. However, further usage for external purposes was not considered useful because the outcome was perceived to be "too internally focused". Within Case 1, the option of external use was left open.

Another similarity between the cases was the involvement of the management in the process of applying the method. In both cases applying the method received strong support from the CEO, and in both cases the CEO actively participated in the process. Furthermore, in both cases the project was delegated to a professional who showed great enthusiasm towards the main concepts and the objectives of the method. It seems this active involvement positively influenced the effect of the method.
Interesting difference between the two cases appeared to be the attitude and expectations towards measuring KP. In the first case measurement appeared to be an important motive for applying the method. In the second case, the possibility and relevance of measuring KP in terms of incremental and radical innovation was denied in an early stage of the process. As a consequence, the quantitative diagnosis of KP was applied pro forma.

Design of the method

In both cases, the main problem with regard to the design of the method was related to the application of Zegveld's Quantitative Framework for detecting incremental and radical innovation. Due to practical reasons, this analysis had already been simplified in the sense that the number of years had been reduced from twelve to five (which was seen as the minimum to detect a trend). However, even this limited number of years appeared to be a problem within these cases. In Case 2 it was only possible to generate a series of three annual statements. Whereas adding mid term figures seemed to be a solution to this problem, gathering these data confronted us with new problems (availability of data, estimations, seasonal pattern).
Another problem related to the application of the Quantitative Framework appeared to be that the outcome was seriously influenced by (financial) restructuring in the past few years. In Case 1 the sudden change in the build up of residual was caused by a one time depreciation of a questionable debtor. In Case 2 radical restructuring of the organization in the beginning of the period influenced the data throughout the whole period. As a result, the outcome in Case 1 resulted in questioning of the validity of the instrument and subsequently the rejection of the outcome. In Case 2 it was impossible to draw any conclusions on the basis of the data available.
In Case 1, the interpretation of the data was further complicated as a result of the fact that incremental innovation in the Quantitative Framework was seen as a change in management focus (from one to another generic strategy), which for the participants was difficult to translate to everyday practice. The fact that a company was qualified either as incremental innovation or not, was difficult to relate to the idea of everyday improvements. Although the participants seemed to understand Zegveld's interpretation, they refused to accept the conclusion that their organization did not qualify as incremental innovation.
To conclude, in Case 1 the difficulties with applying the Quantitative Framework resulted in rejection of the outcome. In Case 2, during the first workshop, the participants indicated not to be interested in the outcome of the Quantitative Framework. The outcome was proclaimed to be too theoretic beforehand. As a result, the diagnosis of KP in both cases was solely based on the outcome of the survey. However, this appeared not to hinder the process. Although the Quantitative Framework had been introduced to generate input for the process of creating a KP-statement, the lack of data with regard to incremental and radical innovation did not seem to harm the process of generating a KP-statement. Therefore, based on the experiences within these first two cases, the added value of the Quantitative Framework within the context of this research can be questioned. The Quantitative Framework did not contribute to the aim of diagnosing KP. At least, not in this context, for this purpose, and by this researcher. Therefore, we should consider leaving out this element in the next iteration.

The other elements of the method caused less problems than the Quantitative Framework. However, some possibilities of improvement might be noticed. The first case revealed that the method lacked coherence. Although the different parts were suggested to form a coherent part, the relationship had not been clear to the participants. In order to increase coherence we introduced a board game in the second case. The aim of the board game was to bridge the gap between the survey and the KP-statement. Despite the difficulties in the first workshop of the second case, it seemed the board game increased coherence and was an effective instrument to shift gear from passive analysis towards active participation.
Although the aim of this research is to develop a practical method, in the second case the theoretical start of the first workshop (and maybe the fact that it was announced as a part of a Ph.D. research) seemed to create hesitations about the effectiveness of the method. Therefore, it might be considered for the next iteration to shift focus in the first workshop from explaining towards interactive diagnosing. In combination with the board game, this would make the process less theoretic and more participative.
In both cases, the final product of the method (the KP-statement) was highly appreciated for its communicative power. The fact that it was action oriented, its compact size, and that it helped to make the implicit strategy explicit, seemed to fit these companies well. In order to stress the relationship between the organizational goals and the outcome of the method, and in order to include the outcome of the diagnosis, an extra column was added in the second case.
In both cases, the process of generating a KP-statement took more time than expected. As we want to limit our method to two workshops, and as the first workshop is needed to introduce the concepts, present the outcomes of the survey and collect shared findings (based on the KP-game), we should try to limit the process of generating a KP-statement to one workshop. Based on the experiences within these two cases, we should investigate the possibility of skipping the first step (inventory of actions and challenges), using the time between the workshops to formulate the knowledge strategy, and to postpone the formulation of the indicators to a later moment (after all the initiatives have been agreed upon). This would imply that the emphasis of the second workshop shifts to defining challenges and actions.

Context of application

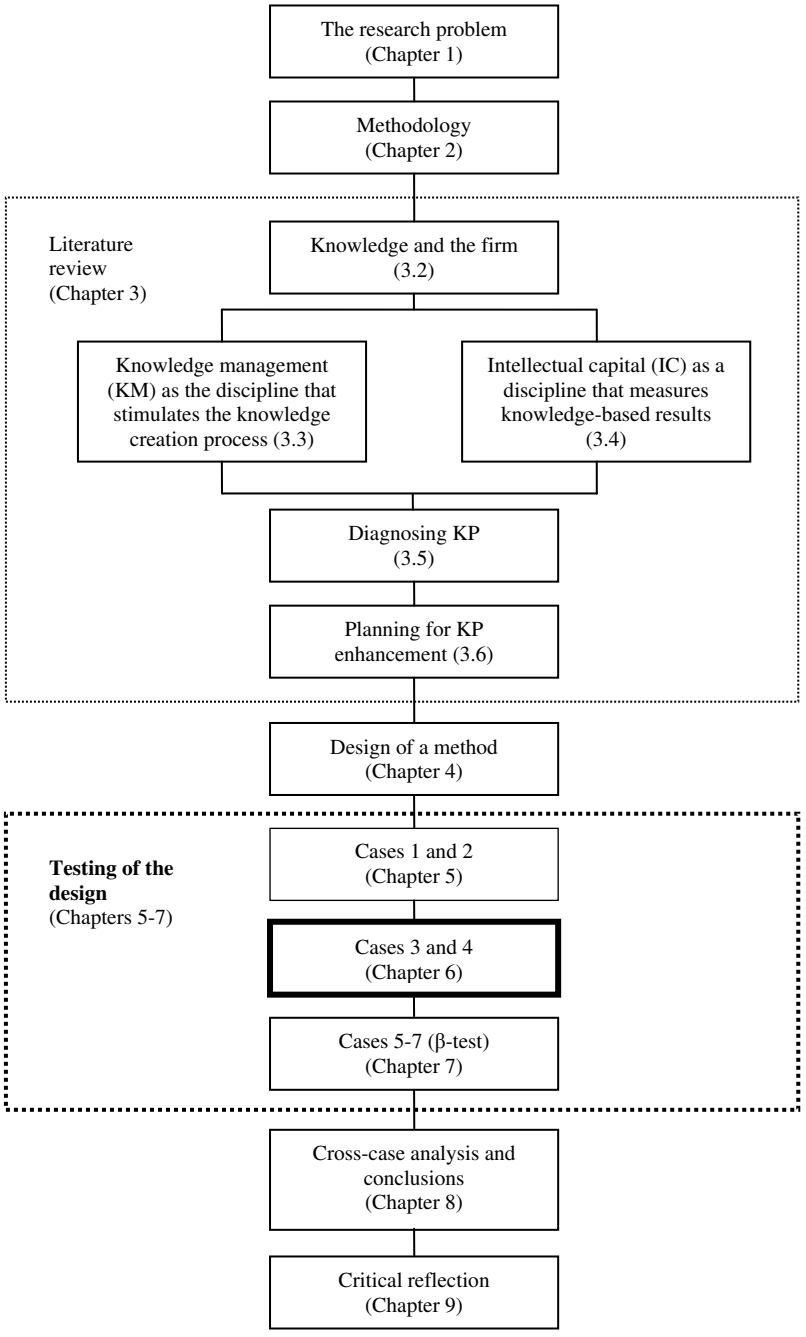
Considering the description of the class of contexts (medium-sized knowledge-intensive service firms), the main distinction between the two case sites was its size. After successfully applying the method in the first case (107 employees), important motive for selecting the second case was to test if the method would also be effective in a relatively small company (43 employees).
On the one hand this seems to have worked out well (high response to survey, relative high participation). On the other hand this could also have been the source of the initial reluctance to participate in the process, because applying the method within a small company (with very limited support staff) leads to a relative large increase of work pressure. Therefore, applying this method within this context might require a higher degree of practicality and output focus than in a larger company.

Conclusions

To conclude, in order to improve the method, the following points should be taken into consideration before the next iteration:

1. The practicability and the added value of the Quantitative Framework within the context of this research can be questioned. Therefore, we should consider leaving out this element in the next iteration. However, considering the aim of diagnosing KP from two perspectives (process and result), if we leave out the Quantitative Framework, how can we diagnose KP in terms of incremental and radical innovation?

2. In order to make the process less theoretic and more participative, we should shift the focus in the first workshop from explaining to interactive diagnosing.
3. In order to limit the method to two workshops, we should consider shortening the process of generating a KP-statement.



Sub questions
to be answered:

1. How can we design and test a management method?

2. What is meant by knowledge productivity (KP)?

3. How can we diagnose knowledge productivity?

4. How can we plan KP enhancement?

5. What does the initial design of the management method look like?

6. What can we learn from testing the method in practice?

Main Question:
How can organizations diagnose KP and plan for enhancement?

6 Testing the improved design: Case 3 and 4

This chapter reports about the third and fourth case in which we applied the KP-enhancer. The third organization where we applied the method was De Baak – Management Centre VNO-NCW, one of the largest and oldest executive development centres in The Netherlands. The fourth firm was Broek, Steen & Poppel (BSP)[15], a Dutch business law firm. These two case studies took place between June 2006 and May 2007. The aim of these iterations was to test the improved design of the KP-enhancer. Specific attention was paid to the simplification of the process of generating a KP-statement. Before elaborating on these two case studies, we first describe the improvements that were made after the second iteration.

6.1 Improving the method

After the second iteration we decided to alter the method on three points. The first alteration was the removal of Zegveld's Quantitative Framework and instead include in the survey a new set of questions with regard to incremental and radical innovation. The second alteration was the further improvement of the questionnaire. The third alteration was the simplification of the process of generating a KP-statement. This paragraph elaborates on these alterations.

6.1.1 Diagnosing incremental and radical innovation

One of the main findings of the previous cases was that the method seemed to work well without using Zegveld's Quantitative Framework. Therefore we decided to leave out this element in the next iterations.

In order to bridge the gap between Zegveld's Quantitative Framework and Kessels' Corporate Curriculum, ten statements about incremental and radical innovation were added after the first iteration. Removing the Quantitative Framework also implied reconsidering these statements. As we further wanted to explore the possibilities to diagnose KP in terms of incremental and radical innovation, we decided to renew this part of the survey. Within the next iterations, the main aim of this part of the questionnaire would be to reveal the type of innovations the organization tries to achieve. Is it aiming at incremental improvements and/or radical innovation? The awareness about the type of innovation that is pursued, might contribute to diagnosing KP (and subsequently planning for enhancement). Further investigation of the two types of innovation, resulted in a new and more extensive list of statements (Table 6.1).

Table 6.1: New statements about incremental (IV) and radical (RI) innovation

Code	Statement*
Incremental innovation	
IV1	We work at gradual improvement of the things we are doing
IV2	We work at continuous improvement of our work processes
IV3	We work at continuous improvement of our products and/or services
IV4	Our employees continuously work at further refinement and specialisation
IV5	The knowledge and experience that is needed to realize our ambitions is already present in the organization
IV6	We are guided by proven concepts
IV7	Our device is: "do the things that we are doing better"
IV8	Our ambitions are mainly rooted in the past
IV9	The past period was dominated by implementation and realization of existing ambitions

** See Appendix 9 for original Dutch version*

[15] Fictitious name

Table 6.1 (continued): New statements about incremental (IV) and radical (RI) innovation

Code	Statement*
Radical innovation	
RI1	We work at radical renewing of the products and/or services that we offer
RI2	We have decided not to deliver certain products and/or services anymore
RI3	We spend much time/attention to new products and/or services
RI4	Our employees explore working areas that are new to the organization
RI5	For the realization of our ambitions, we need knowledge and experiences that are not present in the organization at the moment
RI6	We are guided by new opportunities
RI7	Our device is: "do better things"
RI8	Our strategy statement draws a new perspective for our organization
RI9	The past period we made radical choices with far-reaching consequences for the future

** See Appendix 9 for original Dutch version*

6.1.2 Further improving the questionnaire

In order to increase alpha, several items were deleted after the first iteration. The second iteration resulted in lower alpha scores in all but one of the learning functions (ability to reflect). This substantial decrease of alpha is probably the result of the smaller size of the sample. The latter seems to be confirmed by the consolidated alpha scores which show more or less similar scores compared to the increased alpha scores after the first iteration (Table 6.2). Calculation of the alpha scores of the new statements with regard to incremental innovation (.825) and radical innovations (.772) indicated high reliability.

Table 6.2: Reliability (Cronbach α) per learning function and types of innovation based on data from first two case studies

	Transfer Solutions		***Midfield Consultants***		***Total***	
	n	**α**	**n**	**α**	**n**	**α**
Subject matter expertise	74	.838	38	.792	111	.844
Ability to solve problems	65	.864	33	.652	99	.811
Ability to reflect	62	.781	32	.837	95	.803
Ability to communicate and cooperate	72	.859	38	.699	110	.833
Self-regulation of motivation	68	.900	29	.757	97	.893
Peace and stability	70	.851	35	.845	105	.845
Creative turmoil	65	.796	35	.737	100	.784
Incremental innovation			35	.825		
Radical innovation			38	.772		

It seems the improvements after the first iteration worked out well. However, what is striking in the consolidated figures is that the non-response rate in some learning functions is considerably higher than in others. These non-response rates provide a possibility for further improvement.

Item analysis

After the second iteration, reliability analysis revealed four items (PO1, CS5, VR3, ZM3) that would increase alpha if deleted. However, considering that the alpha scores were already high and that deleting these items would only marginally increase alpha, we decided not to delete them. Furthermore, inter-item analysis also revealed that item MD7 had relatively low inter-item correlations with four other items. However, deleting this item would lead to a decrease of alpha, and therefore this item was not deleted either.

Non-response

The first two iterations resulted in a relatively high non-response rate (see Table 6.2) for several learning functions (solving problems, the ability to reflect, self-regulation of motivation and creative turmoil). Analysis of the non-response rate per item showed that two items in particular (VR4, VR5) generated relatively high (>10%) non-response rates. In order to try to improve the response rate, we decided to rephrase these items.
Cause of the relative high non-response rate (11/114) of the first item (VR4) might be that respondents interpret this statement as "MY activities/projects …". Therefore the new statement starts with "In our organization…". The even higher non-response rate (14/114) to item VR5 could be related to the previous statement: if activities/projects are not evaluated, this item is not applicable. Therefore this statement has been rephrased without referring to evaluations.

Table 6.3: Rephrasing items VR4 and VR5

Item	Old	New
VR4	Activities/projects are systematically evaluated (e.g. by evaluation forms or evaluation meetings)	In our organization, activities/projects are systematically evaluated (e.g. by evaluation forms or evaluation meetings)
VR5	The outcome of evaluations regularly result in a change of the way we work	New insights about the best way to do our work, regularly leads to a change in our way of working

Although not as high as the two items above, the following items also showed relatively high non-response figures (5%-10%). In line with the reasoning related to item VR4, all but one of these statements (PO5, PO6, VR9, CO3, CO10) have been rephrased starting with "in our organization…" or "our employees…". Finally, the non-response to item PO9 could be the effect of the fact that this item combines "structure" and "procedures". This question does not give the possibility to make a distinction between either of them. Therefore item PO9 has been rephrased in "…structure AND/OR procedures".

Table 6.4: Rephrasing items PO5, PO6, PO9, VR9, CO3, CO10

Item	Old	New
PO5	We are stimulated to experiment with unconventional approaches	In our organization one is stimulated to experiment with unconventional approaches
PO6	We are given sufficient room to renew existing procedures	In our organization one gets sufficient room to renew existing procedures
PO9	New ways of working are hindered by structures and procedures	New ways of working are hindered by structure and/or procedure
VR9	We discuss the quality of our work with our clients regularly	Our employees discuss the quality of our work with our clients regularly
CO3	We continuously keep an eye on our competitors	Our employees continuously keep an eye on our competitors
CO10	We stimulate each other to explore unconventional ways of working	In our organization we experiment with unconventional ways of working

Reintroducing two items

After the First iteration we decided to delete item VR2 ("We understand why we excel in certain areas and why we do not excel in other areas") in order to increase alpha. However, this item is believed to be closely related to the core of this learning function. Therefore this item was reintroduced in the questionnaire. Furthermore, after the first iteration we also deleted item CO8 "It is not certain if our organization will still exist in its current form in a few years time". This item refers to existential threat as a precondition for creative turmoil. As this item is also believed to be closely related to the core of this learning function, we

reintroduced this item as well, although rephrased and reversed: “The continuity of our organization is guaranteed” (De continuïteit van onze organisatie is gewaarborgd).

Reverse items

Finally, analysis of the response after the first two iterations also learned that respondents only needed 13-21 minutes to complete the survey. In addition, the response seemed to show a tendency to high scores. In order to keep the respondents alert and to stimulate variation we reversed one or two questions per learning function (MD6, MD9, VR8, VR9, ZM3, SR2, SR9, CO5, CO8).

6.1.3 Simplification of the process of formulating a KP-statement

The third alteration of the method after the second iteration was the simplification of the process of formulating a KP-statement. As we found out in the first and second iteration, the process as described in the Danish Guideline, is rather complex and time-consuming. Within the context of this research, we do not have the time to extend this process as we assume that organizations are only willing to invest a limited amount of time in this process.

Important driver for simplification of this element of the method is that the aim of this research is to develop a practical method. Practical in the sense that it is acknowledged to be workable within the time available. As time and resources within medium-sized enterprises are usually scarce, the time to apply this kind of method is also scarce.

Based on the first two iterations, several possibilities were identified for shortening of the process. First, the inventory of existing activities and underlying challenges (first step) seems not to contribute to the process. The idea of this inventory is that it can be related to the challenges and initiatives the participants come up with in a later stage of the process, in order to see whether current initiatives are appropriate (related to strategic goals) or not. The idea of starting with current practice makes the process practical, which will apparently lead to longer and deeper commitment. As time is limited and as this step is repeated later in the process (Step 3), deleting this step will simplify the method and shorten the lead time. Furthermore, as the involvement of employees in this process is limited to only two meetings, the risk of loosing commitment is limited.

A second finding with regard to the process is that the introduction of the framework for defining the Knowledge Strategy (use value – products and services – knowledge resources) requires a lot of time. Especially the question about the “use-value” of products and services appeared to be difficult to understand. Furthermore, the question about the products and services the company provides, resulted in irritation, because the answer was supposed to be very obvious.

Based on these findings the process of generating a KP-statement was reduced to one session and some preparatory homework in the following way: At the end of the first workshop, in which the survey is analyzed and collective findings are formulated, participants are asked to give answer to the following questions:

1. What products/services does the company provide?
2. What is the use-value of these products/services?
3. What knowledge resources do we need in order to provide these products/services?

The answers to these questions, together with (public) available information (e.g. website, brochures, strategy documents) about the company, is used to formulate a draft version of the knowledge strategy. This draft knowledge strategy is used as a starting point for the second workshop. The draft is discussed and eventually modified in such a way that it is accepted by all participants. Based on the accepted knowledge strategy, participants are asked to define the

most important challenges (priorities) based on the outcome of the first workshop and the knowledge strategy. Finally the participants are asked to translate the challenges into initiatives.

6.2 Case 3: de Baak – Management Centre VNO-NCW

6.2.1 Introduction

The third organization where we applied the KP-enhancer was Foundation de Baak – Management Centre VNO-NCW (Dutch federation of industries). De Baak is a meeting place for leaders, business people and professionals representing profit, not-for-profit or governmental institutions. The core activity of De Baak is learning to learn, among other things through training, coaching and events. De Baak has a full-service concept, which means that De Baak does not only provide the contents, but also the process and contexts of learning. This implies that the professionals of De Baak (Program Makers) are trainers, instructors, developers, as well as process companions. The main focus areas of de Baak are leadership, management/executive development, personal development, business development. De Baak counts about sixty program makers and fourty support staff divided over two locations: Noordwijk and Driebergen. Including the hotel employees, de Baak counts for more than two hundred employees. De Baak has a vast network of more than four hundred specialists in The Netherlands and abroad who can work as instructors.
De Baak is a typical professional service firm. "Program makers of De Baak are typical professionals. They are self-confident and autonomous, but also able to participate in a larger context. They are creative and innovative in the sense that they can create a context for learning without knowing how beforehand.(translation CS)"[16] These two levels of learning (employees and customers) are reflected in the mission statement: "De Baak is a special company that takes itself and others forward through learning."[17] In order to do so, De Baak specializes in acquiring, sharing and combining knowledge, which should lead to better exploitation of resources, both for De Baak and others. Together, De Baak can be described as a medium-sized, knowledge-intensive service firm, and thus fits into the class of contexts for which the KP-enhancer has been developed.
Important motive for selecting De Baak as a case study was the researcher's formal association with this company. In addition, De Baak had explicitly declared to be interested in participating as a case study. The application of the method was first adopted as a project by the Chief Financial Officer (CFO). Later it was taken over by the Director of the Executive Development Centre Noordwijk (Director EDC).
The method was applied in the period June 2006-May 2007. The main reason for the relative long lead time of this case study was the interruption caused by the summer holidays, change of sponsorship, and illness of the Director EDC. Within this section we report about the application of the KP-enhancer per phase, and finally we will reflect on the effectiveness of the method within this context.

6.2.2 Phase 1: Problem definition

The aim of this first phase is to define the problem that has to be solved and check if this problem fits into the class of problems for which the method has been designed. In two conversations with the Chief Financial Officer (CFO), we explored the possibilities of

[16] Strategy de Baak 2005-2007, 30 November 2005.
[17] Strategy de Baak, 2003, translation comes from *Be Inspired* (Corporate Brochure De Baak)

contributing to the context of De Baak. The past few years, De Baak went through an intensive process of strategy development and became aware of the importance of knowledge and expertise as a source of relative advantage. According to the CFO, the management had doubts about the extent to which De Baak distinguished itself from competitors through the quality of the available knowledge. Do we have the right knowledge? What is the quality of the knowledge in our products and services? How can we improve the quality of our knowledge in order to strengthen our relative position?
At first, the expectation was that the KP-enhancer could provide an answer to these questions through measuring the value of knowledge. Especially within the first conversation, a strong desire was expressed to come with alternative (monetary) indicators that would enable the management of knowledge. The main concern of the management seemed to be (financial) measurement of KP in order to be able to manage and control the knowledge assets. It seemed the CFO expected an HR-accounting method. At this point it seemed the KP-enhancer would not be the right solution to the problem, because it does not measure KP in the sense that it expresses the monetary value of knowledge or knowledge productivity. However, further exploration of the problem learned that the organizational strategy development process had not only resulted in a strategy statement, but also in raised awareness about the gap between strategy and operation. Important concern of the management was: does De Baak have the right resources to execute its strategy? As knowledge is the main resource of De Baak, this question could also be phrased as: does De Baak have the right *knowledge* resources to execute its strategy? As the strategy of De Baak did not explicitly elaborate on the quality of the knowledge resources and the consequences for executing the strategy, the KP-enhancer could make a contribution by showing the consequences of the strategy statement in terms of knowledge resources and knowledge management. In other words, the KP-enhancer could add a knowledge perspective to the strategy statement.
This objective was accepted by the CFO as a starting point for the application of the KP-enhancer. A few months later (after presenting the outcome of the questionnaire, before the workshops), the problem statement and the objective were confirmed by the management team (Klein Overleg). They explicitly stressed the need for the development of an “alternative language”; alternative to the traditional financial language of the management. According to the CEO, the increased importance of knowledge asks for a new language that does not only reveal financial performance, but also the performance of knowledge assets. This new idiom would help to strengthen the knowledge focus of De Baak. It would contribute to raising awareness about the importance of knowledge assets for De Baak and it would overcome the perceived “one sided focus on financial performance”.

6.2.3 Phase 2: Diagnosing KP

After qualifying the case study nomination and after defining the problems at hand we started gathering data in order to assess the quality of the process of knowledge creation. All employees (excluding hospitality) were asked to participate in an electronic survey based on the seven learning functions of the Corporate Curriculum. The total lead time of the questionnaire was two weeks. After one week the invitation was followed by a reminder to those who did not respond yet and those who did not finish their questionnaire. A final reminder was send two days before the deadline. In total, 151 employees were invited to participate. The questionnaire generated a response of 54% (n=82). The survey counted 83 statements. The average time for completing the survey was 21 minutes, which satisfies the requirement of keeping the method practical (i.e. keep investment in time limited).

Table 6.5: Average response per item, De Baak (n=82; 54%)

Learning function	Item*	1	2	3	4	5	6	7	8	9	10
Subject matter expertise	**MD**	3.46	2.81	2.93	3.09	2.48	3.04	3.58	3.70	3.39	3.15
Ability to solve problems	**PO**	3.22	3.71	4.32	4.39	4.21	3.83	4.45	3.05	3.43	
Ability to reflect	**VR**		3.47	3.73	3.47	3.28	3.35	3.95	2.96	3.68	
Communicative and social skills	**CS**		3.83	3.94	3.77	3.32	3.72	3.43	2.96	3.49	4.24
Self-regulation of motivation	**ZM**	4.06	4.10	3.76	3.84	4.11	4.11	3.93	4.18	3.99	4.04
Peace and stability	**SR**	2.94	3.06	2.93	3.46	3.64	2.78	2.89	3.18	3.09	2.96
Creative turmoil	**CO**	4.08	4.13	2.85	4.09	4.23	3.84	3.59	2.55		3.91

** these codes refer to the item codes in the questionnaire (Table 4.1)*

Table 6.5 shows the average scores per item. The blank spaces are the result of removing questions in order to increase alpha after previous iterations. The average scores per learning function (Figure 6.1) shows that the ability to solve problems (PO), self-regulation of motivation (ZM), and creative turmoil (CO) generated the highest average scores. The lowest average scores were generated by the learning functions that refer to subject matter expertise (MD) and peace and stability (SR).

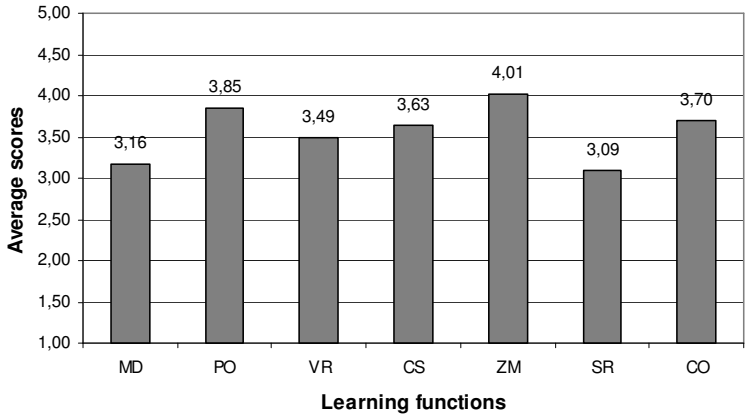


Figure 6.1: Average scores per learning function, De Baak

As the learning functions of the Corporate Curriculum only reveal the quality of the process of knowledge creation, the survey also contained a series of items that refer to incremental improvements and radical innovations. The aim of these questions was to find out what types of innovation are pursued predominantly and to make a connection between the quality of the learning functions and the different types of innovation. As the items related to radical innovations generated an average score of 3.52 and the items related to incremental innovations an average score of 3.18, it seemed the predominant focus in De Baak was on the former. Together, the average scores of the learning functions and the scores with regard to incremental and radical innovation were combined in the Knowledge Productivity Flywheel (Figure 6.2).

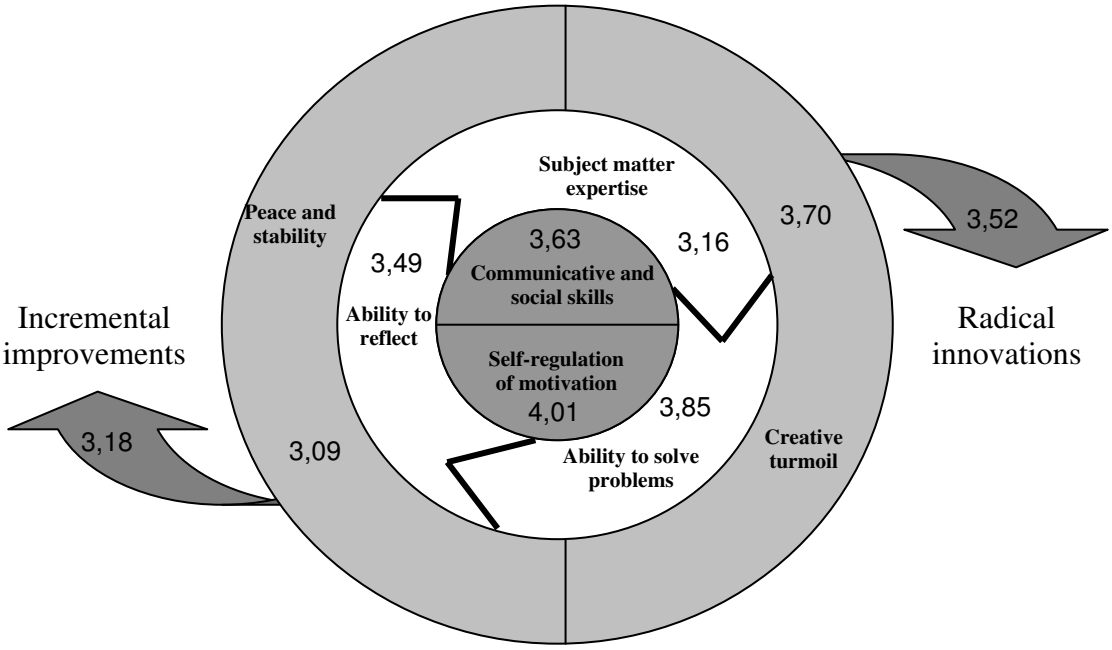


Figure 6.2: The KP-flywheel De Baak

The idea of organizing the survey just before the summer holidays (beginning of July) was that we could speed up after the holidays when everybody would return to work. However, this break in the application of the method led to a loss of momentum and a substantial delay. This delay had three main causes. First, the workshops had not been planned and participants had not been selected and invited before summer holidays started. Due to absence of the key people we had to wait until the beginning of September. Second, after the holydays the CFO demanded the researcher to present the outcome of the survey to him and the management team prior to organizing the workshops. This request caused another delay of a month, as the presentation to the management team was early October. Third, during the presentation to the management team, sponsorship for the project was implicitly taken over by the Director EDC. As this new sponsor had not been involved in the process until now, another meeting had to take place (19 October) before we could start organizing the workshops. Eventually the two workshops took place on November the 6th and 23rd.

As the presentation of the outcome in the management team had to be done in a few minutes, as the management team had not been involved in the process until now, and as the sponsor did not show strong support to the project, the presentation did not generate enthusiasm. As a result, questions were asked about the purpose of the project and its significance compared to other issues. Whereas we thought the presentation was one step in a process that had already been decided on, it appeared to be a moment of making the decision whether to continue or not. Another interesting point of discussion was that the process design of the method did not appeal to the management team. The method should be "circular rather than linear". Furthermore, the meetings should not be called workshops, as "that is what we do all day". And the method should make more use of visual aids, as these would be more inspiring. At the end of the discussion the sponsorship was – more or less – taken over by the Director EDC. The assignment was to discuss the process design, before organizing the workshops.

Two weeks later, the meeting with the new sponsor took place. As the new sponsor had not been involved until now, the main issue was to give an update. The issue of the process design appeared to be no issue anymore so potential participants of the workshops were selected. Finally several optional dates were selected to organize the meetings (we carefully avoided the word "workshops").

We tried to compose a representative group in the sense that it would contain Program Makers (PM), Assistant Program Makers (APM), support staff and management. We only partly succeeded in our intention, because we could not find any support staff to participate in the workshops. Important constraint appeared to be the location of the meetings. Although several people from the support staff were interested, they could not come because the workshops were organized in a different location. Furthermore, as the management team explicitly had asked to involve HR in these meetings, we explicitly invited them to participate. However, they could not accept the invitation, due to geographical reasons, time constraints and other priorities.
Eventually the meetings took place in November. The first meeting lasted two hours and was attended by six persons (three APM, three PM). Due to illness the sponsor could not attend this meeting. The structure of the meeting was as follows:

1. introduction knowledge productivity
2. report outcome survey
3. KP board game

As the concept of KP was new to all the participants, we started with a short introduction of KP in terms of processes and results. Next the factual outcome of the survey was presented and discussed. When interpreting the scores, the main question was “do you recognize the scores?” And if so, “are these scores sufficient in order to achieve the basic objectives of De Baak?” Finally, during the KP board game, all participants were asked to put their cards on the learning functions which according to them should be strengthened in order to improve performance (i.e. the ability to generate incremental or radical innovations).
Together the interpretation of the outcome and the board game resulted in the conclusion that the following learning functions needed to be strengthened:

- Subject matter expertise, in particular purposeful knowledge development (learning function one).
- Communication and collaboration, in particular the ability to acquire access to the knowledge and network of others (learning function four).
- Peace and stability in order to be able to reflect on current and past events (learning functions three and six).

6.2.4 Phase 3: Formulating a KP-statement

Two weeks later a second meeting took place. This meeting lasted three hours and was attended by six persons. As two of the Program Makers were not able to attend the second meeting, they were replaced by two other Program Makers. Due to other obligations, the sponsor only attended the last hour of the meeting.
After the first meeting we agreed that all participants would provide input for the second meeting as described above. The input was used to generate a first draft of the Knowledge Strategy. After a short introduction to the subject (for the new participants) and a recap of the outcome of the first meeting, the first version of the knowledge strategy was presented to the participants. After a short discussion and some minor modifications, the knowledge strategy was accepted by all the participants.
Next, the knowledge strategy and the outcome of the previous workshop had to be translated into a set of challenges. In order to do so, each participant was asked to write down two or three main challenges. Next they were asked to discuss these challenges in couples and reduce their combined challenges to two or three. The next step was to make an inventory of all the challenges and decide on the three or four most important ones, considering the findings of

the first workshop and the knowledge strategy (in particular the knowledge resources). This resulted in the following set of challenges that deserved first priority:

1. Develop focus on strategic knowledge areas;
2. Accompany/support knowledge development of employees;
3. Acquire access to each others knowledge.

The strong support for these three challenges within the second workshop seemed to support the outcome of the first workshop. These three challenges seemed to further focus attention and strengthen the importance of the findings related to the first and fourth learning function (subject matter expertise and communication and collaboration).
Finally, the participants were asked to make an inventory of current activities related to the three priorities. This resulted in a very long list of formal activities and implicit ways of working related to each priority. As none of these activities seemed to really satisfy the need to support these challenges, four new activities were decided upon:

1. Make an inventory of knowledge related to persons;
2. Create special interest groups;
3. Make explicit choice with regard to strategic knowledge areas;
4. Ask employees to formulate a knowledge ambition (within a certain time frame).

The knowledge strategy, challenges and initiatives were brought together in the KP-statement (Table 6.6) and reported to the sponsor. At this point, due to serious illness of the Director EDC, another delay occurred in the application of the method. As a result, the KP-statement was discussed with the client for the first time March 5th, 2007, more than three months after the second workshop. Despite the delay, the client stressed the importance of continuing the process that had been started. First, he believed in the importance of knowledge assets for De Baak and the importance of enhancing knowledge productivity. Second, he did not want to finish the process prematurely, as this would harm the trust of all the people involved. Therefore it was decided that the outcome of the workshops would be presented to the management team (Klein Overleg) by the researcher, and that the client would propose the management team to take the KP-statement as a starting point for improving KP.
It took another two months before the KP-statement was presented to the management team (May 1st). As the time available was limited, and as we had the impression that a factual presentation of the outcome would not be appreciated, we decided to give the MT an impression of the process, by demonstrating the KP board game. Next, the KP-statement was presented, and the MT-members were asked whether they perceived this statement to be a useful starting point for further action. The discussion that followed almost entirely focused on the (un)desirability of the introduction of yellow pages. The meeting was concluded with the agreement that two members of the MT (Director EDC and the Director Business Development) would further investigate the possibilities. In the meeting that followed, it was decided to take up almost all initiatives that were proposed in the KP-statement.

Table 6.6: KP-statement De Baak

Knowledge strategy	**Challenges/priorities**	**Initiatives**	**Indicators**
De Baak is a special company that takes itself and others forward through learning … … in the form of activities that inspire people to learn to learn, such as training, coaching, events and multimedia services. To achieve this we need: - Motivated professionals with the ability to learn - The ability to design, organize and sell learning programs - The ability to execute learning programs (as an accompanist, trainer or teacher) - Knowledge about topics related to leadership, personal effectiveness and the context in which this knowledge will be applied (organizations, society) - A network of teachers and trainers that inspire us and link us to new customers - A knowledge landscape that supports everyone within our network	Focus on knowledge areas	• Make explicit choices with regard to strategic knowledge areas	• % activities that are in line with strategic knowledge areas
	Knowledge focused mentoring of employees	• Make knowledge ambition of employees explicit	• % realized knowledge ambitions
	Access to the knowledge of each other	• Make inventory of specialisms of employees (so that they can find each other more easily) • Create knowledge pools (CoP, SIG)	• % completed profiles • # knowledge pools

6.2.5 Evaluating the effectiveness of the method

As the project had had two sponsors (CFO and the Director EDC), the evaluation of the effectiveness of the method took place in an interview with both persons involved. The main focus of the evaluation was on the effects and the design of the method. Within this section we report about this evaluation.

Effects of the method

The main objectives of applying the KP-enhancer in De Baak were to overcome the one sided financial focus of the management, and to translate the strategy statement into consequences for knowledge and KM. As the strategy statement did not explicitly elaborate on the quality of the knowledge resources and the consequences for executing the strategy, it was expected that the KP-enhancer could reveal the consequences of the strategy statement in terms of knowledge resources and knowledge management.

During the final interview, it appeared that the perception about the effectiveness of the method in succeeding in these objectives widely differed between the CFO and the Director EDC. Whereas the latter was satisfied with the outcome, the former was strongly disappointed. According to the CFO, the method had not generated new insights. Everything mentioned in the KP-statement had already been noticed before. Actions had already been decided on in the past, and the indicators were not as expected. Although the expectations had been discussed extensively beforehand (more extensive than in any other case), they appeared to diverge considerably from the actual outcome. During the evaluation it appeared that the CFO had expected to receive a translation of the organizational strategy into strategic knowledge domains and a concrete overview of (the level of) the available knowledge. He had expected answers to the questions: What knowledge do we need, considering our strategy? How much of this knowledge do we have? To what extent do we make the available knowledge productive? Although the method, to a certain degree, answers the first question, it does not answer the second and the third. Moreover, these questions go beyond the scope of this method.

According to the Director EDC the effect of the method was that it had raised awareness and had made knowledge productivity more urgent. As a result of the KP-enhancer it had become clear to him that knowledge should be managed deliberately. Therefore he saw the KP-statement as a good starting point for future KM initiatives.

Design of the method

As the CFO and the Director EDC hardly participated in the application, they did not have any suggestions for further improvement of the method. However, based on the experiences of the researcher, several remarks can be made with regard to the (improved) design of the method.

First, the shortening of the theoretical introduction at the start of the first workshop did not seem to hinder the understanding of the main concepts. Through shortening, the emphasis of the first workshop shifted from explaining to analyzing KP which seemed to be highly appreciated. Second, contrary to the previous iteration, the KP board game was a success. Although, as some of the participants had to leave early, we did not have sufficient time to get the most out of it. Based on the experience in this iteration, it seems the game requires at least one hour. Third, it seems the simplification of the process of generating a KP-statement worked out well. The steps were clear, they fitted into the available time and resulted in a clear and focused KP-statement.

Finally, in this case the new items in the questionnaire about incremental and radical innovation (Table 6.1) did not contribute to a better understanding of the concept of KP and it did not add to a better understanding of the current situation.

6.3 Case 4: Broek, Steen & Poppel Lawyers

6.3.1 Introduction

The fourth firm where we applied our method was Broek, Steen & Poppel Lawyers (BSP). BSP is a relative large independent business law firm in The Netherlands. Although a full service law firm, the main departments are: Corporate and Commercial law, Real Estate law, and Employment law. The expertise of BSP is based in Dutch law, however with a global outlook. In order to facilitate this global outlook, BSP has connections with law firms throughout the world. BSP is based in Amsterdam and employs over 350 staff including 130 lawyers, thirty civil law notaries and thirty partners.
The main reason for selecting BSP as a case study was that it is a relatively large professional service firm, with a strong focus on professional satisfaction, financial growth and learning. According to the corporate brochure, BSP does not simply deliver legal advice: They are continuously devoted to innovation in order to facilitate clients in their ever-changing markets. Therefore, employees of BSP are stimulated to conduct legal education programs and lecture at universities. Many of them publish articles in text books and in professional publications. BSP can be described as a medium-sized knowledge-intensive service firm, and thus meets the criteria of the class of contexts for which the KP-enhancer has been designed.
Again, the selection of this case study was based on personal contacts of the researcher. This contact was a former colleague that introduced us to the newly appointed Manager Knowledge & Information (Manager K&I). After several meetings in the Spring of 2006, he introduced us to the General Director, and we got approval for applying the KP-enhancer.
As this fourth iteration took place parallel to the third iteration (De Baak), the method had not been changed. Implication is that this case study had the same focus as the previous iteration. Therefore, special attention was paid to the new questionnaire about incremental and radical innovation and to the simplified process of generating a KP-statement.
The KP-enhancer was applied in the period June-December 2006. Like the previous iteration, the application of the method in this case study was also divided in two periods by the summer holidays. Whereas the first phase of the KP-enhancer (intake and problem definition) was finished before the holidays, the second and the third phase of the method (survey and formulation of statement) were applied after the summer holidays.

6.3.2 Phase 1: Problem definition

The aim of the first phase was to define the problem that had to be solved and check if this problem fitted into the class of problems for which the method has been designed. During our first meeting the Manager K&I elaborated on the aims of his KM activities and the reason why he was triggered by the KP-enhancer. As he was at the beginning of the implementation of his KM plan 2006-2008, he was looking for a method that would enable him to measure the return on investments of his KM-activities. Knowledge development and access to knowledge resources was one of the focus points within the recently formulated corporate strategy. According to the strategy, the knowledge and information policy had to be intensified because the segment of the market BSP operated in, combined with the high

hourly rates, should be justified by optimal access to relevant (internal) knowledge resources.[18]
This awareness of the importance of access to knowledge resources was not new to BSP. It had been present for several years. In 2004 the first K&I-manager was appointed. He was succeeded by a second in 2005. This second Manager K&I translated the above ambition in a strategic plan for knowledge management for 2006-2008.[19] According to this plan, the starting points for KM within BSP were, among other things:

- Access to knowledge is a fundamental necessity in order to maintain and improve competitive advantage. Investments in KM should lead to faster and/or better processing of cases.
- More and more customers demand high quality knowledge as they expect their counterpart(s) to be informed about their history with the firm. Furthermore, they also require real time information about the status of their case.
- Knowledge in itself has no value. It only gets value when it is applied by employees in products, services, improvements and innovations.

Although a lot had been said and written about KM at BSP, a focused set of KM goals was missing. Whereas the KM plan 2006-2008 presented an inventory of general advantages of KM, these advantages were not explicitly related to the overall strategic goals. As knowledge was one of the main focus points of the corporate strategy, the expectation was that applying the KP-enhancer could support the process of strategy development from a knowledge perspective: the outcome of this method could serve as input for this process. Or even better, the KP-statement could serve as an appendix to the new strategy statement, in which the strategic goals would be translated into knowledge management activities. In order to contribute to these goals, it was agreed upon that the main reasons for applying the KP-enhancer within BSP would be:

1. to create awareness among employees about the importance of knowledge productivity in relation to the performance of the firm. Although the corporate strategy and the KM plan were very confident about the importance of knowledge for BSP, this importance appeared not to be self-evident among all employees.
2. to give direction to initiatives for the improvement of knowledge productivity. Although the KM plan already accounted for many initiatives, it did not relate them explicitly to specific (strategic) goals. The KP-enhancer could bring about the connection between goals and initiatives.
3. to support the strategy development process from a knowledge perspective. As an extension of the current strategy development process, the strategic goals had to be further operationalized. Applying the KP-enhancer could contribute to this process.

Although the first reason – creating awareness – deserved priority, it was stressed that this awareness should inevitably lead to activities.

Early June we decided to split the method into two parts. The first step (problem definition) would be finished before the summer holidays, the survey would start early September, so that we could finish the method late October or mid-November at the latest. This planning was aligned with the planning of the strategy development process as it was our aim to add the KP-statement as an appendix to the final version of the strategy.

[18] Corporate strategy: *Broek, Steen & Poppel*, September 2006.
[19] Plan van aanpak kennismanagement, Broek, Steen & Poppel, 2006-2008.

Although it was emphasized that the process approach of the KP-enhancer was highly appreciated, some concessions had to be made with respect to the process in order to make the method more acceptable within the context of BSP. First we added several steps which gave key persons (managers) the opportunity to express their support to (the outcome of) the method. Second, because of the extreme focus on time within a lawyer's practice (every six minutes should be justified), it was decided to limit the number of workshops to one and go through the process as fast as possible. The danger of the latter change of the method was that it would lose strength, however, as it fitted into the purpose of this iteration (simplifying the method), we welcomed this change as an interesting experiment.

6.3.3 Phase 2: Diagnosing KP

After qualifying the case study nomination and after defining the problems at hand we started gathering data in order to be able to assess the quality of the process of knowledge creation. All employees were asked to participate in an electronic survey based on the seven learning functions of the Corporate Curriculum. As in the other iterations, the total lead time of the questionnaire was two weeks. After one week the invitation was followed by a reminder to those who did not respond yet and those who did not finish their questionnaire. A final reminder was send two days before the deadline. In total 312 employees were invited to participate. The questionnaire generated a response of 62% (n=192). The survey counted 83 items. The average time for completing the survey was thirty minutes.

Table 6.7: Average response per item, BSP (n=192; 62%)

Learning function	Item*	1	2	3	4	5	6	7	8	9	10
Subject matter expertise	**MD**	3.77	3.26	3.42	3.28	2.65	3.03	3.53	3.30	3.14	3.00
Ability to solve problems	**PO**	3.07	3.34	3.09	3.82	2.89	3.13	3.90	2.80	2.77	
Ability to reflect	**VR**		3.18	3.21	2.72	2.93	2.87	3.28	3.08	3.14	
Communicative and social skills	**CS**		3.77	3.34	3.23	3.07	3.33	3.05	2.88	2.91	3.94
Self-regulation of motivation	**ZM**	3.38	3.27	3.09	2.88	3.32	3.21	3.16	3.23	3.24	3.62
Peace and stability	**SR**	3.08	3.48	2.98	3.35	3.36	2.71	2.72	3.10	3.05	3.14
Creative turmoil	**CO**	3.98	3.82	3.22	4.02	3.81	3.65	3.26	2.58		2.36

** these codes refer to the item codes in the questionnaire (Table 4.1)*

Table 6.7 shows the average scores per item. The blank spaces are the result of removing items in order to improve alpha after the previous iterations. The average scores per learning function (Figure 6.3) show relatively even scores at a relatively low level (compared to previous iterations). The lowest scores are related to the *ability to reflect* (VR) and *peace and stability* (SR). The highest score is related to *creative turmoil* (CO).

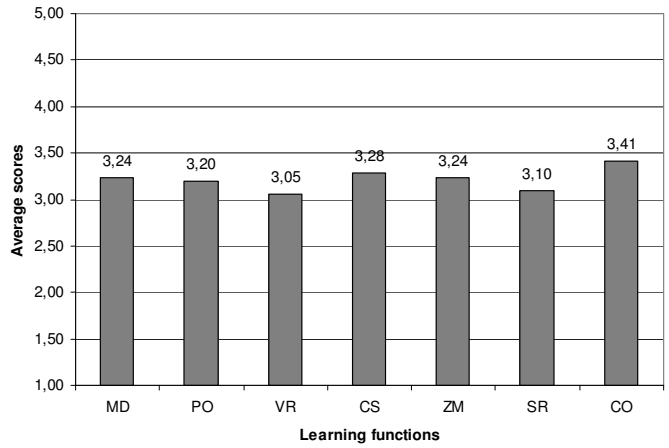


Figure 6.3: Average scores per learning function, BSP

In order to find out whether different types of employees had different perspectives on the quality of the learning functions, we also calculated the averages per type of employee (Table 6.8). A distinction could be made between partners, non risk bearing fee earners, non legal employees within the section, and support staff.

Table 6.8: Average scores learning functions related to different types of employees, BSP

	Subject matter expertise	***Ability to solve problems***	***Ability to reflect***	***Communicative and social skills***	***Self-regulation of motivation***	***Peace and stability***	***Creative turmoil***	***Total average***
Partners	3.11	3.4	2.9	3.35	3.51	3.36	3.5	**3.304**
Fee earners	3.19	3.36	3.06	3.5	3.45	3.13	3.43	**3.303**
Non-legal employees	3.33	2.99	3.01	3.17	2.94	2.98	3.37	**3.113**
Support staff	3.25	3.18	3.22	2.97	3.24	3.16	3.49	**3.216**

Table 6.8 revealed that, compared to the overall scores, partners and fee earners generated higher scores and non legal employees generated lower scores. Several learning functions show differences in perception between the different types of employees. The main differences in perception with regard to *problem solving* was observed between partners (3.4) and non legal employees within the section. The main difference in perception with regard to the *ability to communicate and cooperate* was observed between the fee earners (3.5) and the support staff (2.97). The main difference in perception with regard to *self-regulation of motivation* was observed between partners (3.51) and non legal employees within the section (2.94).

Finally, the survey about incremental and radical innovation resulted in an average score of 3.06 for radical innovation and an average score of 3.31 for incremental innovation. Together we combined the average scores of the learning functions and the scores with regard to incremental and radical innovation within the Knowledge Productivity Flywheel (Figure 6.4).

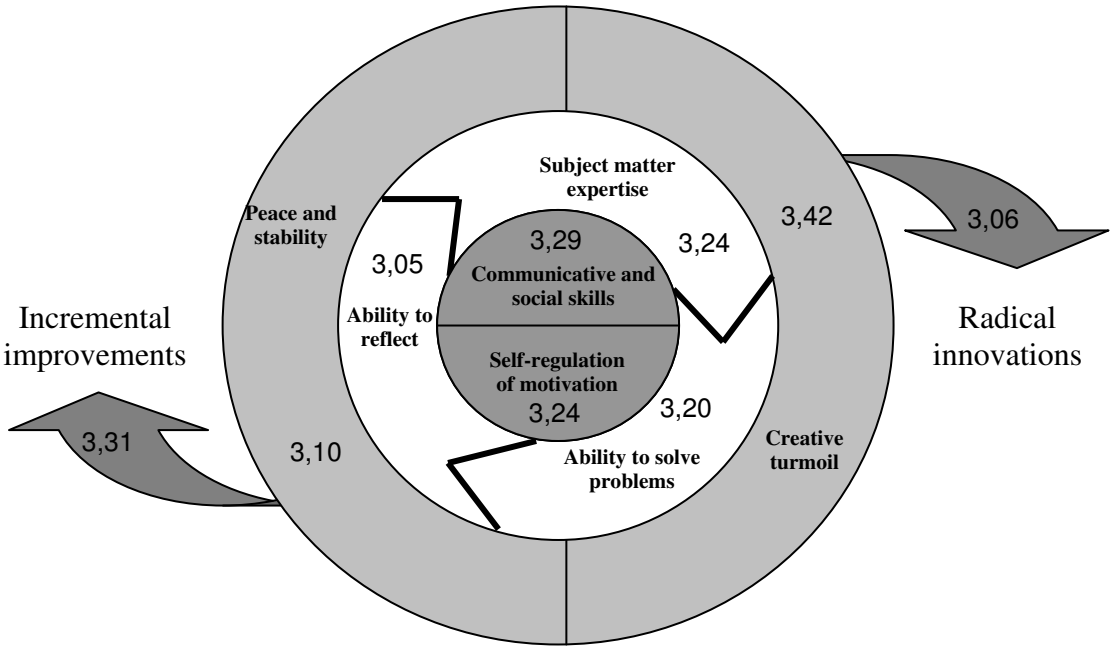


Figure 6.4: Knowledge Productivity Flywheel Broek, Steen & Poppel

As agreed in the first phase we would reduce the number of workshops to one in order to speed up the process. Therefore, the outcome of the survey was first presented, discussed and interpreted with the Manager K&I. The aim of this meeting was to generate some preliminary conclusions, which could serve as input for the workshop.
Important element of this meeting was the analysis of the underlying scores per item. Striking was that only one item (CO4) scored above four. In total 14 items (MD5, PO5, PO8, PO9, VR4, VR5, VR6, CS8, CS9, ZM4, SR3, SR6, SR7, CO9) generated scores below three. Based on the low scores, it was observed that the following topics needed attention:

- strategic knowledge development (MD5)
- room to experiment (PO5, PO8, PO9, CO9)
- reflection (VR4, VR5, VR6, SR3, SR6, SR7)
- culture for knowledge sharing (CS8, CS9, ZM4)

In order to find out whether distinction could be made between the perception of different types of respondents, an extra analysis was made of the scores per type of respondent. As we have seen above, the main observation was that the legal staff (partners and fee earners) overall generated higher scores than non legal staff (non legal employees and support staff). In particular with regard to learning functions two (ability to solve problems), four (ability to communicate and cooperate), and five (self-regulation of motivation) striking differences in perception could be observed. After analyzing the data, the following points were noted:

- Partners and fee earners generate low scores on the ability to reflect (2.9 and 3.06).
- Non legal employees generate low scores on the ability to solve problems (2.99), ability to reflect (3.01), self-regulation of motivation (2.94), and peace and stability (2.98).
- Support staff generates low scores on the ability to communicate and cooperate (2.97).

Based on an analysis of the scores per item, three more observations could be made with regard to the different types of respondents:

- Both partners and fee earners generated low scores (average 2.44) on the item about purposeful development of knowledge (MD5).
- Both partners and fee earners generated low scores (average 2.6) on the item about the dissemination of new knowledge and experiences (SR7).
- All types of employees generate low scores on items related to experimenting with new ways of working (e.g. CO9).

Finally it was observed that, although the focus seemed to be on incremental innovations, the learning functions for these type of innovations (ability to reflect and peace and stability) generated the lowest average scores (3.05 and 3.10).

Based on the analysis of the data the Manager K&I wrote a report about the outcome of the survey[20]. In this report he wrote that the survey revealed agreement about the necessity to renew as a consequence of the development in the market. When assessing the ability to renew, he remarked:

1. incremental improvements fit our organization better than radical improvements, however our organization generates low scores with regard to the *ability to reflect* and *peace and stability*;
2. our organization generates low scores with regard to systematic knowledge development (related to strategic goals);
3. knowledge sharing needs to be improved.

Based on these observations, the Manager K&I concluded that renewal of the work processes was required. When giving direction to this renewal, he suggested that the following priorities should be discerned with regard to knowledge management:

1. create room for development of and experiment with new knowledge;
2. develop a strategic knowledge orientation;
3. stimulate a culture of knowledge sharing.

These conclusions were used to report the results of the survey to all employees via intranet late October and they were used as input for a workshop early November. This workshop was attended by two partners, two senior lawyers and two support staff (IT and KM). As time is the main denominator within this firm, it was scheduled for exactly one hour. Objective of this meeting was to share and discuss the main findings of the survey, in order to verify our observations, create commitment, and generate input for the KP-statement.
In order to stimulate the discussion, the Manager K&I formulated a series of propositions about KM at BSP. Participants of the workshop were asked whether they agreed or not. In some cases they were asked to make a distinction between several options. The aim of these propositions was to focus attention and generate discussion.

Propositions workshop knowledge management

1. Knowledge has become the main distinguishing characteristic of legal services in the high end of the market.
2. 5% of our time should be spend on activities related to knowledge and quality.
3. Creating a culture of sharing within BSP is not possible.
4. The role of *knowhow employee* should evolve into a *professional support lawyer*.
5. Electronic files offer the following possibilities:

[20] From: *Outcome survey KM*, October 2006

   a. improve collaboration
   b. efficiency in dealing with cases
   c. improve service to clients
   d. a combination of a, b and c.
   e. no improvements
6. When processing cases, a certain degree of division of labor would be desirable in the future.
   a. Yes, especially case preparation and case evaluation
   b. Yes, especially case administration
   c. Yes, both a and b
   d. No
7. Making knowledge available for others should not be free of obligations.
8. Processing legal information:
   a. requires specialized employees
   b. should be done by lawyers themselves
   c. requires specialized employees which support lawyers
   d. a and c
9. It is desirable to develop specific knowledge services for clients, like proactive monitoring of legal opportunities, investigate a company, information gathering.
10. Every practice should have a legal knowhow employee who takes care of issues like research, model development, knowledge administration, product development, publications.
11. The main priority for KM in the next three years is:
   a. develop and maintain a comprehensive knowledge database
   b. attract and educate professional support lawyers
   c. introduce electronic files
   d. introduce means for knowledge sharing (communities, forums, wiki's).
   e. other…

As time was limited, the discussion focused on propositions one to five and 11. The remaining propositions were scored in writing (multiple choice). The outcome of the discussion and the written scores were processed by the Manager K&I and reported back to the participants[21].
In general the propositions generated consent among the participants. In particular Proposition 1 and Propositions 6-10 generated predominantly (unanimous) agreement. The remaining propositions resulted in more differentiated views. With regard to Proposition 2 it was agreed that 5% was not enough. According to the participants, each practice should spend more than 5% of its time on activities related to knowledge and quality management. The proposition about creating a knowledge sharing culture (Proposition 3) led to a discussion about the desirability of sharing knowledge and the danger of misuse/abuse of knowledge. The main problem related to this issue seemed to be the fact that knowledge created in one section, would lead to income in another section. Although everyone seemed to agree with the necessity of creating a knowledge sharing culture, it was expected that it would require a great deal of effort. With regard to Proposition 4, most participants agreed that the knowhow employee should evolve into a professional support lawyer. However it was acknowledged that the danger of making a lawyer responsible for knowhow tasks would endanger the knowhow activities, as knowhow activities are presumed to have lower priority than clients and cases. According to the participants of the workshop, electronic files (Proposition 5) would improve collaboration, efficiency and the service to clients. External developments in

[21] Memo to participants workshop KM, 10 november 2006.

this field were expected to force BSP to advance in electronic filing. Finally, Proposition 11 resulted in a variety of priorities with regard to KM in the next three years. All suggestions were supported equally.

6.3.4 Phase 3: Formulating a KP-statement

As it was not possible to claim more time for this project, we could not organize a second workshop in which to formulate a KP-statement. Therefore, the outcome from the workshop was used by the Manager K&I to make a draft KP-statement, which was then presented to the General Director. This resulted in the KP-Statement as presented below (Table 6.9).

Within this case, the process of formulating the KP-statement (Step 3) took place parallel to the final phase of the previous step in which the data were analyzed. Although we did not organize a second workshop and did not involve others, the process we followed was more or less the same as in previous iterations and in line with the method. In two meetings between the Manager K&I and the researcher (18th October and 6th of November), one meeting with the General Director (6th of November), and a series of emails the KP-Statement was formulated.

Although the initial design of the KP-Statement went too far within this context (with regard to employee participation), the logic and the design of the output was much appreciated. So much that the Manager K&I tried to introduce the structure of the KP-statement into the strategy development process for the firm as a whole. However, as the strategy development process was already in an advanced phase, this attempt failed.

The lesson drawn (by the Manager K&I) from applying the KP-enhancer was that the main problem was the lack of a knowledge sharing culture and that there was a mismatch between this problem and the current initiatives. Although this lack of a knowledge sharing culture was acknowledged by many colleagues, and although almost everybody seemed to agree about the importance of solving this problem, nobody seemed to be prepared to do something about it. According to the Manager K&I, he was confronted with a “wall of benevolence”. To the Manager K&I, this situation resulted in concern about the effectiveness of the KM function within BSP.

In January 2007 the KP-Statement and the concern about the effectiveness of KM was shared with the (new) board of directors. The concern was taken up seriously and resulted in a proposed shift in the structure and focus of the KM function. First, in order to involve more people and create more commitment, it was decided to establish a KM support group (klankbordgroep). Next, to break the wall of benevolence, it was decided that the KM function would focus on one or two practices that were really prepared to implement a new way of working. Finally, as suggested during the workshops, it was decided to increase the number of knowhow employees and upgrade their profile to professional support lawyers.

Table 6.9: KP-Statement Broek, Steen & Poppel

Knowledge Strategy	**Challenges**	**Initiatives**	**Indicators**
BSP offers specialized legal services to mid-sized and large enterprises. Its main focus areas are corporate law, real estate law and labour law. To achieve this we need: • Highly qualified employees with the right knowledge and the ability to use this knowledge to solve legal issues of our customers; • Focused management of the development and dissemination of required knowledge • Room to create new knowledge (applications); • Fast access to the right internal and external information sources; • Facilities for an effective exchange of knowledge; • Professional research and selection of information; • Effective processing of electronic files; • Specific knowledge services for customers; • A good reputation.	• Focused development of knowledge	1. Introduce yellow pages 2. Legal knowhow employees participate in product development 3. Implementation of collaboration tools (CoP, Forum, Wiki)	# completed yellow pages # new products # communities of Practice (CoP)
	• Improve accessibility of knowledge	4. Implement a search engine 5. Offer research service 6. Improve quality of intranet (personalized access to information application) 7. Introduce a new way of capturing and disseminating knowledge by legal knowhow employees 8. Implement a system for capturing and sharing of procedures	# searches # research assignments # sources w.r.t. strategic knowledge areas # procedures that have been shared
	• Enable electronic services	9. Implement electronic filing 10. Development of an extranet 11. Implement a system for automated file production	# electronic files # clients that use the extranet # automatically produced files
	• Enhance knowledge profile	12. Legal knowhow employees capture more client information 13. Development of specific knowledge services for clients 14. Legal knowhow employees start publishing in professional magazines and journals 15. Legal knowhow employees maintain relationship with universities (faculties).	# publications for customers # customers for knowledge services # articles in (professional) magazines # relationships with universities

6.3.5 Evaluating the effectiveness of the method

Like the previous iterations, the effectiveness of the method was formally evaluated in a meeting with the main persons involved. After the presentation of the KP-statement to the board of directors, a semi-structured interview took place with the Manager K&I and the General Director. In addition, we also interviewed the Manager K&I nine months after completion of the method (September 2007). This section elaborates on the effects of the application of the method and the design of the method. The starting points of this evaluation were the requirements of the method in general and the specific expectations of the outcome of the method within this case.

Effects of the method

The aim of applying the KP-enhancer within this context was to create awareness about the importance of KP, make a plan for KM, and influence the strategy development process from a knowledge perspective. Both the Manager K&I and the General Director agreed that applying the method contributed to the first and second aim, but had not influenced the strategy development process.

The most important contribution to the first objective (creating awareness) came from the survey. According to the interviewees, the survey had a surprisingly high response (62%). Interesting effect had been that the survey resulted in conversations about the knowledge intensity of the work of the support staff. These conversations contributed to the awareness that knowledge and knowledge development are not the exclusive domains of the legal professionals. Another element that contributed to increased awareness was the workshop. Even though the format of the workshop was reduced to one short meeting, the effect of this workshop was that the participants showed more concern with the importance of KM. According to the Manager K&I, the approachability of the participants had increased.

As we have seen above, the main contribution to the second objective (make a plan for KM) came from the KP-statement. According to the Manager K&I, the KP-statement appeared to be very effective "because it is compact, it is based on a sound logic, and it is very concrete. Nobody can say 'I have not read it', 'it is not clear', or 'it is not concrete'." The KP-statement appeared to be a much more effective instrument than the existing KM action plan. According to the General Director, the KP-Statement "proved to be a more effective way to get the subject on the agenda than the existing action plan". Proof of this are the actions that were decided upon after presentation of the KP-statement to the board of directors. "In all its simplicity, the KP-statement forced us to acknowledge the real problem and act accordingly". According to the Manager K&I, the KP-statement could be characterized as "hermetic". "It is very difficult not to agree, and it would be painful not to act accordingly". In a sense, the KP-statement functioned as a key (or crowbar) that helped open the door towards meaningful actions.

The initial aim of getting the KP-statement accepted as an appendix to the new strategy statement, was not achieved. Although KM got its own paragraph in the new strategy statement, both the Manager K&I and the General Director agreed that this was not the result of the application of the KP-enhancer. Due to the (parallel) planning of the KP-enhancer and the strategy development process (both processes were finished more or less at the same time), it was difficult to introduce the findings from the one into the other. Maybe, if the KP-enhancer would have been applied earlier, the findings could have influenced the strategy development process better.

Effects as perceived after nine months

In this case we had the opportunity to reflect on the application of KP-enhancer after nine months. In a short interview with the Manager K&I we asked how he looked back upon the application of the method, what he thought had been the main results, and what happened with these results since the completion of the method.

According to the Manager K&I, the effects of applying the method had been limited in everyday practice in the sense that it did not change the things he was doing and it did not (despite the initial expectations) change the attitude of the Board towards KM. According to the Manager K&I, the main merit of the KP-enhancer was that it helped to connect strategy and (existing) KM initiatives. This connection helped him to plan KM initiatives and to communicate about (justify) KM initiatives to the organization.

Design of the method

The main point with regard to the design of the method is related to the workshops. Intention of the workshops is to create involvement and commitment with regard to improving the process of knowledge creation. Within this case study, the two workshops (as designed) were reduced to one meeting of one hour. Although it was the aim of this case study to explore the possibilities of simplifying the process, and although we knew in advance that it would not be possible to ask many employees to invest a lot of time in this project, this serious alteration of the intended design reduced the involvement of other employees to a minimum. If it is true that involvement is needed to raise commitment, then the level of commitment as a result of applying the method within this case can be questioned. However, considering the effects of the method, the radical reduction of employee participation did not seem to hinder the effectiveness of the method.

According to the Manager K&I, the main reason for reducing the two workshops to one meeting was the reluctance of employees to participate in this project. This reluctance was based in two cultural characteristics. First characteristic is the strong focus of BSP on billable hours of productive time. As employees think in billable periods of six minutes, one hour is already long. This results in a major resistance against long term and internal (non-billable) investments in time. Second characteristic that causes reluctance is the fact that it is not common practice to involve employees to give direction to management policies. Within this (type of) firm, management is contracted out to managers and these managers are expected to solve management problems themselves, without bothering the legal professionals. In other words, KM is the problem of the Manager K&I, and therefore should be solved by the Manager K&I. Whenever professionals are involved in management matters, they expect top-down directives instead of bottom-up participation.

6.4 Statistical analysis Case 3 and 4

In this section we make a statistical analysis of the survey based on the response in the third and fourth iteration. This analysis is based on the reliability scores of the learning functions, item analysis and missing value analysis.

6.4.1 Reliability analysis

Compared to the alpha scores of the previous iterations, all but one of the reliability scores are lower (Table 6.10). However, the reliability scores of learning functions one to five (MD, PO, VR, CS, ZM) seem to be relatively stable and at a satisfactory level. The main differences compared to the previous iterations can be found in the scores related to learning functions six and seven (SR and CO) and the scores related to incremental and radical innovation (IV and RI). These scores are relatively low and unstable.

Table 6.10: Reliability (Cronbach α) per learning function and per type of innovation

	De Baak		BSP		Totaal	
	n	α	n	α	n	α
Subject matter expertise	75	.780	168	.808	243	.794
Ability to solve problems	74	.818	154	.817	228	.848
Ability to reflect	71	.713	146	.795	217	.792
Communicative / social skills	76	.725	167	.816	243	.808
Self-regulation of motivation	72	.854	148	.827	220	.883
Peace and stability	67	.681	144	.802	211	.771
Creative turmoil	67	.654	144	.542	211	.584
Incremental innovation	63	.573	137	.696	200	.665
Radical innovation	61	.736	109	.617	170	.714

Whereas De Baak generated relatively high alpha scores on *creative turmoil* and *radical innovation*, BSP generated relatively high alpha scores on *peace and stability* and *incremental innovation*. As the previous iteration (Midfield Consultants) showed a similar pattern, we suspected a relationship between the scores of the last two learning functions and the scores related to incremental and radical innovation. Calculation of the alpha scores of the combination of these two sets seemed to support this hypothesis as the combination of items related to SR and IV generated an alpha score of .804, and the combination of CO and RI generated an alpha score of .777. These alpha scores could be further improved by deleting several items.

6.4.2 Item analysis

This analysis is based on the alpha scores "if item deleted" and a separate inter item analysis. A distinction can be made between the items related to the learning functions of the Corporate Curriculum and the items related to incremental and radical innovation.

The previous analysis after the second iteration revealed four items (PO1, CS5, VR3, ZM3) that would increase alpha if deleted. Now we count eight items that would increase alpha if deleted: MD9, PO1, CS5, ZM3, SR2, SR9, CO3, CO8. Seven of these items would only marginally increase alpha scores. Deleting CO8 however, would considerably improve alpha of the seventh learning function (from .584 to .669).

Item CO8 (de continuïteit van onze organisatie is gewaarborgd) was one of the items which had been removed after the first iteration and reintroduced (although rephrased and reversed) after the second iteration. This item represents an important element of this learning function

(existential threat as a precondition for creative turmoil). However, as this item continues to cause problems, and as we need to improve the reliability of this learning function we should consider to delete this item again.
What is striking in the list of items that would increase alpha if deleted, is that six of these items are reversed items (MD9, CS5, ZM3, SR2, SR9, CO8). Five of these items were reversed after the previous iteration. The aim of reversing these items was to keep the respondents alert and stimulate variation. However, as these items have a negative contribution to the alpha scores we should consider restoring the initial (non reversed) formulation.
Reliability analysis of the items related to incremental and radical innovation reveals four items that would increase alpha if deleted (IV5, IV8, RI2, RI5). These scores could not be compared, because the items were introduced after the second iteration. Each of these items would improve the alpha scores considerably (if deleted). Deleting all of them would increase the alpha even more (IV up to .7482 and RI up to .7943).

A further analysis of inter item correlations confirms the weaknesses of most of the above mentioned items. An inventory of low (<0.1) and negative inter item correlations confirms the reliability problems related to learning functions six and seven and the items related to incremental and radical innovation (Table 6.11). It seems these items do not fit the variables to be measured, and therefore it should be considered to delete these items.

Table 6.11: low (<.1) and negative inter item correlations

Item	Low (<0.1)	Negative
MD9	MD2, MD3, MD4, MD5	
PO1	PO4, PO7	
SR2	SR5, SR6, SR7, SR10	SR10
SR9	SR6, SR7	
CO3	CO4	CO5, CO6, CO8, CO10
CO8		CO1, CO2, CO3, CO4, CO5, CO6, CO7, CO10
IV5	IV1, IV2, IV3, IV6	IV7, IV8, IV9
IV8	IV1, IV4, IV7	IV2, IV3, IV5
RI2	RI4, RI7, RI8	RI1, RI3, RI6, RI9
RI5	RI1, RI3, RI9	RI4, RI6

As deleting MD9 would only marginally increase alpha, and as this item did not cause any problems in the first two iterations, there seems to be no need for deleting this item. More or less the same goes for items PO1, SR2, and SR9. Although deleting CO3 would improve alpha only marginally, the fact that it correlates negatively with four other items pleas for deleting this item. As CO8 correlates negatively with all other items, deleting this item seems inevitable. Deletion of both CO3 and CO8 would result in an alpha score of .6920 for this learning function.

6.4.3 Missing value analysis

Like the first and second iteration, the third and fourth also resulted in relatively high item-non-response rates. Moreover, the non-response increases the more we advance in the questionnaire. Whereas the first learning function generated 243 cases (89%), the last learning function only generated a response of 211 (77%). The questions about incremental and radical innovations generated even lower response rates (200 (73%) and 170 (62%)).
The response of a survey is the part of the sample that generates the required information; non-response is the part that does not ('t Hart et al., 1998). Although respondents within this survey are obliged to respond to all items (otherwise they cannot proceed with the survey), they have the option to select “not applicable” or to stop answering questions somewhere

halfway. Choosing these options leads to missing values. Within this research, the survey generated three kinds of missing values. The first kind is caused by respondents that started the questionnaire, but did not answer a single question. The second kind of missing values is caused by item-non-response as a result of not finishing the survey. The third kind of item-non-response is the result of using the option “not applicable”. Each of these kinds of missing values are analysed in this section.

First, 33 (11%) cases in the third (14) and fourth iteration (19) gave up before answering the first question. As we made a distinction between fee earners and support staff, we can identify their different behaviours. Striking is that 27 (82%) of the respondents that gave up before answering the first question were from the support staff. Although we do not know for sure, it seems plausible that these respondents – after seeing the first set of questions – deliberately decided not to participate in this survey. If this is true, this could be an indicator that the questionnaire fits fee earners better than support staff.

This hypothesis seems to be confirmed when analysing the group of respondents that did not finish the survey. In total, 18 (6.6%) respondents started answering the questions, but gave up somewhere halfway. As twelve (66%) of the respondents that did not finish the survey were employees from the support staff, this could say something about the applicability of this survey for this group.

The third class of missing values is caused by respondents using the option “not applicable” (n.v.t.). This questionnaire aims to be applicable for all employees. A frequent use of “not applicable” could indicate that the questionnaire does not fit all employees. Many item-non-responses can also lead to a reliability problem, as the number of respondents decreases.

In total the survey counts 83 items. Of these, 48 items generated low levels of missing values (<5%). However, with 35 items the percentage of values missing was higher than 5%. Six of these generated high levels (>10%) of missing values (VR9, IV6, IV9, RI4, RI5, RI9) and one item generated a very high level (20%) of missing values (RI2). These items are perceived as “not applicable” (n.v.t.) for the respondent’s situation.

Partial non-response can be the result of idleness or not understanding the question(s) (Swanborn, 1981). In addition, partial non-response could be the result of respondents getting tired or losing interest. Some of them will give up completely, others will flee into the “non applicable” option. However, the majority of the respondents give up in the beginning of the questionnaire, so this cannot be caused by being tired. Besides, the level of item-non-response of the questions related to the seven learning functions are more or less consistent. The main problem is the last part of the survey, in which the level of item-non-response increases. To be more specific, the items related to incremental innovation generate an average of 6% of item-non response and the items related to radical innovations generate an average of almost 11% of item-non-response. It seems the problem is more an issue of the final part of the survey, than of respondents getting tired or losing interest. Item-non-response can be the result of erroneous formulations ('t Hart et al., 1998). Common errors in this respect are the use of difficult words or phrases, ambiguous questions, questions related to more than one subject, negative questions or questions that are multi-interpretable.

After the previous iterations, items with high levels (>10%) of missing values were rephrased in order to improve the match between the item and the respondents situation. These changes seem to have worked out well, considering the level of missing values with regard to these items (VR4, VR5) in these iterations. In addition, we also rephrased several items with levels of missing values between 5% and 10%. Two of these items (VR9 and CO3) again generated high levels (10.6% and 9.1%) of item-non-response in the third and fourth iteration. What is striking is that both items refer to customers. Plausible explanation for the non-response could be that respondents that do not have frequent contact with customers, interpret this item as not applicable to them.

In total this questionnaire generated 405 missing values in the third and fourth iteration due to the use of the option “not applicable”. Although the support staff represents 54% of the cases, this group was responsible for 80% (325) of these missing values. Again, this supports the idea of a misfit between the survey and the support staff. Although this tendency was the same in both the third and fourth iteration, the support staff in the fourth iteration (BSP) generated a much higher level of item-non-response than the support staff in the third iteration (De Baak). This could indicate that the survey fits one firm better than the other.

6.4.4 Conclusions statistical analysis

Statistical analysis of the survey in the third and fourth iteration led to the following conclusions:

1. The items related to incremental and radical innovation cause the main problems in the third and fourth iterations. Low reliability scores and very high levels of item-non-response (up to 20%) demand a fundamental reconsideration of these two sets.
2. Second weakness of this survey is in the items related to learning functions six and seven (peace and stability and creative turmoil). The problem of these two sets of items is that they do not show stable reliability scores. Four items appeared to contribute negatively to the alpha scores. As these sets of items continue to cause problems, deletion and reformulation of several items is inevitable.
3. A third weakness of this survey is in the reversed questions. In order to keep the respondents alert and stimulate variation, we reversed a series of statements after the second iteration. The effect of this change in the third and fourth iteration was that almost half of these items contributed negatively to the reliability scores. Six of the eight items that would increase alpha if deleted, are reversed items. As the initial formulation (in first and second iteration) did not cause problems, restoration of the initial formulation of these items seems to be the solution to this problem.
4. Fourth weakness of this questionnaire in the third and fourth iteration was the overall high level of item-non-response. Missing value analysis revealed that 80% of the non response was generated by respondents from the support staff. In order to improve the applicability of the items (and thus reduce item-non-response), reformulation of items with high levels of item-non-response seems imperative.

6.5 Reflections Case 3 and 4

The aim of this section is to reflect on Case 3 and 4. This reflection will focus on the initial objectives within both cases, the effects of applying the method, the design of the method, the context of application, and possible consequences for further testing of the method.

Objectives and effects

In both cases it took some time and several interviews to clarify to the participants the purpose of the KP-enhancer and find an appropriate objective that fitted the operational requirements of the method. At first, in both cases it was expected by the client that the method would lead to financial measurements. After introducing the method and its objectives, in both cases the focus shifted towards translation of the strategy statement into consequences for knowledge and knowledge management.

Difference between the two cases was the context of application. In Case 4 the method was applied within the context of and contributed to the improvement of an existing knowledge management initiative. The dedication of the Manager K&I seems to have contributed positively to the effectiveness of the method.

Almost the opposite seemed to be true in Case 3, where the application of the method did not take place in the context of an existing project, did not seem to contribute to an urgent problem, and lacked a person that really "owned" the project. Considering the long lead time, the lack of enthusiasm during the process, and the lack of enthusiasm about the result of the method, it can be questioned what the real motive for applying the method was. Was it to do the researcher a favour? Considering the working relationship between the researcher and the case organization, this might have been the case.

Again, like Case 1 and 2, the application of the method in Case 3 and 4 received full management support. Difference however was that the top management in these cases did not actively participate in applying the method. In Case 4 this was compensated by the enthusiasm and dedication of the Manager K&I. In Case 3, the lack of management participation was not compensated. In fact, as applying the method had not been delegated to a problem owner (in all other cases it was), the method was completely dependent on the participation and the enthusiasm of the management. Lack of management participation seems to have influenced the effectiveness of the method in this case. Effective application of the method not only seems to require management support, but also a dedicated problem owner.

According to both case-organizations, important effect of applying the KP-enhancer was increased awareness of the importance of knowledge and knowledge productivity for improving organizational performance. As this effect is in line with the functional requirements of the method and the initial expectations of these specific cases, the method seems to have been effective in this respect.

Interesting to note is that within Case 4 different elements of the method seemed to have helped to increase awareness among different groups. First, the questionnaire had been an important element in raising awareness among the support staff, because it raised questions and resulted in conversations about the knowledge intensity of their work. Next, the meeting with the professionals (partners, lawyers) contributed to increased commitment towards the KM function. And finally, the KP-statement appeared to be an effective instrument to reveal the real problem at hand (as perceived by the Manager K&I) and to convince the board of directors to change the focus and the structure of the KM function. So, different elements of the method contributed to increasing awareness of different groups of employees. When customizing the method this could be taken into account.

In the fourth case, the KP-statement helped to reveal the real problem at hand (lack of knowledge sharing culture). Next it helped to communicate this message to the board of directors and get approval for a shift in the focus of the KM function. According to the Manager K&I, the KP-statement had been much more effective than the existing KM plan. As one of the requirements of the method is that the method should help make a plan for KM, and as this had been one of the specific expectations within this case, this is another indication that the method was effective.

Design of the method

When comparing the process of applying the method in these iterations, it can be concluded that the method has been applied, more or less, as intended in Case 3, and that major alterations have been made to the process within Case 4. However, judged by the effects, Case 3 has not been more successful than Case 4. So, holding on to the design of the method does not seem to be a necessary condition for effectiveness of the method.

Within Cases 1 and 2, a lot of effort had been put in explaining the main concepts to the participants in the workshops. As this required a lot of time, made the workshop too theoretical and subsequently seemed to result in a loss of engagement, we decided to shorten the theoretical introduction at the beginning of the first workshop. Although we only had the opportunity to test this once (Case 3), it seemed to work out well. As a consequence of this change, we gained a lot of time and the emphasis of the workshops within this case shifted from explaining (passive) to diagnosing (active), which seemed to appeal to the participants. This effect was strengthened by the introduction of the board game.

As the aim was to design a practical method, and as we found out that the process of generating a KP-statement required more time than intended, we decided to simplify this process after Case 2. Based on the experiences within Case 3 and 4, it seems we can conclude that simplification of this process is feasible. Whereas the third case showed that it is possible to generate a KP-statement within two meetings, the fourth case showed that it is possible to generate a KP-statement based on one meeting of one hour. Moreover, based on our experiences, simplification within this specific context (strong focus on billable time) is not only possible, but also a necessary precondition. However, it has to be noted that the KP-enhancer was developed as a participative method that involves people in order to create commitment. Although the KP-statement within Case 4 convinced the board of directors, the extent to which the process of formulating the KP-statement created commitment among the rest of the employees remains to be seen. Besides, considering the major alterations, the motivation of applying the method can be questioned. Was it really to create awareness and commitment, or was it to develop a statement that would convince the board of directors? With regard to the latter it certainly proved to be successful.

In Case 3, diagnosing KP in terms of incremental and radical innovation did not add any value. In Case 4, the concepts fitted the already existing conviction that the firm had to renew its processes (e.g. electronic filing) in order not to lose the connection with the developments in the market. The fact that item CO4 (The developments in the market force us to renew) generated the highest average score (4.02) was interpreted by the Manager K&I as a confirmation of this conviction. Therefore, the outcome of the survey with regard to incremental and radical innovation was used to stress the importance of improving the learning functions that contribute to renewal.

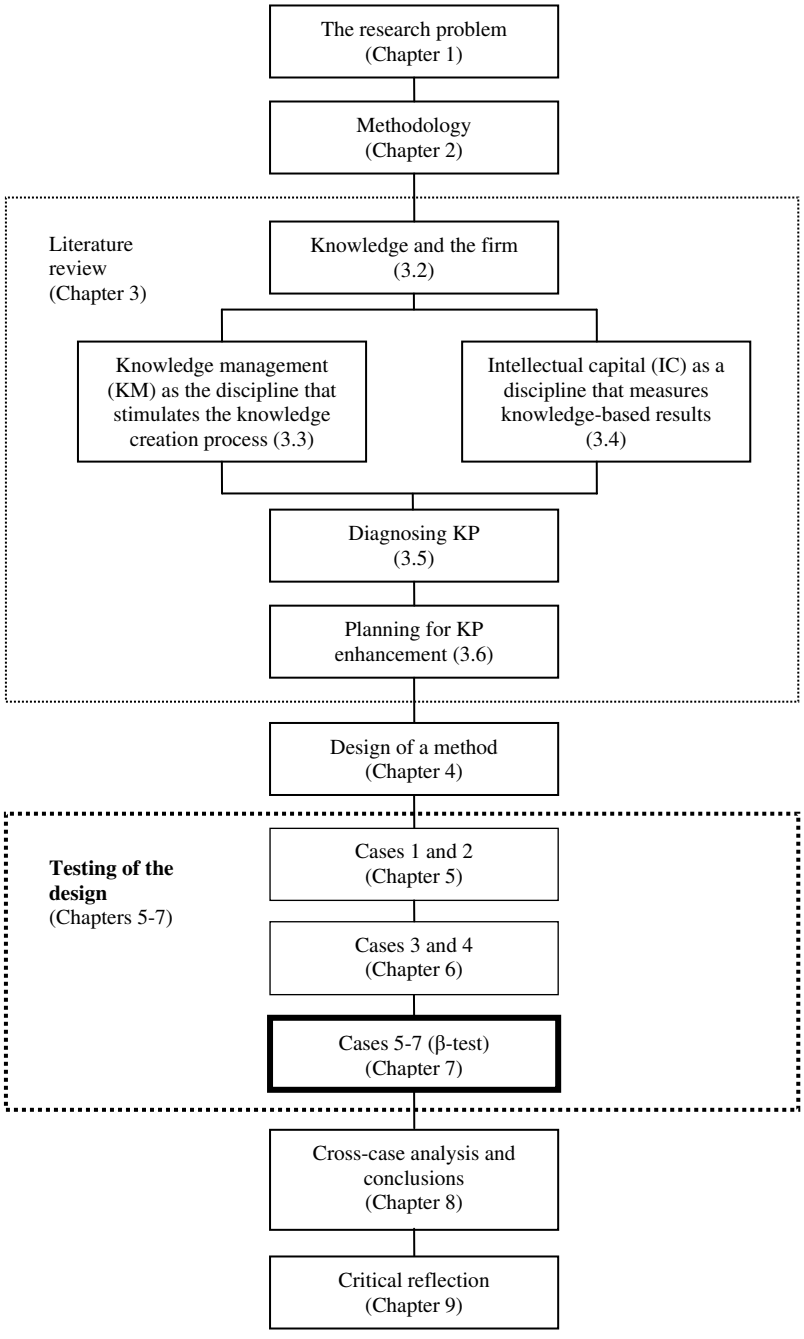
Context of application

Compared to the first two iterations, these two cases were relatively large firms. Particularly in Case 4 it can be questioned how to relate the outcome of the survey to the different sections within the firm. As the scope of the KM function within this firm was organization wide (not only within, but also across sections), it was self-evident that the method would be applied organization wide. However, when applying the method in firms with this size, it seems sensible to make a distinction within the outcome of the questionnaire between different departments or function groups. This will improve the possibility of relating the outcome to the different types of respondents and subsequently will make the outcome more relevant.
Another issue with regard to the applicability of the method within Case 4, was the culture of the organization. Considering the major alterations that had to be made, it can be questioned whether the KP-enhancer fits a context with a strong focus on billable hours. Furthermore, the participative approach of the method requires a participative organizational culture. Therefore, it should be able to involve employees in the application of the method.
Finally, the experiences in Case 3 uncovered that application of the method does not only require management support, but also a dedicated problem owner. Considering the other cases (Case 1, 2 and 4) it could be argued that the method is preferably applied within the context of an existing KM initiative.

Conclusions

Based on these two cases, it seems we can draw the following conclusions:

1. Important objective for applying the KP-enhancer was the need to translate the organizational strategy into consequences for knowledge management.
2. The method performs better within the context of an existing (knowledge management) initiative.
3. Management support is not a sufficient precondition for successful application of the method.
4. Increased awareness about the importance of knowledge and KP has been the main result of applying the method within these cases.
5. The effectiveness of the questionnaire with regard to incremental and radical innovation is diffuse and needs to be further explored.
6. The less theoretical and more participative approach of the first workshop generates more involvement of the participants.
7. Different elements of the method contributed to raising awareness among different groups of employees.
8. Simplification of the process of formulating a KP-statement appeared to be possible.
9. Holding on to the design of the method is not a necessary condition for formulating a KP-statement.
10. Formulating a KP-statement does not necessarily require a participative approach.
11. The KP-statement can be an effective instrument to communicate about KM.
12. When applying the method in larger firms (>250), distinction should be made between different departments or function groups when reporting the outcome.



Sub questions
to be answered:

1. How can we design and test a management method?

2. What is meant by knowledge productivity (KP)?

3. How can we diagnose knowledge productivity?

4. How can we plan KP enhancement?

5. What does the initial design of the management method look like?

6. What can we learn from testing the method in practice?

Main Question:
How can organizations diagnose KP and plan for enhancement?

7 β-testing the method: Case 5, 6 and 7

7.1 Introduction

When Windows XP was launched in 2001, it had only been tested by a limited number of companies and end users. When Windows Vista was launched in 2007, it had been tested by more than three million potential users between January 2005 and February 2006. This test resulted in more than a billion responses, which helped Microsoft to improve the final product before it was launched. This test has probably been the most extensive test of any software product ever. This test, according to software experts, resulted in a more reliable (safer, stable) final product.
One of the main success factors of β-testing software products is the power of large quantities. The more a product is tested, the more is learned about its functioning and the elements that have to be improved. As a result the final product will be more reliable and stable. Although it is impossible to test a management method like the KP-enhancer as many times as a software product like Vista, the concept of β-testing seems to be useful within the context of design-based research (DBR).
Though β-testing is most widely used in relationship to software development, more and more it is also used to refer to the development of other products, services and even brand-names[22]. This chapter investigates the applicability of β-testing within the context of DBR. First we elaborate on the attributes of β-testing software products. The next section explores the idea of β-testing solution concepts. Then these ideas are translated into a method for β-testing. The last part of this chapter presents the results of β-testing the KP-enhancer in three case studies.

7.2 β-testing software products

According to the Longman Dictionary, testing (put something to the test) means "to find out the qualities of something by using it in certain conditions". The preposition *beta* adds to this that the test is performed by a potential user (of the "something" part in the definition) and the role of the developer is reduced to a distant observer.
The concept of *β-testing* refers to the second stage in a development cycle. The first phase of the development cycle is usually referred to as the *alpha* (α) stage, named after the first letter in the Greek alphabet. The second phase is named *beta* (β), the second letter in the Greek alphabet. As β-testing is mainly associated with, and as β-testing has become a general accepted practice in software development processes[23], this section first investigates the concept of β-testing in relationship to software development.

The starting point of the concept is that, within a (software) product development process, distinction can be made between alpha and β-testing. Whereas alpha testing is the testing of

[22] We found articles in professional magazines in which the concept of beta testing was used with regard to the testing of brand names, training programs and apparel manufacturing. (Bonner, 1997; R.G. Cook, Belliveau, & VonSeggern, 2001; Katt, 2002)
[23] According to Wikipedia, "the term beta test applied to software follows from an early IBM hardware development convention dating back to punched card tabulating and sorting machines. Hardware first went through an alpha test for preliminary functionality and manufacturing feasibility. Then a beta test to verify that it actually correctly performed the functions it was supposed to, and then a c test to verify safety. With the advent of programmable computers and the first sharable software programs, IBM used the same terminology for testing software. Beta tests were conducted by people or groups other than the developers." Later this terminology was adopted by others and referred to the final testing period for new computer software before it was released on the market. (*Software testing*, 2006)

the product by the developer of the product, β-testing is the testing of a product by a potential user. Whereas an alpha test is most commonly conducted in an artificial or laboratory environment, a β-test is most commonly conducted in the supposed context of application or real life environment. Preferably in as many different environments and under as many different circumstances as possible.
In a software development process that makes distinction between an alpha and beta stage, alpha testing is employed as a form of internal acceptance testing and as a preparation for β-testing. The transition from the alpha to the beta stage takes place when "the developers announce a feature freeze on the product, indicating that no more feature requirements will be accepted for this version of the product" (*Software testing*, 2006). In the remainder of the process, the focus will be on issues like stability, performance, compatibility and documentation. Only software issues, bugs and unimplemented features will be addressed.

The first and main reason for β-testing a (software) product is to generate valuable and detailed feedback about the functioning of the product. This feedback helps to further improve the product before it goes public and before it is sold commercially. Extended testing of usability, stability and reliability makes the product more robust and reduces the risk of failure. In this sense, β-testing can be seen as just another phase in the development cycle. Second motive for β-testing is that it provides access to the context of application and the perspective of the intended user. No matter how much a developer tries to simulate the many different circumstances of the context of application, nothing compares to testing the product in the real world. Therefore, the second reason for β-testing is that it broadens the view of the developer. Within the software development process, the narrow view within the alpha testing stage is most commonly referred to as internal view or white box testing. The broader view of β-testing is referred to as external view or black box testing. Cost effectiveness is the third motive for β-testing. Especially large scale open β-tests generate much more relevant information than a software development team could ever come up with. In this sense, β-testing is a temporary extension of the development team. In the case of VISTA, the development team was extended with three million people and generated more than a billion responses. As distribution of the software through the internet is free and the testers do not have to be paid, the costs are very limited. Sometimes testers even have to pay for a beta version. Fourth main reason for β-testing is the acknowledgement of the marketing value. The news that a software product is in the stage of β-testing implies that it will be for sale shortly. Moreover, software developers found out that testers will often purchase the product after testing is completed. β-testing seems to create positive experiences and commitment to the product. Therefore, sales benefit from extensive β-testing.

As soon as the developers decide to shift from the alpha to the beta stage, a call for β-testers is published in the professional media or on the website of the software developer. A distinction can be made between closed and open betas. The former implies limited distribution among (professional) users, the latter implies unlimited distribution, usually through portals (e.g. www.beta-watcher.com and www.betabase.com) or specific beta sections of websites of software companies.
As the main aim of β-testing is to generate feedback, record keeping and reporting are very important. β-testers are asked to report about errors and their circumstances. A distinction can be made between faults and failures. The former refers to programming errors. In the case of the latter, the software does not do what the user expects. This feedback is collected and analyzed by the software developer, and gives direction to further improvements of the product and new releases. For example, the β-test of Windows Vista resulted in 89 new releases (Community Technology Previews or CTP's), largely based on feedback from β-testers, before it was decided to go public.

As we have seen, β-testing has become an important part in the software development cycle, with major (financial) benefits for the software development companies. These benefits seem to be in contrast with the lack of financial rewards for β-testers. Story goes that Microsoft honored a man who found 186 bugs in the product by thanking him at a luncheon (Ekhaml & Ekhaml, 1998). However, the developers of popular software products can count on overwhelming responses to their calls for β-testers. What then motivates β-testers to contribute to the development of a software product?
According to the β-test portals and the software development companies themselves (e.g www.cambridgesoft.com), the benefits for β-testers are manifold. The main benefits however are expected to be in the excitement of being ahead of others (Grossbauer, 1998; Noack, 2000), the process of β-testing itself (detecting bugs), influencing the development process, and finally to find out which software is worth buying. A survey of www.betasphere.com among one thousand β-testers about their needs, motivation and attitudes, more or less seemed to confirm these arguments. According to this survey, the number one reason why people seem to participate in a β-test is to influence the features and development of new products (86%). Finding a better way of doing things is important to 77%. Learning more about the product or technology is important to 75%. Furthermore, 65% of the β-testers rely on beta program participation to consider the purchase of a new product[24].
The benefits of β-testing software seem to outweigh the downside of β-testing. The main elements of this downside are that β-testing is time consuming (and thus expensive for the β-tester), the poor quality of the beta products, which can cause serious technical problems, and the fact that the product expires at a certain date (and are sometimes very hard to remove from the system). Software development companies are very clear about this downside and explicitly warn β-testers beforehand: "We pretty much guarantee that you will receive buggy software. These bugs may crash your computer (or worse)." (www.cambridgesoft.com) and: "A tester should expect to experience bugs, extremely slow performance, bugs, lag, bugs, incomplete and missing features, bugs, lots of downtime, and bugs" (www.atbeta.com).

Within β-testing of software products we can see several trends. The first trend is that β-tests are getting longer, less restricted and more common (*A long winding road out of beta*, 2005). More and more, beta versions of software products are taking on a life of their own. Several beta-versions of software products are known for being widely used for a long period. Examples in this respect are Gmail, Google (Catalogs and News), Netscape Communicator and Flickr. This development could indicate a trend towards a situation in which software is meant to stay in beta state. This state of "perpetual betas" (*Software testing*, 2006) seems to acknowledge that the line between beta versions and final or "gold" versions is blurring. The decision to shift from the beta stage to the final release version is an artificial one. "Code complete" does not necessarily mean that the development process is completed. It is a commercial decision to bring the software to the market. In a sense, the final product does not exist. It is just a convention. As Larry Page, co-founder of Google, argues, the decision to end the beta-version is an arbitrary decision, therefore beta is a messaging and branding thing (*A long winding road out of beta*, 2005). Other examples of fading lines between beta and final versions are the increasing number of "patches" and software updates. These patches and updates are the result of ongoing in-the-field software development. An example is the development process of LINUX. In a sense, the continuous development of LINUX by the actual users in the field is the *raison d'être* of this product. The line between development and usage has completely faded.

[24] Data from secondary sources available at www.findarticles.com (Beta testing made better) and www.prweb.com (Betasphere survey sheds light on opinions and experiences of beta testers).

Until this line has completely faded, β-testing software products has become serious business. More and more developers focus on testing software products of others. These testing companies are specialized in managing customer feedback and call themselves "the voice of the customer" (e.g. http://www.voc-online.com). Their mission is "to enable our customers to obtain comprehensive feedback for their products in order to make critical go/no-go decisions." This very well states the essence of the concept of β-testing.

7.3 β-testing solution concepts

β-testing is an effective way of testing hardware and software products. Using this concept within the context of DBR, would imply testing design knowledge or solution concepts. As the aim of the Design Sciences is to develop knowledge for the professional in the field, β-testing would mean testing this knowledge by the professional in the field.

In his 1994 article, Van Aken already refers to the idea of β-testing, when he argues: "ideally, after a series of case studies, the method should be frozen and tested until the understanding of the method starts to converge" (Van Aken, 1994, p.24, translation CS). Later he explicitly labels this phase as "β-testing" when he argues "after testing and refining of the rules by the researchers themselves, one should have a phase of 'β-testing', i.e. testing of the rules by third parties" (Van Aken, 2001, p.7). In addition, "invaluable insight can be gained by subsequent 'β-testing' …, i.e. translating the rule to other contexts, having third parties use it , assess its effectiveness and make final improvements" (Van Aken, 2004a, p.232). So, analogue to β-testing in the software development cycle the aim of β-testing solution concepts is to make final improvements before they can be released.
Within the methodological literature, a lot has been written about testing solution concepts, however, hardly anything has been said about β-testing. Although Van Aken makes explicit distinction between alpha and β-testing, he does not extensively elaborate on the respective characteristics. Both types of tests serve the same purpose. The alpha and β-testing of solution concepts can offer further insight into the intended as well as the unintended consequences of its application, in its indications and contra indications, and in the scope of its possible application, its application domain. Furthermore, aim of alpha and β-testing is to collect supporting evidence in order to come to a point of "theoretical saturation" (Van Aken, 2005).
The main aim of testing design knowledge is justification. Justification of solution concepts is obtained through testing in its intended contexts. First, during the development of the solution concept by the researchers themselves, and subsequently by third parties to obtain more objective evidence (Van Aken, 2005). So, alpha and β-testing serve the same cause, but distinguish themselves by the person who performs the test and the degree of objectivity of the outcome. "Third party testing counteracts the 'unrecognized defenses' of the researchers (Argyris, 1996), which may blind them to flaws or limitations of their rules" (Van Aken, 2005). In this sense, the aim of β-testing is to rule out the rival explanation of *investigator bias* (Yin, 2003) or the experimenter effect ("it is just me"). Is it the method itself or the unique combination of knowledge, experience and strong determination of the deviser that makes the method succeed? β-testing investigates the effectiveness of the product (i.e. KP-enhancer) when separated from its developer.
According to Van Aken (2005), β-testing can be seen as a kind of replication research. Replication within multiple case studies refers to the idea of obtaining more robust evidence through multiple experiments (Yin, 2003) or repeating a finished research by a third party (Tsang & Kwan, 1999). In a sense, this kind of research serves the same aim (obtaining more robust and objective evidence) as β-testing. However, fundamental difference is that these replications are seen as independent research projects, whereas β-testing should be seen as a replication of the original (alpha) test within the context of the same research. Whereas the

aim of β-testing is to replicate under different circumstances, the aim of replication research often is to simulate the original circumstances as much as possible (Tsang & Kwan, 1999). As β-testing is a distinguishing stage within a research project, it might be closer related to the concept of "internal replication" (Swanborn, 1981).

Important aspect of β-testing is that it takes place in practice in order to enlarge the scope of the research. This reasoning is closely related to the concept of *contextualization* within the new production of knowledge (Gibbons et al., 1994; Nowotny, Scott, & Gibbons, 2004). The main aim of contextualization is to make the context speak back, which in a sense also expresses the main aim of DBR. Science has always spoken to society, but now society speaks back to science. According to Van Aken (2001) the explicit alpha and β-testing of research recommendations is a key difference between mode 1 and mode 2 knowledge production. Whereas mode 1 knowledge production is characterized by description-driven research and ends with the formulation of management implications, mode 2 adds another phase in which these recommendations are tested in practice. This testing in practice contributes to the enlargement of the scope and enrichment of the potential of the research (Nowotny et al., 2004). β-testing seems to intensify the idea of contextualization as it enlarges the scope and improves the ability of society to speak back to science.

Van Aken (2005) also compares β-testing to evaluation research of social programs. However, fundamental difference between evaluation research and β-testing is that the former is retrospective and the latter is not. According to Swanborn, evaluation research typically takes place during the last (evaluation) stage of practically oriented research. However, more and more evaluation research also takes place during the empirical field research (Swanborn, 1981). β-testing can be positioned in between the field research and the evaluation stage. It is the final stage of the empirical field research, however, it is not the final evaluation of the research.

Another concept that is closely related to β-testing is the concept of *action research*. Action research refers to research of which the "output results from *an involvement with members of an organization over a matter which is of genuine concern to them*" (Eden & Huxham, 1996, p. 75, italic from original). This seems to be applicable to β-testing, however, β-testing is more than just involvement of the members of an organization. It is not only about testing *with*, but also about testing *by* people in the field. Otherwise there would be no distinction between alpha and β-testing. Whereas the concept of action research in particular refers to the researcher acting on or in the social system (Lewin, 1946; Susman & Evered, 1978), the concept of β-testing adds an extra dimension, i.e. the persons involved in the research. The same goes for *participative research* or *participatory action research*. Again the emphasis is on doing research in collaboration with people in the field. β-testing is a type of (participatory) action research, in which the primacy of the testing within a research (temporary) shifts from researcher to the people in the social system under investigation.

In a sense, β-testing is a compromise between the two roles of field researchers. According to Swanborn (1981), distinction can be made between "public" and "under cover" roles of field researchers. In the former, the researcher and the aims of the research are communicated to anyone involved. In the latter, they are not in order not to influence the behavior of the people observed. B-testing is something in between, as the objectives of the test are made public, although the researcher stays under cover.

Lessons from testing a Risk Diagnose Method

In earlier DBR projects, hardly any reference is made to β-testing methodology (Andriessen, 2003; Rozemeijer, 2000; Van Raaij, 2001). The exception is Halman's (1994) doctoral research in which the final three (of seven) case studies were deliberately performed by third

parties. The aim of these final case studies was to test the scope, usability and transferability of his Risk Diagnose Method (RDM).
Although Halman (1994) does not refer to β-testing as such, he makes a distinction between an initial phase of "progressive testing" (voortgaande toetsing) and a subsequent phase in which verification is more important than further development. The aim of the case studies in this phase was to test the applicability of the method outside the context in which it had been developed. Having the method tested by third parties would also give insight in the extend of transferability of the method. Testing transferability means testing the extent to which the method, based on the available guideline and the support material, can be applied by third parties. Important aspects with respect to transferability of the method are the aim and functioning of the method, knowledge about the main concepts related to the method, required degree of documentation and the risks of failure. In order to test the transferability, the method was applied three times by third parties and the support material was evaluated by a review panel.
The three β-tests were performed by master students as a subject for a final thesis. After the initial contacts had been made with the three companies, potential testers went through a formal application process in order to get the best fit between the testers and the culture of the respective firms. Potential testers (students) had to qualify by passing several subjects in their studies (project management, consultancy processes, management of technical innovation). After being selected, they received an extra literature assignment and were tested with regard to their knowledge about the main concepts of the method. The students had to pass this test before starting with the application of the method.
The β-test of the method was divided into three stages. In phase one the students got acquainted with the firm, analyzed the current product innovation processes, and formulated a problem statement. In the next phase, the students applied the Risk Diagnose Method in a carefully selected product innovation project. The application was supported by a guideline and other support material. In the third and last phase the method was evaluated and the testers investigated the possibilities to secure the method as a standard way of working. Each phase was concluded with a presentation and a written report. During the tests, the students were asked to keep notes about the limitations of the method. In their final reports they were asked to come up with suggestions for improvement. These suggestions resulted in several further improvements of the method.
In all three cases the method was applied successfully. Based on the results, with respect to the precautionary measures (careful selection of testers, knowledge about main concepts, time to settle in the firm), Halman concludes that his method appeared to be transferable to third parties. However, preconditions for successful application were:

1. state-of-the-art knowledge about key concepts of the method,
2. the ability to act as process manager,
3. and profound knowledge about the method.

The main message with regard to β-testing was "to take sufficient precautionary measures in order to secure the intended result" (Halman, 1994, p.162).

Lessons from 21 β-test programs

A source that is often referred to is Dolan and Matthews' (1993) analysis of 21 β-tests of software products. Based on their analysis they present a method for β-testing. Interesting is that they translate the experiences with software development to a method for product development in general. As the aim of this chapter is to translate the concept of β-testing to a

method for testing solution concepts, the method presented by Dolan and Matthews could be helpful. Therefore this section explores their findings.
According to Dolan and Matthews "β-testing is one of a variety of procedures by which a firm has potential users 'try out' a product and report on their experience" (Dolan & Matthews, 1993, p.318). Based on an examination of 21 β-test programs, they make distinction between three classes of purposes for β-testing.

1. product function;
2. product support/marketing mix;
3. sales promotion.

Whereas firms do not pursue all of these purposes, the testing of the basic functioning of the product (number one above) seems to be the core purpose of β-testing. For this purpose, the idea is simply "to see if the product does what it is designed to do" (p.320). In their examination Dolan and Matthews also found that in many cases the test goes beyond the product itself, which means that it also focuses on supporting elements like training, documentation, marketing, pricing, etc. This expansion of beta purpose beyond the core purpose of testing the product functioning, "reflects the fact that the customer's utility is determined by more than the core product alone" (p.321). A distinction between the first and second purpose is that while the product basic functioning can also be achieved through large scale alpha testing, the test of supporting materials requires testing by potential users themselves. Finally, the third class of testing purposes aims at building closer relationships with key customers and to legitimize the product. Successful usage of the product by a prestigious firm (collecting testimonials and success stories) reduces other potential customers' uncertainty about the product. So, while the central aim of β-testing is to test the basic functioning of the product functioning, "limiting one's objective to this purpose leaves a good deal of the potential untapped" (p.322).
Based on a smaller sample of four companies, Dolan and Matthews also examined the process of β-testing. Based on this examination they formulate five guidelines for effective beta program management:

1. Product design should be frozen prior to beta. β-testing should be done only after a design is agreed upon and detailed alpha testing complete, as a β-test is seen as a commitment to the market place.
2. Effective beta programs recognize the full set of benefits from β-testing (see purposes above). The purpose of the β-test should be clear beforehand, does not necessarily have to be the same for all test sites, and should be communicated to all involved in the test.
3. Maximum utility of betas is derived from recognizing the segmentation of the market and devising ways of making the beta a close approximation to real world. As the market is usually not homogeneous, the β-test should be designed in such a way that it reflects the heterogeneity of the intended context of application.
4. As a general control rule, grow the number of beta sites over time; begin with sophisticated customers with good relations with the firm. Usually β-tests begin with a small number of testers. This number increases over time as the uncertainty of using the product has become a good practice and found to be effective in a number of situations.
5. Monitor beta product performance on a regular basis. Systematic and frequent communication with the test site is necessary in order to receive the feedback needed to strengthen the product.

In their conclusion, Dolan and Matthews stress that β-testing is most valuable, when the product concerned is complex, the potential applications are not fully understood and the users are heterogeneous. As this is inherent to the nature of solution concepts, β-testing is a valuable element in the development process.

Experiences from consultancy

Van Aken (2004a) points to the fact that "much material is already available from some form of testing, since several top academic researchers also have consultancy practices. These practices are, in essence, the translation of their research results to other contexts and both the successes, and especially the less than successful applications, should provide much insight" (p.232). However, this material is not really the result of β-testing, as it is not performed by third parties, which, as we have seen, is an essential part of β-testing.

Within the context of this research project, an interesting and inspiring example of a researcher learning from (consultancy) practice comes from Robert Kaplan (1998), who wrote down the process of developing two new management accounting approaches – *activity based costing* and the *balanced scorecard*. This way of doing research, which is referred to as "innovation action research", is summarized as follows:

> In this mode, we initially documented a major limitation in contemporary practice, then identified a new concept to overcome this limitation, and continued to apply and improve the concept through publication, teaching, and active intervention in companies. In this innovation action research cycle, the researcher enhances the underlying theory and, in the process, also becomes a skilled implementer of the new concept. (Kaplan, 1998, p.89)

Although Kaplan does not refer to the concept of β-testing, he acknowledges the invaluable insights they received from testing their original concept of the balanced scorecard by two practitioners in the field. Whereas the original concept (as described in their initial article) confined the method to a measurement system, these practitioners applied it as a central management system, translating the mission into strategic objectives and operational measures. Implicitly, Kaplan seems to make a distinction between the initial tests by the originator of the method and the subsequent tests by practitioners in the field. Curiously enough, in the same article, Kaplan stresses the importance of engaging the originating scholars in the implementation process, because

> If the originating scholars are not actively engaged in the implementation process, they run the risk of having their ideas trivialized or implemented badly by others.… The originating scholars can maintain the conceptual rigor of their ideas so that implementations under their supervision will represent more valid tests of the concepts applicability. (Kaplan, 1998, p.104)

This contradiction illustrates the rigor-relevance discussion within management research: how to maintain rigor when the conditions within a research change? How to produce relevant knowledge without losing scientific rigor? β-testing seems to be a useful concept to contribute to reconciling the rigor-relevance dilemma in design-based research. Therefore, in the next section we present a methodology for β-testing solution concepts.

7.4 Five rules for β-testing solution concepts

The concept of β-testing seems to fit design-based research. After successful application of the concept to hardware and software development, the next step is to apply the concept of β-testing to knowledge development. β-testing solution concepts is about systematically

involving the potential users of solution concepts in the development process. β-testing follows alpha testing and refers to (a series) of tests which are performed in the context of application and by potential users of the product. So, β-testing does not only differ by place (context), but also by the person performing the test.
The main contribution of β-testing is that it adds to justifying the solution concept by generating additional evidence from a more objective perspective. This evidence about the effectiveness of the solution concept, combined with the results from the alpha tests (performed by the researcher/developer), increases the reliability of the outcome of the research. In addition, having the solution concept tested by potential users provides the opportunity to specifically test the effectiveness of the supporting material and the degree of transferability of the solution concept. Finally, successful applications result in success stories and contribute to the credibility of the method.

The main message of Dolan and Matthews (1993) is that we should recognize the full set of benefits of, and be clear about the purpose of the β-test. The main message of Halman (1994) is that we should take the necessary precautionary measures in order to secure the intended result. Based on these findings, a set of rules was developed for β-testing solution concepts within the context of this research.

1. Purpose: recognize the full set of benefits

As we have seen above, Dolan and Matthews (1993) recognized three different layers in β-testing purposes. The first and core function aimed at product functioning, the second on product support and the third on sales promotion.

2. Test sites: respect heterogeneity of the market

This second rule for β-testing refers to the diversity of both firms and people applying the method. Before releasing the final product it is important to test it under different circumstances in order to explore the scope of application. This implies that the test sites can go beyond the intended context of application.

3. Preparation: take necessary precautionary measures

This third rule for β-testing is about transfer of knowledge. As we have seen, taking the necessary precautionary measures secures the success of the application of the method. These measures aim at preparing the β-testers to apply the method.

4. Execution: monitor execution on a regular basis

The aim of this design rule for β-tests is twofold. First, close monitoring of the execution of the method reduces the risk of failure. Second, frequent communication with the β-testers improves the quantity and quality of the feedback.

5. Reflection: let the context speak back to you

In terms of contextualization, β-testing is the ultimate way of generating feedback. However, generating valuable feedback cannot be taken for granted. Therefore, the fifth rule for β-testing aims at securing feedback from the test sites.

These five rules served as a starting point for β-testing the KP-enhancer. The next section elaborates on these tests.

7.5 β-testing the KP-enhancer

The β-tests of the KP-enhancer took place in three sites (Table 7.1). The first and second site were two different units within a single department of the Dutch Ministry of Justice. The third site was the Dutch subsidiary of an international pharmaceutical company. These tests took place in the period January-May 2007.

Table 7.1: Overview of β-test sites, period of testing and the main focus of the tests

Company	*Description*	*Employees*	*Period*	*Main focus of tests*
Health bv[25]	Dutch subsidiary of pharmaceutical firm	400	January-April 2007	1. Functional requirements 2. Supporting material 3. Requirements person applying the method 4. Limiting conditions
CPB-NO	National Office of department of Dutch Ministry of Justice	154	January-May 2007	
CPB-RO	Regional Office of department of Dutch Ministry of Justice	156	January-April 2007	

This section elaborates on these three β-tests. However, before doing so, we will apply the five rules for β-testing solution concepts to the context of this research, briefly describe the alterations of the method based on the experiences in the preceding tests, and provide a broad overview of the guideline that was developed as supporting material for the β-tests

7.5.1 Methodology

These tests are based on the five rules for β-testing, which were suggested above. This section translates these rules to β-testing the KP-enhancer

1. Purpose: recognize the full set of benefits

Based on the suggestion that β-testing programs should recognize the full set of benefits, β-testing within the context of this research aims at different layers (objectives) simultaneously. However, the main focus will be on product function and product support.
The first layer (method functioning) aims at further testing the functional requirements of the method. Central question at this level is "does the method do, what it is supposed to do?". Reference point for β-testing the functioning of the method are the functional requirements as described in the design of the method. This part of the testing should be seen as an extension of the previous iterations (alpha tests). The second layer aims at testing transferability and support material. This layer especially refers to the operational requirements of the method and the aim of this research to develop transferable design knowledge. Important element of investigation is the perception of the β-tester with regard to the ease-of-use of the method. Is the method practical and user friendly? Is the method easy to understand? Is the method easy to apply? The third layer aims at generating testimonials. Successful application will not only add to theoretical validity, but also to the credibility of the solution concept. To what extent has the application of the method been successful according to the firms?

2. Test sites: respect heterogeneity of the market

The selection of the test sites is based on the suggestion to explore the boundaries of the application domain of the method and the suggestion to test the method under different

[25] Fictitious name.

circumstances. Whereas the focus of the alpha tests was on mid-sized professional service firms, the β-tests will be performed in two units of a department of the Dutch Ministry of Justice and the Dutch subsidiary of one of the largest pharmaceutical firms in the world.

3. Preparation: take necessary precautionary measures

The main aim of this rule is to prepare the β-testers for their task. This means that knowledge about the method has to be transferred from the alpha tester to the β-testers. Important element of knowledge transfer within this study was a guideline of the method (see below). However, acknowledging that a guideline can only partly frame the experiences with the method, a workshop was organized to "demonstrate" the method and to enrich the information in the guideline. Additional, the β-testers received a professional print of the board game, and a template of the PowerPoint presentations for the workshops.

4. Execution: monitor execution on a regular basis

The starting point of β-testing is that the β-testers apply the method themselves. In order to reduce the risk of failure and in order to generate high quality feedback, we established a structured mechanism of feedback. This means that the β-testers were asked to submit a written report after each phase of the method. After the first phase they were asked to give feedback about the problem statement. After the second phase they were asked to report the shared findings about the current situation (conclusions about possibilities for improvement). Finally, after the third phase they were asked to submit the finalized KP-statement. Submitting these reports would help the β-testers "to keep the eye on the ball", as it forced them to formulate the intended products. It would help to assess the extend to which the method was being applied according to plan and interfere if necessary. Finally, systematic monitoring would help to reconstruct the process and assess its effectiveness afterwards. In addition to this structured feedback mechanism, the β-testers could, at any point ask the researcher for additional support.

5. Reflection: let the context speak back to you

The main objective of β-testing is to generate feedback about the effectiveness of the method, acquire further insight into its intended as well as unintended consequences, its indications and contra indications, and the scope of its possible application. As we have seen, β-testing provides the opportunity to test the transferability of the method to third parties. Based on the purposes of the β-test (rule one above) within this study, the β-testers were asked beforehand to focus on the following questions during the application of the method.

1. Does the method do what it is supposed to do?
2. Does the supporting material (guideline, game) meet the needs of the user?
3. What knowledge and skills are required in order to be able to apply this method?
4. What are the preconditions for successful application?

The β-testers were asked to record their experiences in a logbook, which would improve the quality of the feedback and help to reconstruct events afterwards. After completing the method, the effectiveness was evaluated. This evaluation was a combination of interviews with the β-testers, the observations of the researcher and interviews with other people involved in the companies. When interviewing the other people involved, main point of inquiry were the expectations and results, the design of the method, and the process of applying the method.

7.5.2 Improvements of the method

Based on the statistical analysis after the previous iterations, we decided to rephrase a number of items again, in order to try to improve the reliability of the questionnaire. When rephrasing, special attention was paid to learning functions six and seven (peace and stability and creative turmoil), to reversed questions, and to those items with overall high levels of item-non-response.

Second, as the questions about incremental and radical innovation did not work out well in the previous iterations, both in practice and statistically, we decided to renew the items related to innovation. The new items related to incremental and radical innovation are based on the idea that incremental innovations require *adaptive* employees, and radical innovations require *innovative* employees (Walz & Bertels, 1995). Respondents are asked to finish ten sentences by choosing between two options.

1. In order to be successful …
   a. we should better exploit existing solutions
   b. we should consider new solutions
2. Existing structures and procedures …
   a. should be improved
   b. should be replaced
3. We should search for opportunities in …
   a. existing services and/or existing markets
   b. new services and/or new markets
4. Our clients want …
   a. predictable solutions
   b. unexpected solutions
5. In the choices we make …
   a. we should continue building on proven successes
   b. we should radically break with the past
6. I especially find satisfaction in …
   a. making a success of something that already exists
   b. inventing something completely new
7. I like to …
   a. solve a problem as soon as possible
   b. play with a problem
8. I do not like …
   a. to solve vague problems
   b. to work out something into detail
9. Rules are there …
   a. to live up to
   b. to deviate from
10. Change is …
    a. a necessary evil
    b. a challenge

The first option refers to adaptive employees, the second option refers to innovative employees. Adaptive employees are needed to generate gradual improvements of current processes, products and services, innovative employees are needed to generate radical change and deviations from current practice. The outcome of the questionnaire serves as an innovation profile of the organization, which indicates the organizational capability of generating incremental and radical innovation.

7.5.3 Guideline of the method

Based on the initial design of the method, and the experiences in the previous four iterations, the method was described in a guideline. The main aim of this guideline is to make the method transferable to others. As complete transfer of knowledge about the method and its application is not possible, users of the method need some guidance when applying the method. Inherent to solution concepts, the guideline has to be interpreted by the professional in the field, and translated to the specific context of application.

After introducing the main concepts related to the KP-enhancer, the guideline describes the what, why and how of the method. Next it gives a step-by-step description of the method.

Phase 1: Problem definition

The aim of this phase is to come to an agreement about the problem to be solved. After the scope has been determined, the problem is formulated with, and validated by the client.

Step 1: Determine the scope

Before investigating the problem at hand, it should be perfectly clear what the scope of the project (i.e. application of the KP-enhancer) is. This can be the organization as a whole, but also a business unit or a department.

Step 2: What is the problem at hand?

The next step is to determine what problem has to be solved with the KP-enhancer. In a formal conversation between the researcher and the client, the objective, expectations and intended results are discussed. The main question to be answered is whether the problem at hand fits into the class of problems for which the method is designed.

Step 3: Validate the problem statement

In this step, the facilitator writes down the problem to be solved (based on the interview in step 2) and asks the client to approve the report. The problem statement as formulated in this document should fit in the class of problems as formulated in the design of the method and will be the reference point for assessing the effectiveness of the method after completion.

Phase 2: Diagnosing KP

The aim of this phase is to analyze the process of knowledge creation and come to a set of shared findings and areas (learning functions) for improvement.

Step 4: Questionnaire

The first step within this phase is to assess the quality of the process of knowledge creation. All employees, within the scope of the project, are asked to participate in an electronic survey. The survey consists of about eighty items. The lead-time of the survey is two weeks.

Step 5: Processing data from questionnaire

After the deadline has expired, the data of the questionnaire are processed into a format which can be used in the following workshop. The initial processing of the data is done by the researcher. The interpretation and preparation of the workshops is done by the β-testers.

Step 6: Collective interpretation of the data (Workshop 1)

The aim of this workshop is to introduce the concept of knowledge productivity to the participants of the workshop, to present the outcome of the questionnaire, and to collect shared findings about possibilities to improve the process of knowledge creation. The latter is facilitated by playing a board game. At the end of the workshop, participants are literally asked to put their cards on the learning functions that, according to them, have to be improved.

Phase 3: Formulating a KP-statement

The aim of the third phase is to translate the collective findings of the previous phase into a KP-statement. The KP-statement tells us which initiatives have to be put in place in order to improve the current situation from a knowledge perspective.

Step 7: Report findings Workshop 1 and prepare Workshop 2

Within this step, in between the two workshops, the findings of the first workshop are reported to the participants. In addition, the participants are asked to answer a series of questions, in order to enable the facilitator to formulate a draft knowledge strategy. Both, findings of the first workshop and the draft knowledge strategy, serve as a starting point for the second workshop.

Step 8: Formulating a KP-statement (Workshop 2)

The aim of this step is to collect all the information needed to formulate a KP-statement. This step is based on the Danish Guideline and consists of the formulation of a knowledge strategy, knowledge productivity challenges, knowledge management initiatives, and indicators that measure the progress of the initiatives.

Step 9: Validating the KP-statement

Finally, the outcome of the second workshop is put together in a KP-statement model. Again, the result is reported to, and validated by the participants of the workshop. Next it is presented to the client/management team.

The above description is a broad outline of the guideline. The actual guideline described the steps in much more detail. To prepare the β-testers, a special workshop was organized in which we presented the guideline and other supporting material.

7.6 β-test 1 and 2: Child Protection Board (CPB)

The CPB (Raad voor de Kinderbescherming) is a department of the Dutch Ministry of Justice, which is responsible for complying with the International Children's Rights Treaty (Internationale Verdrag inzake de Rechten van het Kind). As children have a vulnerable and dependant position, they require special care and protection. Evidently, the parents bear primary responsibility, however, if they do not (cannot) assume their responsibility, the authorities must provide support, and intervene if necessary. The CPB represents the rights of the child whose development and upbringing are under threat. The CPB creates conditions to remove or prevent this threat. The CPB makes inquiries, provides advice in legal proceedings and can suggest measures or sanctions[26]. The CPB is a second-line organization, and thus does not itself provide assistance to families and children. The CPB does ensure that, if

[26] About the Child Protection Board, organizational brochure, January 2004.

necessary, professional help is called in. The Board works in close cooperation with other agencies, like the Bureau Juvenile Care (Bureau Jeugdzorg), the Advice and Registration Point Child Battery (Advies- en Meldpunt Kindermishandeling), the Police and the Courts.
The CPB consists of a National Office (Landelijk Bureau) and 13 regional offices. In total, the board counts almost 2000 employees, of which 67% are female. Two thirds of the employees work in the primary process, as researchers, coordinators, team leaders, behavioral experts, legal experts, project employees, and prevention employees.[27] These professionals are mainly located in the Regional Offices. The main task of the National Office is to translate policy from the Ministry into practice for the regions and support the primary processes (legal affairs, communication, facilities, finance, ICT, KP&C (Quality, Planning and Control), personnel and development). The first β-test of the KP-enhancer took place in the National Office of the CPB. The second β-test took place in a Regional Office.
The CPB operates in a fast changing environment. The Board exists for more than one hundred years and has become an authority in the field of juvenile protection and juvenile crime. Knowledge is of eminent importance to the Board, and therefore knowledge management is acknowledged to be an important organizational function.[28] The past period, this acknowledgement has led to several knowledge management initiatives. The focus of these initiatives was on strengthening the internal and external knowledge function of the Board, through improvement of the knowledge processes.[29] Mid 2006, it was decided to continue the knowledge management initiatives "low profile".[30] Although the importance of KM was stressed, the knowledge management project should focus on a limited number of feasible initiatives. Since then, KM was restricted to a yellow pages (kenniskaarten) project. The application of the KP-enhancer should be seen within the context of this low profile knowledge management approach. As the main focus of knowledge management has been on knowledge itself (project yellow pages), applying the KP-enhancer was seen as a possibility to widen the scope to the abilities that are needed to create knowledge, like solving problems, reflection, etc.
Both β-tests within the CPB were conducted by José, who works as a learning adviser at the National Office, and was already familiar with (and enthusiastic about) the concepts of the *Corporate Curriculum* and *knowledge productivity*. The fact that the KP-enhancer was a further operationalization of these concepts, was an important reason for her to apply this method. In addition, the possibility to "jump on the train of this research" was perceived as an opportunity to give an impulse to the knowledge management project. Finally, if the KP-enhancer would appear to be successful, the intention was to extend the application to all other (regional) units within the CPB. The latter would be in line with the task of the National Office to support the regional offices.

7.6.1 β-test 1: National Office CPB (Case 5)

The first β-test took place in the National Office of the Child Protection Board, where the KP-enhancer was applied in the period January-May 2007. As stated above, the task of the National Office is to translate legislation into policy and support the regional practices. In total, the National Office counted 154 employees, of which the majority were policy employees (beleidsmedewerkers), personnel officers (P&O) and IT officers. Remaining tasks are related to functions like communication, facilities, legal affairs and finance. Representatives of all departments were involved in applying the method (total eight persons).

[27] Annual Report [Jaarbericht], 2004
[28] A Wise Board [Een Wijze Raad: visiedocument KM], date unknown
[29] Project proposal knowledge function [Projectvoorstel: Inrichting Kennisfunctie Raad], 2-2-2006
[30] Memo Activities Project Knowledge Function [Activiteiten Project Kennisfunctie 2006 e.v.], 26-6-2006

Phase 1: Problem definition

Within the project plan[31], reference is made to the overall objectives of knowledge management, i.e. the need to strengthen the knowledge function of the Board, in order to improve organizational excellence (excellente uitvoeringsorganisatie). Within this context, the main reason to apply the KP-enhancer was to give an impulse to the existing Quality and Knowledge project. Problem with this project was that, although several initiatives had been suggested and executed, it was not clear how these initiatives contributed to the overall goals of the organization. The scope of the initiatives was limited, and there seemed to be neither coherence nor synergy between the different initiatives. Therefore, the project plan stressed the need to broaden the scope of KM (from knowledge itself, to the ability to create knowledge) and create coherence and synergy between the different initiatives, through:

1. Insight in the current state of affairs with regard to the knowledge development function of the organization.
2. A coherent plan for improvement of the complete knowledge function of the organization.

Phase 2: Diagnosing KP

Due to security reasons, it was not possible to send invitations with a unique link to the questionnaire. Consequence was that respondents were invited by mail, but had to approach the questionnaire via intranet. Total response to the survey was 69% (n=107).
As intended, the first workshop was used to present the data (average scores per learning function, high and low scores per item, innovation profile), interpret them together and come to a set of shared findings, facilitated by the KP board game. At the end of the first workshop, the working group came to the following conclusions[32] with regard to the quality of the process of knowledge creation:

- The ability to reflect (professional reflection) and time to do so, needs to be enhanced (learning functions three and six).
- The ability to detect and reuse available knowledge needs to be improved (learning function one).
- Check and act: when starting a new project always check what already has been done (learning function one).

These findings were reported and served as a starting point for the second workshop mid-March, in which they were combined with the knowledge strategy and translated into challenges in the KP-Statement.

Phase 3: Formulating a KP-statement

As intended, this phase consisted of the formulation of a knowledge strategy, subsequent challenges and related initiatives. As the development of the knowledge strategy and the subsequent challenges took more time than expected, an extra workshop (March 27th) was needed to define initiatives and complete this phase. After completion of the method, the β-tester was asked to present the KP-statement (Table 7.2) in a management team meeting. However, due to illness, she was not able to present the outcome. Therefore, the KP-statement was discussed without her. This resulted in some unexpected (at least to the general manager) questions from the members of the management team about the validity of the method in

[31] Project plan Measuring and improving knowledge development [Meten en verbeteren kennisontwikkeling RvdK], 18-12-2006
[32] Report workshop 19th February 2007

general, and the KP-statement in particular. Although the initiatives that were suggested in the KP-statement were acknowledged to be the right initiatives, the management team questioned the left hand side of the KP-statement (knowledge strategy and challenges). They had difficulties with the formulation of the knowledge strategy (where did this strategic statement come from?), the selection of the challenges (why these, and not other challenges?), and the relationship between the outcome of the survey and the KP-statement (what happened to the outcome of the survey?). Although one of the members of the management team had participated in the process, and attended all workshops, she appeared to be unable to answer these questions.
Despite these (unanswered) questions, the management team decided to continue the process (KM-project), based on the KP-statement. However, the following meeting resulted in a more or less similar questioning of the meaning of the KP-statement. Therefore, it was decided to stop the process temporarily. As the β-tester was abroad for a few months now, it was decided to wait at least until she had returned, so that she could comment on the above questions.

Table 7.2: KP-statement CPB (National Office)

Knowledge strategy	Challenges	Actions	Indicators
The National Office of the CPB forms the bridge between policy (written by the Justice Department) and procedure in the province and therefore improves the equality of rights, uniformity in the execution of rules, and room for the realization of policy with regard to the protection of children… …by delivering specialized knowledge and support at operational tactical and strategic levels; focussed on the regional organizations, their management and society in the form of research, advice, standards and formats, instruments and audits, training programs and trajectories. In order to achieve this we need: • Knowledge and skills regarding content and process, the organisation and our clients • Knowledge of the political environment, chains of communication and clients • Motivated employees • An open culture where everyone's capacities are optimalised • A knowledge friendly infrastructure and supportive systems	1. Documenting and archiving of existing knowledge.	• digital and paper archives • library • evaluation forms • selections of best practices • FAQ lists and maintain them	• Progress • % of projects that are evaluated • The score on section … of the Corporate Curriculum survey • The score on section … of the MTO
	2. Improve and assure the accessibility of our knowledge.	• Determine knowledge domain of LB • Yellow pages policy department • Yellow pages all other departments • New intranet • Restructure and authorize folders/p-disk • Knowledge stewards for each domain • Introduction program for employees	• # of hits on yellow pages • Progress • The score on section … of the Corporate Curriculum survey • The score on section … of the MTO
	3. Maintain and use our existing knowledge in procedures and processes. (What do we have and what do we need?)	• Integrate the use of existing knowledge into the consulting process • New intranet • Discuss developments during job assessments • Learning-based activities • Stimulate employees to find and disseminate knowledge	• % of job assessments • # of completed yellow pages
	4. Promote existing knowledge	• Link internal and external activities that promote the LB (presentations, published articles, training courses, etc) • Publications • External communications such as an regular column about knowledge in *factor 15* • New intranet (collaborative platform) • Knowledge lunches • Introduce themes to departmental meetings	• # of publications • # of knowledge-sharing activities (e.g. theme lunches) • The score on section … of the Corporate Curriculum survey • The score on section … of the MTO
	5. Assure enough time and space for learning, a.o. professional reflection.	• Introduce reflection into intervention groups • Knowledge lunches • Discuss developments during job assessments	• The score on section … of the Corporate Curriculum survey • The score on section … of the MTO

7.6.2 β-test 2: Regional Office CPB (Case 6)

The second β-test took place in the Regional Office Den Bosch/Eindhoven of the Child Protection Board, where the KP-enhancer was applied in the period January-May 2007. The Regional Office counts 155 employees: 32 support staff, 12 team leaders, and 111 professionals. The working group involved in applying the KP-enhancer consisted of two members of the working group Learning and Development, eight members of the management team, and the regional secretary (total 11 persons). The method was applied by the same person as in the previous test.

Phase 1: Problem definition

The main aim of applying the method in the Regional Office of the CPB was to give an impulse to the working group Learning and Development. This working group has been established in 2003, in order to broaden the organizations perspective on learning.[33] The idea behind this initiative was that learning takes place at the workplace, which should be taken into account when deciding about new learning and development activities: learning is broader than training and education only and this should be reflected in the policy and activities. This working group, consisting of representatives of all function groups, organized a series of meetings on the concept of the Corporate Curriculum. These meetings resulted in deliberately widening of the learning and development program with workplace related activities, like knowledge lunches, case meetings, and feedback training. However, this plan did not lead to the desired structural broadening of the organizations perspective on learning. After a series of initial initiatives, the spirit of this working group faded. The aim of applying the KP-enhancer was to revive the spirit of this initiative and generate a new plan for learning that goes beyond training and education.

Phase 2: Diagnosing KP

The response to the questionnaire in the Regional Office was 70.3% (n=109) and thus almost identical to the response in the National Office. After processing the data, the results were presented to and interpreted by the working group. This resulted in the following conclusions[34] with regard to the current situation of the process of knowledge creation.

1. We should improve the ability to reflect, in order to enhance the ability to innovate (learning function three)
2. People should be aware that they are not a victim of the context. Therefore they should enhance the ability to take control over the situation (learning function five)
3. People should be stimulated to communicate (learning function four)

After the workshop, these conclusions were reported back to the members of the working group, and served as a starting point for the second workshop on March 22nd.

Phase 3: Formulating a KP-statement

Again, like the previous iteration, the second workshop was too short to complete the KP-statement. Therefore, the process was finished in an extra meeting mid-April (without the facilitator). In this meeting the management team decided about the initiatives to be taken. Finally, the results of the workshops and the final meeting were used to formulate a KP-statement (Table 7.3). The intention was to present this statement to the employees of the different offices of the organization.

[33] Internal memo: Summary Learning & Development [Samenvatting Leren & Ontwikkelen], date unknown.
[34] Report workshop 27th February, 19-3-2007.

Table 7.3: KP-statement CPB (Regional Office)

Knowledge strategy	Challenges	Actions	Indicators
The Regional Office of the CPB secures from an independent position, to avert the threatening development of children … …by doing diagnostic research, consulting on legal procedures, proposing measures and sanctions, by propagation of specialised knowledge for and collaboration with chainpartners, and the execution of alternative punishments (taakstraffen). To do this we need: Knowledge and skills regarding: content and process; the organisation; clients; and society: • Competent, self-aware and motivated employees • A knowledge friendly infrastructure and supportive systems • Knowledge of the political environment, chains of collaboration, and communication, and clients • A learning culture where everyone's knowledge and capacities are utilized	1. Taking responsibility - Have a clear understanding of our circle of influence - Acceptance of that circle - Create a clear conception of the myths and convictions	• Agree to regional approach (e.g. monitoring the waiting list) • Discuss 'personal responsibility' during job assessments (this will be added to the assessment report) • Have an annual MT meeting about influencing culture • Clearly show framework in all memos, progress reports and announcements • Have every team make a yearly plan/action plan and give account to this plan • Assure feedback from management; compliments, acknowledge successes, stimulate problem solving, organize a 'bezemklas' • Organize a course on cyclical feedback	• Agreed plan is carried out • # of job assessments in which the item occurs • MT theme was held • # taken up in forms • # of teamplans and justification of plan • Evaluation of communication from MT • # of employees taking part
	2. Stimulate the learning cycle with an emphasis on reflection and leaning from what we do	• Intervision for everyone (stimulate this in department meetings) • Individual coaching (at least 5x each year) • Use client satisfaction survey as input for learning activities • Report in teams about professional development programs • Organize reflection sessions for the MT (benen-op-tafel-sessies) • Record the 'Demming circle' for each plan • Round tables (gd,jd/tl/ro) (still needs to be worked out) • Close each team meeting with an evaluation	• # of intervision and coaching sessions • # of learning activities (derived from css) • # of sessions (in minutes) • # sessions; minutes • # of evaluations
	3. A balance between new challenges and consolidation	• Have an opening of the new year; make a yearly calendar; set priorities • MT: 2x a year reflection and communication to employees • Central agenda	• Employee satisfaction survey • # of reflections and communications • Work was done according to the agenda
	4. Promoting ourselves in the chain	• 'Civiele casusregie' • Theme for MT and team: how do we promote ourselves in the chain?	• The team 'quality for children' developed a strategy • Client satisfaction survey

7.6.3 Evaluation β-test 1 and 2

As both tests have been carried out by a single person, and as it is difficult to distinguish which finding comes from which test, the evaluation of both tests are combined. The findings are based on the experiences of the β-tester written down in a logbook, an interview with the β-tester after completing the method, an interview with the director of the Regional Office, an interview with the director and a member of the management team of the National Office, and the observations of the researcher. The evaluation focuses on the four research questions, as formulated above (see β-test rule 5 in section 7.5.1).

Both β-tests had a more or less similar starting point. Both tests took place within the context of an existing initiative, and the outcome had to contribute to the further advancement of these initiatives. In both cases the tests were supported by the top management and the method was applied by a person that was highly dedicated to the concepts of the Corporate Curriculum and knowledge productivity. In addition, in both cases the concept of the Corporate Curriculum had already been used before.

In the first case (National Office) the main objectives were to analyze the current state of affairs with regard to KP and generate a comprehensive and coherent plan for improvement of the knowledge function (go beyond yellow pages). Directly after completion of the method in the National Office, it seemed the main objectives had been achieved. Applying the method resulted in a coherent plan for improvement that went beyond the yellow pages. The subject was back on the management agenda, and there seemed to be more awareness about the interdependence between different initiatives (which was illustrated by the rejection of a project proposal that had not taken other initiatives into account). Based on the KP-statement the management team decided to continue the process. However, despite the apparent successes of applying the method, continuation of the process appeared to be a problem when the facilitator had to leave the process. Furthermore, this situation also uncovered that participating in the process of applying the method is not a sufficient condition to understand the logic of it. The person that participated in the workshops had not understood the logic of the method in general and the KP-statement in particular. As a result, she was not able to explain the link between the organizational objectives and the knowledge strategy and between the outcome of the survey and the (initiatives in the) KP-statement. These experiences might indicate that continuation of the process after completing the method to a large extent depends on the facilitator.

The main objective of the second case (Regional Office) was to give an impulse to the existing Learning and Development project. These objectives seemed to be achieved, as it was indicated that the main results were:

- More awareness about the importance of a broader perspective on learning and development;
- More clear view on the main learning and development problem;
- A new starting point for the learning and development project.

According to the facilitator (β-tester) of the method, the concept of the Corporate Curriculum and its visualization in the KP-flywheel, had helped to develop a more clear view on the main learning and development challenge. Whereas it seemed (based on the outcome of the survey) as if the main problem was located in the context (outer circle), the management team realized that it would not be possible to change the context. Therefore they concluded that the main challenge was to learn to deal with the context, or to enhance the ability of people to take control over their own situation. According to the director of the Regional Office, applying

the method resulted in a new starting point for the learning and development project. The method resulted in an analysis of the current situation and helped them to advance. After completion, the intention was to present the KP-statement to the employees, implement the suggested initiatives and use the statement as a guideline to monitor the advancement of the learning and development project in the coming years.
Within this case, the fact that the β-tester had left the process, and the management had to take over, appeared to be no problem. However, difference compared to the National Office had been that the whole management team had participated in the process of applying the method. Besides, the final step (defining initiatives) had already been taken without the β-tester.

As β-testing also provides the opportunity to (further) test the functioning of the method, we also evaluated this aspect. With regard to the initial phase of the method, the β-tester concluded that it had been difficult to "sell" the method, because the concepts which are used are very abstract, and the results of applying the method are intangible. It was because of her strong dedication, and her (informal) position and reputation in the organization, that she succeeded in getting approval for the application of the method. The latter was confirmed by the director of the Regional Office, who stated that she approved the application of the method, because it was proposed by José (the facilitator), even though she did not exactly understand what the method was about. Considering the outcome of the process, she confirmed that the trust she had had in José proved to be right.
The second phase of the method, in which the current situation was analyzed, the method appeared to function quite well. The survey itself, the presentation and interpretation of the outcome, and the board game were appreciated in both cases. The part that was appreciated most was the presentation of the outcome of the survey. In both cases it appeared to be difficult to finish this step, as participants really enjoyed interpreting the data. According to the director of the Regional Office, the first workshop was "excellent" and "superb". She was astonished about the quantity of valuable information that was generated by the survey. According to her, the presentation of the data resulted in fantastic conversations, in which participants were stimulated to reflect on the current situation. The outcome of the survey appeared to be stimulating and motivated participants to reflect on their own situation. Playing the KP board game appeared to be an effective way to generate conclusions about the current situation.
For the β-tester, the main difficulty in this phase of the method, had been the interpretation of the data from the survey. However, this had been difficult the first time only. Whereas, the β-tester needed assistance in the first case, in the second case she was able to interpret the data and prepare the first workshop herself.
In both cases the time available to generate the KP-statement appeared to be insufficient. The first step, in which the knowledge strategy was formulated, required far more time than expected. Both β-tester and participants had difficulties with understanding the concepts of *user value* and *knowledge resources*. Although a knowledge strategy had been formulated beforehand (based on input by the participants), it took a lot of time to explain the concept and agree about the formulation. As a result, in both cases there was no time left to decide about the activities in the second workshop. In order to finish the process, the National Office decided to organize an extra workshop, and the Regional Office spend an MT meeting on this subject. According to the director of the Regional Office, the second workshop was as inspiring as the first one. However, the third meeting was not, as this meeting illustrated the weaknesses of the organization: many of the challenges confirmed what was already known, and many of the activities had already been decided on in the past.

As discussed above, in the National Office the KP-statement appeared not to be self-explanatory. Without explanation, the management team was not able to make the link

between their strategic objectives and the knowledge strategy, and between the outcome of the survey and the initiatives in the KP-statement. When considering the final version of the KP-statement (Table 7.2), it has to be acknowledged that this statement lacks internal consistency in the sense that the supposed relationship between the different elements (e.g. challenges and initiatives) is not always evident. Cause of this lack of consistency might be that the process of generating a solid and consistent KP-statement might requires more time. At first it takes time for the facilitator to get acquainted with the concepts, next it takes time to pass on these concepts to the participants in the process, and finally it takes time to apply these concepts to the specific situation. Although the method might result in a consistent statement (written down by the facilitator), this does not necessarily mean that the participants got to the essence of it. As we have seen in the National Office, this situation endangers the continuity of the process after the facilitator leaves the process. Furthermore, the lack of self-explanatory power of the KP-statement might also be caused by the fact that the conclusions from the survey are not included in the statement. As a consequence it is not clear where some of the challenges (and subsequent initiatives) come from (e.g. the challenges related to peace and stability). The latter would plead for adding an extra column to the statement, including strategy, objectives, and conclusions from the survey (like in the Midfield-case: Table 5.10). Finally, some of the confusion about the meaning of the statement was also caused by poor formulation of initiatives and questionable relationships between the different elements in the statement. First, many of the suggested initiatives were formulated in a way that it was not clear what the action would be (e.g. 'archive' or 'learning activities'). Second, many of the indicators in the statement suggested a direct link between the initiatives and items in the survey. Implicitly it was suggested that the survey could reveal the success of the actions, and it was particularly this link that was (rightfully) questioned by the management. Considering these experiences, it seems the method should pay more attention to the quality and logic of the KP-statement.

The supporting material (guideline, game, output from survey, templates for presentations) was highly appreciated by the facilitators and appeared to be useful. However, based on the experiences described above, the material should be extended with:

- a guideline (or brochure) for the organization in which the objective, results and consequences of applying the method are explained in clear (not abstract) language.
- a guideline for the interpretation of the output from the survey.
- more extensive elaboration about the concept of the knowledge strategy and the underlying concepts of user value and knowledge resources.

According to the β-tester, the person applying the method should have a thorough understanding of the concepts of the Corporate Curriculum and learning in organizations. Furthermore, as the method is about the process of creating consensus with a group, the person applying the method should be able to effectively facilitate the group through this process.
According to the director of the Regional Office, the success of the method should, to a large extend, be related to the person applying the method. To begin with, if it was not for José, she would not have approved to apply the method. Next, her strong motivation to work with these concepts, and her enthusiasm were very stimulating. This pivotal role of the β-tester also seems to be confirmed by the problems that arose after completion of the method at the National Office. Without the β-tester, the management team appeared to be unable to continue the process that had been started.

7.7 β-test 3: Health bv (Case 7)

Health Inc., is a pharmaceutical firm, founded in the 19th century, and dedicated to better health and greater access to healthcare for people and animals. Health Inc. aims at helping people live longer, healthier, happier lives, through discovering and developing breakthrough medicines; providing information on prevention, wellness, and treatment; consistent high quality manufacturing of products.
Health bv, the Dutch subsidiary of Health Inc., consists of four divisions. The Pharmaceuticals Group is the Dutch marketing and sales organization of Health medicines. The Animal Health Group is the marketing and sales organization of the animal related medicines. Consumer Healthcare is specialized in research and sales of medicines that can be obtained without doctor's prescription. Finally, Global Research & Development is concerned with clinical research into new medicines. In total, Health bv counts about four hundred employees, of which half are prescribers (marketing and sales).
Knowledge is an important success factor in the pharmaceutical industry. However, within the context of Health bv, this was not reflected in a deliberate policy aiming at better utilization of knowledge. The past few years, several minor knowledge management activities had taken place. The main result of these initiatives had been that it contributed to the awareness of the importance of knowledge for the company and an increasing willingness to structurally manage knowledge as a resource. Important driver for applying the KP-enhancer was to maintain this awareness. In other words, to keep the topic of KM alive.
The β-test was conducted by Eelko, part-time student Human Resources at INHOLLAND University of Professional Education, also husband of one of the employees of Health bv. This assignment is the final project in his studies. After following a course in Knowledge Management, Eelko searched for an opportunity to conduct a knowledge management project. After several conversations, he got interested in the KP-enhancer and searched for a site to apply the method. The director Human Resources (HR) hired Eelko and gave permission to apply the KP-enhancer. The supervision of the project was delegated to the manager Business Intelligence and Technology (BI&T).

Phase 1: Problem definition

After the Director HR gave permission to apply the method in august 2006, a series of interviews were held in order to determine the scope and the problem. Interviews were held with representatives of the HR department, BI&T, and the Medical department. On the one hand these interviews resulted in acknowledgement of the need to advance with knowledge management in general. On the other these interviews resulted in a series of specific, department related problem statements. For practical reasons, it was suggested to limit the scope to a selection of departments and their particular problems.
Early February 2007, the findings were presented in a kick off meeting with the Director HR. In this meeting, neither scope, nor problem statement were accepted. According to the Director HR, limiting the scope to only a few departments would suggest that knowledge management is only relevant to these departments. Focusing on particular (department related) problems, would anticipate on the outcome of the method. Therefore, it was decided to widen the scope to the whole organization. As a result of this meeting, the aim of applying the KP-enhancer became to keep KM alive for the whole organization through investigating the quality of the process of knowledge creation and formulating a plan for improvement.

Phase 2: Diagnosing KP

Mid February 2007 all employees of Health bv were invited to participate in the survey. Although the survey already closed after ten days, it generated a response of 50.9% (n=203). The data was first processed by the researcher and the β-tester, and subsequently presented to

and interpreted by a group of 14 employees of all departments.[35] This resulted in suggestions to improve the following learning functions:

1. Peace and stability in order to reflect on current and finished activities (learning functions three and six).
2. The ability to get access to each others knowledge and experiences (learning function four).
3. Transparency of available knowledge (learning function one).

These conclusions were reported back to the participants, and served as a starting point for the second workshop, two weeks later.

Phase 3: Formulating a KP-statement

The second workshop counted 11 participants.[36] All participants were asked to provide input which was translated in a draft knowledge strategy. This draft (together with the conclusions of the previous workshop) served as a starting point for the workshop. The workshop appeared to be too short to generate all the input needed to formulate a complete KP-statement. Therefore, a third workshop was planned (April 20th) to decide about the activities. However, the day before this workshop would take place, it was cancelled by the Director HR and the manager BI&T, as the circumstances (overall high work load) did not justify that a substantial group of people would spend another three hours on this subject.
As the company wanted to capture the results of the project, and as the β-tester wanted to finish his assignment, the latter decided to finalize the statement with regard to the most urgent challenge (Table 7.4).

[35] Report first workshop knowledge productivity, March 9th, 2007
[36] Report second workshop knowledge productivity, March 23rd, 2007

Table 7.4: KP-statement Health bv

Knowledge strategy	Challenges	Actions	Indicators

Health bv offers treatment solutions [behandelingsoplossingen] for health and health-related problems…
 	
… by offering high quality and innovative medicines to the healthcare field [zorgverleners], knowledge-based services related to health issues [indicatorgebieden], and practical advice for healthcare professionals and patients.
 	
To do this we need:
• Content knowledge:
  • Knowledge about high quality and innovative medicines
  • Knowledge about the healthcare field and healthcare professionals
  • Knowledge about patients
  • Knowledge about health issues
  • Knowledge about healthcare practice
 	
• Personal competences (as defined by HR-competence program):
  • Personal mastery
  • Entrepeneurship
  • Business interface
  • Personal effectiveness
  • People management
	1. Health bv wants insight into its existing knowledge in order to purposefully develop new knowledge (learning unction 1)	• Yellow pages
		• Search engines
		• Decision matrix
		• Knowledge market
		• Knowledge manager
			• # personal pages
			• # searches
			
			• # knowledge markets

	2. Health bv wants to enhance the ability to gain access to each other's knowledge (leaning function 4)		
	3. Health bv wants stability and peace in order to reflect on ongoing and completed projects (learning functions three and six)		

7.7.1 Evaluation β-test 3

After completing the assignment, the β-test was evaluated. Like the previous β-tests, the evaluation is based on the experiences of the β-tester written down in a logbook, an interview with the β-tester after completing the method, an interview with the Director HR and the Manager BI&T, and the observations of the researcher. The evaluation focuses on the four research questions, as formulated above (see β-test rule five in section 7.5.1).

Within this case study, the method was applied by the husband of one of the employees. According to the Director HR, initially the main motivation to apply the method was to do a favor to (a relative of) one of the employees, and because it fitted in the policy of providing opportunities to interns. Therefore, the first and main objective was to create a platform for the β-tester to carry out his research and finish his studies. However, when the β-tester first presented the method to the Director HR, it appeared to fit very well into the management agenda. Although several KM initiatives had already taken place, the outcome of these initiatives had never been carried out properly. In addition, at the moment the β-tester approached the company, it was preparing a shift from a product to a market-oriented organization. In the test phase of this shift, it appeared that access to knowledge would be one of the success factors. Therefore, at a later stage, the motivation to apply the method became to keep the topic of KM "alive" and discover in what way KM could support the organizational change process.

The manager BI&T, to whom the supervision of the project had been delegated, at first expected a "scientific grounded method" that could serve as a starting point for improving data processes. However, during the process he found out that the method did not focus on data and systems, but on issues like culture, people and trust. During the final interview, the manager BI&T acknowledged that he had been unfamiliar with the concept of KM, and that he now realized that it is more related to HR than to BI&T. Therefore, he proposed to secure the project in the HR department. With regard to the scientific rigor of the method, the fact that the survey did not automatically result in suggestions about actions to be taken, but had to be interpreted by the participants in the workshops, resulted in distrust about the reliability of the method. This distrust was shared by the Director HR, because whereas the participants in the workshop concluded that the organization needed more peace and stability, he himself would have concluded that the organization needed more creative turmoil. Both the Manager BI&T and the Director HR had difficulties with the fact that the outcome could be interpreted variously.
The distrust about the reliability of the method in this case could indicate that the KP-enhancer did not fit into the *corporate epistemology* of Health bv. As described in Chapter 3, a distinction can be made between three different corporate epistemologies: cognitivist, connectionist; and autopoietic (Von Krogh & Roos, 1995). Understanding the epistemological assumptions of an organization ensures the effectiveness of knowledge management (Marr et al., 2003; Roos, 2005) because it enlarges the knowledge management repertoire and provides a better understanding of the limitations of each approach (Von Krogh, Roos, & Kleine, 1998). In our research we did not take the issue of corporate epistemology into account. Whereas the epistemology of the KP-enhancer can be described as *connectionist* (experts define what is considered truth), the epistemology of this case organization seems to be *cognitivist* (there is only one truth). Therefore, it seems effective application of the method in this case was hindered by different epistemologies.

The β-tester realized that the initial motivation to apply the method was not in the method itself or the underlying concepts, but in the fact that the company wanted to provide a platform for him to finish his studies ("You have a topic, make it interesting for us").

However, during the process it appeared to him that the topic of knowledge management was perceived as very important. The participants in the workshops clearly hooked on and took it very seriously. During the process the usefulness was confirmed by the participants several times. Another point, according to the β-tester, initially there was a misunderstanding about the output of the project. During the process it became clear to him that the client expected a complete implementation plan. As the awareness about the method and the topic grew, and as it became clear that the β-tester would not implement the solutions, the β-tester, together with the manager BI&T made an effort to secure the follow up of this project. After the second workshop, a meeting took place between the director HR, the internal project leader and the β-tester in order to discuss this topic. In this meeting they agreed to secure the further implementation of the initiatives in the HR department.

The Director HR, the Manager BI&T agreed that the method resulted in increased awareness about the importance of KM, which was in line with the objective of keeping KM 'alive'. According to the β-tester, this was illustrated by the fact that people now talked about KM and used terminology from the method. Another illustration of the increased awareness was the formal proposal to secure the continuity of the project by appointing a KM officer. Furthermore, the increased awareness also led to initiatives aiming at improving the ability to get access to each others knowledge, and improving transparency (second and third conclusion based on outcome survey). According to the HR director, the KM actions that were suggested in the statement, would have been executed anyhow. The method revealed a number of possibilities for improvement, but this was not seen as a merit of the method. These would have been revealed with another approach too. The main merit of the method was that it triggered some valuable (intense and full of emotions) discussions about important issues. However, according to the Director HR, the method did not lead to new insights, but confirmed what was already known. In the words of the HR Director: "it revealed collective intuitive knowledge".

During the final interview with the Manager BI&T and the Director HR, the method was described as a burden to the organization. Although it addressed an important issue, and although it seemed to succeed in the objective of "keeping KM alive", several times it was stressed that this was despite the method. Although knowledge management is important, the concepts that were used were too theoretical and discouraged the participants. Although the outcome of the survey led to valuable discussions about important issues, the reliability of the method had to be questioned ("we learned a lot, but many people got frustrated"). Although the objective was achieved, the way this was achieved (the design of the method) was considered not important. Although it was appreciated how the method connected user value to knowledge resources, the remainder of the method and the way it was implemented was judged as "pretentious". Based on these judgments, the appropriateness of the method in this context should be questioned.

According to the β-tester, the second workshop was too complicated. First, the facilitator had trouble to get to the essence of the concept of the knowledge strategy and to explain the underlying concepts of user value and knowledge resources. Second, many participants seemed to have difficulties to apply the concepts to the company as a whole (instead of their own departments). Third, many participants appeared to be unfamiliar with the objectives of the organization. Together, this resulted in a discussion about the legitimacy to formulate a strategic statement. As a result, the entire workshop was needed to formulate the knowledge strategy, and no time was left to formulate challenges and initiatives. Probably, within this context, it would have been desirable to have the knowledge strategy formulated and approved beforehand. This would have provided clarity about the overall strategic objectives of the organization, and this would have prevented discussions about the legitimacy of the

project group to make a strategic statement. Alternative solution would have been to involve someone (especially in the second workshop) that has the authority to approve strategic statements. Based on this experience we think the method should explicitly address the issue of the availability of, and the awareness about, strategic objectives early in the process.

The supporting material of the method appeared to be useful within this β-test. However, the method would have been more successful, if there would have been a more detailed project plan or guideline for the organization. Therefore, the supporting material should be extended with information about the method that can be used to communicate to the client. What is the objective of the method? How does it work? What are the consequences for the organization?
Based on the trouble with understanding and explaining the knowledge strategy and the underlying concepts of user value and knowledge resources, the guideline should elaborate more on these issues.

According to the β-tester, successful application of the method requires that the person applying the method should have knowledge about organizational science in general and knowledge management in particular. Furthermore, application of the method requires analytical skills, presentation skills and the ability to manage groups. The person applying the method should have some experience with similar processes. This experience will help to recognize similar situations and deal with them effectively.
According to the Director HR, successful application of the method requires that the facilitator is familiar with the company. In addition, as the method introduces complex concepts (e.g. user value), it also requires that participants in the workshops possess the intellectual ability to deal with these concepts.

7.8 Reflections Case 5, 6 and 7

The β-tests of the KP-enhancer took place in three sites. The first and second site were two different units, within a single department of the Dutch Ministry of Justice. The third site was the Dutch subsidiary of an international pharmaceutical company. The main focus of these tests was on the following questions (see section 7.5.1).

1. Does the method do what it is supposed to do?
2. Does the supporting material meet the needs of the user?
3. What knowledge and skills are required in order to be able to apply this method?
4. What are the preconditions for successful application?

In order to be able to formulate answers to these questions, a cross-case analysis was performed (Table 7.5). As β-tests 1 and 2 were performed by the same person, and as it is difficult to distinguish which finding comes from which test, the evaluation of these tests are combined.

Does the method do what it is supposed to do?

Yes, in both cases the outcome of the method appeared to be in line with the objectives. The main effect of applying the method was creating renewed awareness about the importance of KM. In addition, in all cases applying the method resulted in a plan for enhancement. However, applying the method in these cases also revealed several opportunities for further improvement. First, whereas the method assumes awareness about organizational objectives, this appeared to be not self-evident. The lack of awareness about these objectives makes it difficult to formulate a knowledge strategy. Second, the β-testers had difficulty with understanding and explaining the concept of

knowledge strategy and its underlying concepts of user value and knowledge resources. This delayed the process and resulted in the method being perceived as too theoretical. Third, the time to formulate a KP-statement appeared to be too short in all cases. Fourth, in one of the cases the final KP-statement was not self-explanatory which made the continuation of the process dependent on the facilitator. These shortcomings indicate that the development of the KP-enhancer is not yet completed. In Chapter 8 we will do suggestions for further improvement.

Does the supporting material meet the needs of the user?

In all cases the supporting material was highly appreciated and appeared to be useful. However, judged by the number of times the β-testers asked for explanation, the material appeared to be insufficient. After completion of the method, the facilitators suggested to extend the material with a short brochure that could explain the essence of the method to the rest of the organization. This brochure should give answer to the questions: What is the objective? What does the method look like? What are the operational consequences? Furthermore, it was also suggested that the guideline should elaborate more on the concepts of user value and knowledge resources. In the next chapter we will take these issues into account.

What knowledge and skills are required in order to be able to apply this method?

Having the method tested by third parties provides the opportunity to gain insight in the specific knowledge and skills that are required to apply the method. β-testing the KP-enhancer revealed that the person applying the method should not only have a thorough understanding of the concepts underlying the method, but also of the organization in which the method is applied. In addition, the person applying the method should have analytical skills and the ability to facilitate the process. These findings will be used to sketch a profile of the facilitator in Chapter 8.

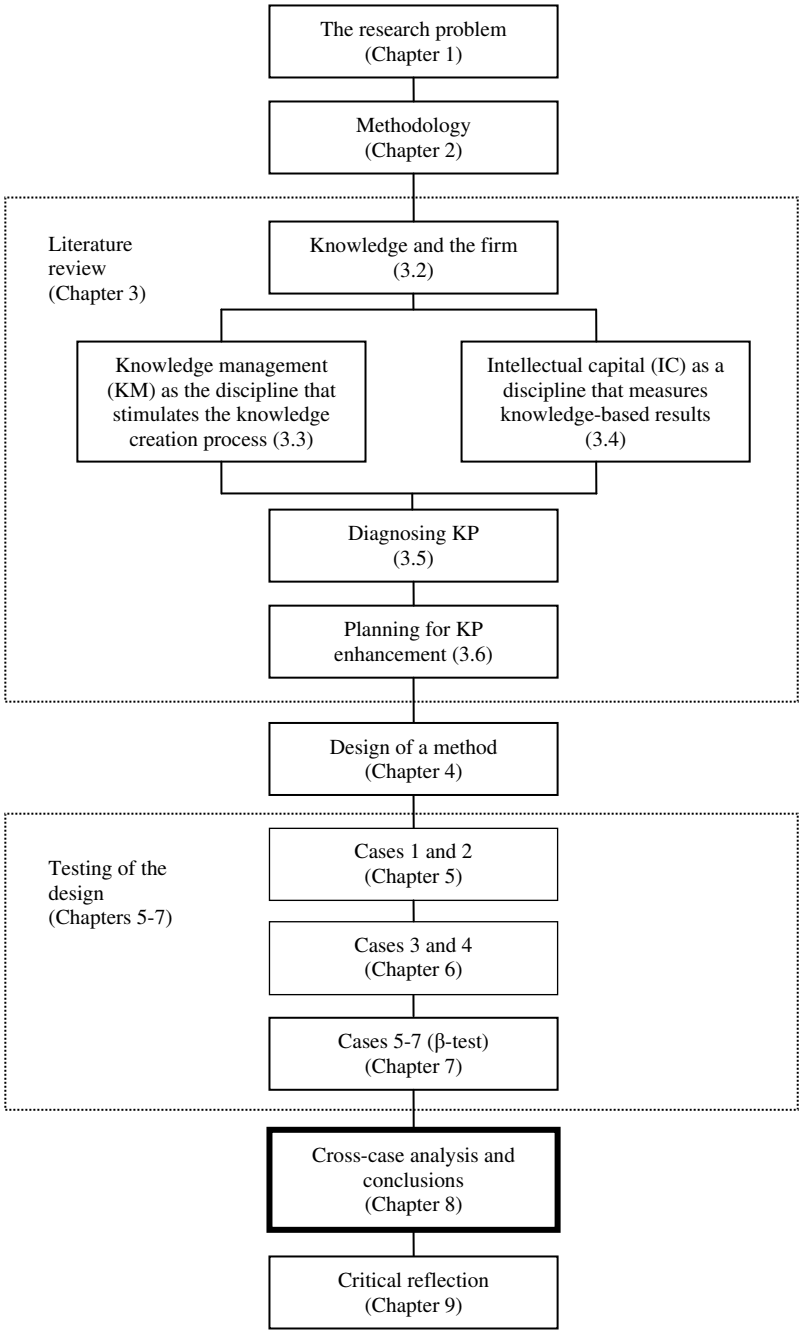
What are the preconditions for successful application?

Finally, β-testing also provides the opportunity to gain further insight in the conditions for successful application of the method. In this respect β-testing the KP-enhancer (in particular Case 7) revealed that "providing a platform for the facilitator" is a questionable motivation to apply the KP-enhancer. In addition, the subsequent lack of a clear problem might suggest that successful application of the method requires that the application is "problem-driven", not "person-driven". Furthermore, also in Case 7, we experienced that successful application of the method requires that the corporate epistemology is in line with the *connectivist* epistemology (Von Krogh & Roos, 1995) of the method. This experience might suggest that we should add an epistemology check to the first phase of the final version of our method.

To conclude, having our method applied by third parties was successful in the sense that the outcome was in line with the objectives. However, the β-tests also resulted in several far reaching suggestions for further improvement which indicates that the development of our method is not yet finished. In the next chapters we further reflect on this issue.

Table 7.5: Cross-case analysis of three β-tests of the KP-enhancer

β-test	*Does the method do what it is supposed to do?*	*Does the supporting material meet the needs of the user?*	*What knowledge and skills are required to apply this method?*	*What are the preconditions for successful application?*
1. CPB-NO 2. CPB-RO	Yes, the outcome is in line with formal objectives. Client is very satisfied, although expectations were different. Shortcomings of the method: - Difficulty with interpreting data from survey - Difficulty with formulating knowledge strategy - Time available to formulate KP-statement too short - KP-statement appeared not to be self-explanatory - Continuation of process to large extent dependent on facilitator	Yes, the supporting material is highly appreciated and appeared to be useful. Suggestions for improvement: - Brochure for the client - Guideline for the interpretation of the data - More extensive elaboration on concept of knowledge strategy	The person applying the method should have understanding of concepts of: - Corporate Curriculum - learning organization Person applying the method should be able to effectively facilitate the group through this process	Trust in quality of person applying the method. A strong motivation to work with the main concepts of the method. A facilitator from 'outside' contributes to acceptance of method.
3. Health bv	Yes, the outcome is in line with objectives. However, according to client this is not necessarily the merit of the method. Shortcomings of the method: - Method assumes awareness of strategic objectives - Concepts were perceived as too theoretical and too difficult - Method does not automatically suggest solutions - Formulating KP-statement requires more time	Yes, the supporting material is highly appreciated and appeared to be useful. Suggestions for improvement: - Guideline (project plan) for the organization - More extensive elaboration on concept of knowledge strategy	The person applying the method should have proper knowledge about - the organization - knowledge management The person applying the method should possess the ability to: - assimilate with the organization - analyze the data and reflect on the outcome - facilitate a group of people through the process Preferably, the facilitator should have experience with similar processes	Participants should be able to deal with the complexity of the concepts that are used (e.g. user value) Participants should be aware of strategic objectives. Application of the method should be problem-driven, not person-driven. Corporate epistemology should be in line with epistemology of method.



Sub questions
to be answered:

1. How can we design and test a management method?

2. What is meant by knowledge productivity (KP)?

3. How can we diagnose knowledge productivity?

4. How can we plan KP enhancement?

5. What does the initial design of the management method look like?

6. What can we learn from testing the method in practice?

Main Question:
How can organizations diagnose KP and plan for enhancement?

8 Conclusions

8.1 Introduction

Our economy has changed from an industrial into a knowledge economy (Drucker, 1993; Toffler, 1981) in which the competitive advantage of organizations is based on the capability of exploiting knowledge resources. The consequence of this transformation is that managers have lost sight of the sources of productivity and productivity growth, because the existing (management) methods and concepts are based on an industrial model of the organization (Edvinsson & Malone, 1997; Stewart, 1997; Sveiby, 1997). The lack of appropriate techniques to reveal knowledge productivity hinders organizations to design effective policies aiming at improving knowledge-based performance. Thus, to prosper in the knowledge economy, we need new management methods and concepts (Drucker, 1993; Stewart, 2002).
Therefore, the objective of this research is to develop a method that helps organizations to make a diagnosis of their knowledge productivity and develop a plan for enhancement. In the first chapter, this objective was translated into the following research question:

> *How can we design and test a management method that helps knowledge-intensive organizations to make a diagnosis of their knowledge productivity and develop a plan to enhance it?*

In order to answer this question we broke down the main question into six sub questions:

1. How can we design and test a management method?
2. What is meant by knowledge productivity?
3. How can we diagnose knowledge productivity?
4. How can we plan knowledge productivity enhancement?
5. What does the (initial) management method look like?
6. What can we learn from applying the method in practice?

As the aim of this research is to design and test a management method, we decided to follow a design-based research (DBR) approach (Sub question 1). In Chapter 3 we defined knowledge productivity as "the process of knowledge creation that leads to incremental and radical innovation" (Sub question 2). Next we decided to combine Kessels' Corporate Curriculum and Zegveld's Quantitative Framework to diagnose knowledge productivity (Sub question 3) and we decided to use the Danish Guideline for the process of planning for enhancement (Sub question 4). Together this resulted in our KP-enhancer in Chapter 4 (Sub question 5), which we subsequently tested in seven cases (Chapters 5-7).
In order to answer Sub question 6 we first tested the initial design (Chapter 5), then we tested the improved design (Chapter 6), and finally we performed a β-test (Chapter 7). In this chapter we first compare the results of the case studies (8.2) and report about the lessons we have learned from applying the method in practice (0). Next we return to the main research question and present the final design of a method that helps organizations to make a diagnosis of their knowledge productivity and develop a plan to enhance it (8.4). Finally, we conclude this chapter by returning to the main concept of this thesis: knowledge productivity (8.5).

8.2 Comparing the cases

In order to be able to answer the research questions, we first performed a cross-case analysis (Yin, 2003). As described in Chapter 4, main elements within the evaluation of the effectiveness of the method have been the context of application, the effects of the method,

and the design of the method. Within this section we will follow this structure when comparing the findings from the seven case studies.

8.2.1 Context of application

Table 8.1 gives an impression of the context in which the Knowledge Productivity Enhancer (KP-enhancer) has been tested. The class of contexts for which the KP-enhancer initially has been designed was Dutch medium-sized (between 50-250 employees) knowledge-intensive organizations. As the initial design of the method included Zegveld's Quantitative Framework, an extra requirement for selecting the first couple of test sites was that these organizations would be able (and willing) to provide a series of annual reports. Therefore we initially focused on commercial service firms. However, after two iterations we decided to leave out the Quantitative Framework (after Case 2). As a consequence we were able to broaden the application domain. Therefore we included two units of a department of the Dutch Ministry of Justice (Case 5 and 6) and the Dutch subsidiary of a multinational pharmaceutical firm (Case 7).

Table 8.1: Testing the KP-enhancer

	Name organization	Type of organization	Number of employees	Method is applied in context of	Main persons involved	Period test
1	Transfer Solutions bv	IT consultancy	107	Knowledge and performance management initiatives	CEO, delegated to Financial Controller	10-05/1-06
2	Midfield	Consultancy	43	Two projects: 'securing knowledge and networks', and 'age conscious personnel management'	CEO, delegated to one of the professionals (Management Consultant)	2-06/5-06
3	De Baak	Training and development	150	No clear relationship with other initiatives	Financial controller, later Director business unit, supported by CEO	6-06/5-07
4	Broek Steen and Poppel (BSP)	Lawyers firm	300	Knowledge & Information (K&I) department	Knowledge manager, supported by General Director	6-06/12-06
5	Child Protection Board-NO	Unit of department of Ministry	154	(Low-profile) knowledge management project	Learning and Development officer (β-tester), supported by MT-NO	1-07/5-07
6	Child Protection Board-RO	Unit of department of Ministry	156	Learning and development project	Learning and Development officer (β-tester), supported by MT-RO	1-07/5-07
7	Health bv	Dutch subsidiary of pharmaceutical company	399	Internship knowledge management	Intern (β-tester) under supervision of Manager BI&T, supported by Director HR	1-07/5-07

In most cases the KP-enhancer was applied within the context of an existing (knowledge management) project. In all cases, the application of the method was supported by the top management. In almost all cases the method was applied in cooperation with a (knowledge management) professional. The seven tests of the KP-enhancer were performed between October 2005 and May 2007. The average lead-time was almost six months. The shortest lead-time was four months (Case 1 and 2); the longest lead-time was 12 months (Case 3).

8.2.2 Problems, objectives and perceived effects

The starting point of this research is that the lack of available information about the effective use of knowledge hinders organizations to design effective policies aiming at improving organizational performance. Therefore, the objective of this research was to develop and test a management method that uncovers knowledge productivity in order to help organizations to make a plan for improvement. Following this objective, the main functional requirement of the KP-enhancer was that it should help organizations to make a diagnosis of their knowledge productivity and help to develop a plan to enhance it. In order to assess its effectiveness we made an inventory of the motives (problem and objectives) to apply the method, and the effects as perceived after applying the method (Table 8.2). With regard to the latter we made a distinction between effects as perceived immediately after completing the method, and effects as perceived after some time. The latter was only possible for Cases 1, 2 and 4. For the other cases, the time between applying the method and finishing this thesis had been too short.

Table 8.2: Applying the KP-enhancer: problem, objective and perceived effects

	Name	**Problem**	**Objective of applying the KP-enhancer**	**Perceived outcome immediately after applying the method**	**Perceived effects of applying the method after…**
1	Transfer Solutions bv	- 'Knowledge is our main asset, but we do not know the value, and we do not know when and how to intervene'	- Develop better understanding of sources and developments of KP - Generate suggestions for improvement	- Increased awareness about importance KP - Increased involvement of employees in strategic dialogue - Set of initiatives that aim at improvement of KP - Insight in the process of knowledge creation	*… 18 months (7-'07)*: - Strategic alignment of initiatives - KP-statement is used as a management control instrument for KM initiatives - Improved communication about KP (both internal and external)
2	Midfield Consultants	Internal: - Further advancement of two internal (knowledge) management projects External: - Organization is not perceived as knowledge-intensive	Internal: - Create awareness about importance of KP, integrate KP in strategy, and give direction to initiatives for improvement of KP External: - Improve ability to attract employees and enhance (knowledge) reputation of organization	- Increased awareness and commitment with regard to KM initiatives - Better insight in strategy and objectives of the organization - Concrete plan for KM - Insight in connection between strategic objectives and KM initiatives - Improved communication about challenges the organization is facing (both internal and external)	*… 15 months (9-'07)*: - KP-statement relates initiatives to strategy - KP-statement provides a framework to hold on to - KP-statement is used to communicate about initiatives - KP-statement is used for strategy development
3	De Baak	- One-sided focus on financial performance - Do we have the right knowledge resources to execute our strategy?	- Develop an alternative (non-financial) language - Reveal the consequences of the strategy statement in terms of knowledge resources and knowledge management	- Increased awareness about importance of KP - Starting point for KM initiatives	Too short period

Table 8.2 (continued): Applying the KP-enhancer: problem, objective and perceived effects

	Name	Problem	Objective of applying the KP-enhancer	Perceived outcome immediately after applying the method	Perceived effects of applying the method after…
4	BSP-lawyers	- How to connect strategic objectives and KM-activities? - Justification increase hourly rate	- Create awareness about importance of KP - Give direction to initiatives for improvement - Support the strategy development process from knowledge perspective	- Increased awareness and concern about importance of KP - Effective framework for translating objectives into KM initiatives - Acknowledgement of 'real' problem	… *9 months (9-'07)*: - Connection between strategy and KM-actions - KP-statement is used as activity planning document by Manager K&I
5	CPB - NO	- Relationship between overall goals and KM initiatives is not clear - Existing KM initiatives have limited scope - No coherence and synergy between existing KM initiatives	- Give impulse to existing Quality and Knowledge project - Diagnosis of current state of affairs with regard to knowledge development - Generate coherent plan for improvement that goes beyond current 'yellow pages' initiative	- Increased awareness about importance of KP and the need to do something about it - Increased awareness about the interdependence of learning functions and the (need for) cohesion between existing initiatives - Insight in current state of affairs and possibilities for improvement	Too short period
6	CPB - RO	- Too narrow perspective on learning and development - Earlier initiatives did not lead to desired broadening of perspective	- Give impulse to existing learning and development project - Generate plan for learning that goes beyond training and education	- More awareness about the importance of a broader perspective on learning and development - More clear view on the main learning and development problem - A new starting point for the learning and development project	Too short period
7	Health bv	- Outcome of earlier KM initiatives never had a proper follow up - Shift towards new organizational structure requires enhancement of knowledge focus	- Provide platform for β-tester - Keep KM alive	- Renewed awareness about importance of KM	Too short period

8.2.3 Design of the method

The KP-enhancer consists of three phases: problem definition, diagnosing KP, and formulating a KP-statement. The aim of the first phase is to identify the problem at hand, set the objectives for applying the method and make a plan for implementation. The main aim of the second phase is to diagnose knowledge productivity from the perspective of the process of knowledge creation and from the perspective of incremental and radical innovation. Finally, aim of the third phase is to develop a plan to enhance knowledge productivity.

An important element of the design of the method was an electronic, web-based survey based on the seven learning functions of Kessels' Corporate Curriculum (Kessels, 1996). The aim of this survey was to generate input for diagnosing the process of knowledge creation. Another

important element of the design was the diagnosis of KP in terms of incremental and radical innovation. Within the first two cases this diagnosis was based on Zegveld's Quantitative Framework (Zegveld, 2000) to detect incremental and radical innovation. Within Cases 3 to 7 this diagnosis was based on a survey. A third important element of the initial design was the process of generating a KP-statement, analogue to the Danish Guideline for developing intellectual capital statements (STI, 2003b).

Table 8.3 provides an overview of the main findings with regard to the functioning of the KP-enhancer per iteration and the improvements that were decided upon as a consequence of these findings. As Case 3 and 4 took place at the same time, the method was not improved between these two cases. The same goes for Cases 5, 6 and 7. As the fifth and sixth iteration were conducted by the same person, the findings of these two cases are combined. Finally, the suggested consequences after the β-tests (Cases 5, 6 and 7) were not tested within the context of this research.

Table 8.3: Improving the design of the KP-enhancer

	Name	Main findings with regard to functioning of the KP-enhancer	Consequences for next iteration
1	Transfer Solutions bv	- Appeared to have expected valuation of KP - Limited availability of financial data hinders application of Quantitative Framework - Difficulties with different interpretation of concepts - Problem with acceptance of outcome of Quantitative Framework - Outcome of Quantitative Framework did not contribute to diagnosing KP, however this did not hinder the process of generating a KP-statement - Survey functions well, however lack of benchmark hinders objective interpretation of outcome of survey - Process of generating a KP-statement requires more time - Enthusiasm about final result (KP-statement) - Lack of coherence between different elements	- Introduce board game, in order to improve coherence and enable process of generating shared findings - Introduce items in survey that connect learning functions and incremental and radical innovation - Rephrase items in questionnaire in order to increase reliability
2	Midfield	- Limited availability of financial data hinders application of Quantitative Framework - No interest in outcome of Quantitative Framework - Survey is perceived as very useful - Game is perceived as childish and needless repetition - Process of generating a KP-statement requires more time - KP-statement is highly appreciated for its communicative power - Too much emphasis on explaining theory	- Remove Quantitative Framework from method - Renew survey with regard to incremental and radical innovation - Rephrase items in questionnaire in order to increase reliability - Less theory, more collective analysis - Simplify the process of formulating a KP-statement
3	De Baak	- Method appeared to have aroused wrong expectations - Emphasis in workshop shifted from explaining to analyzing - KP-game is highly appreciated - Questions about innovation did not add value to process of diagnosing KP - Simplification of the process of generating a KP-statement worked out well	- As Cases 3 and 4 took place at the same time, the method was not improved between these iterations.

Table 8.3 (continued): Improving the design of the KP-enhancer

	Name	Main findings with regard to functioning of the KP-enhancer	Consequences for next iteration
4	BSP-lawyers *	- Method could (to a large extent) not be applied as intended - Difficulty with employee involvement and bottom-up process - Interpretation of data and formulation of statement is mainly done by one person - Workshop is replaced by meeting of one hour, because of strong focus on time - Aim of meeting is to gain support, not necessarily to generate input - KP-statement is highly appreciated for its communicative power	- Renew survey with regard to incremental and radical innovation - Rephrase items in questionnaire in order to increase reliability and decrease item-non-response
5	CPB-NO** (β-test)	- Method was difficult to 'sell', because it is not clear what objectives and consequences are - Interpretation/understanding of the data from the survey by the β-tester appeared to be difficult - The survey, the presentation of the outcome and the board game were highly appreciated - Survey incremental and radical innovation did not add value to diagnosing KP - Difficulties with understanding concepts of *user value* and *knowledge resources* and subsequently with formulating knowledge strategy - Extra workshop/meeting was needed to finish KP-statement - KP-statement appeared to be not self-explanatory	- As Cases 5, 6 and 7 took place at the same time, the method was not improved between these iterations.
6	CPB-RO (β-test)		

7	Health bv *** (β-test)	- Sequence of events is questioned (strategy first!)
		- Reliability of survey is questioned
		- Problem with subjective interpretation of data
		- Survey incremental and radical innovation did not add value to diagnosing KP
		- Explicit demand for expert analysis of current situation
		- Difficulties with understanding concepts of *user value* and *knowledge resources* and subsequently with formulating knowledge strategy
		- Strategy is perceived as management issue
		- Difficult to stick to the scope (whole organization)
		- KP-statement was not finished in second workshop
		- Process was prematurely interrupted
			- Add epistemology check in Phase 1
			- Remove innovation profile
			- Improve information for the organization (objectives, consequences of the method)
			- Improve guideline w.r.t.
			  ○ analysis of data from survey
			  ○ explaining concept of knowledge strategy
			- Take more time for generating the KP-statement
			- Add column to KP-statement with strategic objectives and conclusions from survey

* The final column in this row (consequences) is also based on the experiences in Case 3.

** As these two cases were performed by the same β-tester, we decided to bring the findings of these cases together.

*** The final column in this row (consequences) is also based on the experiences in Cases 5 and 6.

8.3 What we learned from applying the KP-enhancer in practice

Before returning to the main research question (how can we help organizations to make a diagnosis of their knowledge productivity and develop a plan to enhance it) we first give an overview of what we have learned from applying and testing the method in practice (Sub question 6).
Based on the tables in the previous section we successively analyze and report the main findings with regard to the motives for applying the KP-enhancer (8.3.1), the effectiveness of the method (8.3.2), the design of the method (8.3.3), and the context of application (8.3.4). In section 8.3.5 we formulate the generative mechanisms in which the KP-enhancer is grounded. In section 8.3.6 we formulate the requirements for successful application of the method. And finally, in section 8.3.7 we suggest some possibilities for further improvement of the method.

8.3.1 Motives for applying the KP-enhancer

In Chapter 3, based on a literature review related to the concept of intellectual capital measurement, we made a distinction between "internal management problems" and "external reporting problems" (Andriessen, 2004a; Blair & Wallman, 2001; CEC, 2006; Lev, 2001; Mouritsen et al., 2002; Mouritsen et al., 2005; STI, 2003b).
These two types of problems are reflected in the motives for applying the KP-enhancer (Table 8.2). However, the main motive for applying the KP-enhancer appeared to be the need to improve internal (knowledge) management. To be more precise, the main motives to apply this method were:

1. Need for further advancement of KM initiatives
2. Need to develop a strategy for KM
3. Need to monitor the performance of knowledge resources

The main internal motive for applying the KP-enhancer appeared to be the need for further advancement of existing knowledge management initiatives. Striking similarity in several organizations was that the KM initiative had already been started in the past, lost momentum and now needed a new impulse. In order to achieve this goal, most organizations indicated that they wanted to apply the method to generate a plan for improvement of KP. The second internal motive for applying the KP-enhancer appeared to be the need to develop a strategy for KM. Within this class of problems distinction can be made between those who wanted to achieve this goal through translation of the organization's strategy into terms of knowledge and knowledge management, and those who wanted to achieve this goal through connecting existing initiatives to strategic objectives. Third internal motive for applying the KP-enhancer appeared to be the desire to monitor the performance of the knowledge resources. As this third motive was more explicit in Cases 1 to 4, it seems to be related to the expectations with regard to the Quantitative Framework. Although the Quantitative Framework was only applied in Cases 1 and 2, Cases 3 and 4 had already been selected as test sites before we decided to remove this element.
Although improving internal management appeared to be the leading motive for applying the KP-enhancer, some organizations also applied the method to improve external communication (or at least did not rule out the possibility of using the outcome for this purpose). Specific objectives within this class of problems appeared to be the improvement of the corporate reputation with regard to knowledge and knowledge management, and the need to justify (an increase of) hourly rates.

8.3.2 Effectiveness of the method

When assessing the effectiveness of the method, distinction can be made between the effects as intended and the effects as perceived. The former were formulated in the functional requirements of the method (Chapter 4). The latter were formulated by the client after the method had been applied.
The main objective of the KP-enhancer was that it should help organizations to make a diagnosis of their knowledge productivity and that it should help to develop a plan to enhance it. In order to do so, we formulated six functional requirements in the initial design of the method (Chapter 4). The starting point of the KP-enhancer was that it should:

1. Create awareness about the importance of knowledge productivity for improving organizational performance.
2. Assess the quality of the process of knowledge creation.
3. Measure incremental and radical innovation.
4. Generate possibilities for improvement.
5. Develop a plan for knowledge management.
6. Improve communication about knowledge productivity.

Whether the KP-enhancer is effective or not depends on the extent to which it contributed to these functional requirements in general and to solving the specific problem within the context of application.
When reviewing the effects of applying the method, distinction can be made between the effects as perceived immediately after completion of the method and the effects as perceived after a certain period of time (time is indicated in Table 8.2). As a consequence of the iterative design of this research it was only relevant to do the latter in Cases 1, 2 and 4. In the other cases the period between finishing the method and writing this thesis was considered to be too short to reflect on the process for a second time.
Based on the effects of applying the method in the seven case studies, as perceived immediately after completing the method (Table 8.2), it seems we can conclude that the KP-enhancer contributes to:

- Increasing awareness about the importance of knowledge productivity
- Improving insight in the quality of the process of knowledge creation
- Developing a plan for enhancing knowledge productivity

When applying the KP-enhancer, the main effect appeared to be increased, or renewed, awareness about the importance of knowledge productivity for the improvement of organizational performance (Requirement 1). All organizations within this research indicated that the method had contributed to this effect. A second effect of applying the KP-enhancer was that most organizations gained better insight in the quality of the process of knowledge creation (Requirement 2). Although some organizations indicated that the method merely confirmed what they already knew, others indicated that, through applying the KP-enhancer, they gained better understanding of the current situation and the “real” problem. Third important effect of applying the method was that it contributed to developing a plan for enhancing knowledge productivity (Requirement 5). Contribution of this plan was not only that it bridged the gap between organizational strategy and KM initiatives, but also that it uncovered the (lack of) coherence between existing initiatives.
As described above, in three of the cases (1, 2 and 4) we had the opportunity to return after some time, and ask what the perception was about the main effects of applying the method. In all of these cases the managers involved indicated that the plan for KM (Requirement 5) and improved communication about KM initiatives (Requirement 6) had been the main effects of

applying the method. This shift in perception (from Requirements 1, 2 and 5 to Requirements 5 and 6), seems logical as Requirements 1 and 2 are more closely related to the process of planning for enhancement, and Requirements 5 and 6 are more closely related to the implementation process that follows the planning phase.

Table 8.4: Comparison of effects as intended and effects as perceived

Effects as intended	**Effects as perceived**						
	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
1. create awareness about the importance of knowledge productivity for improving organizational performance	X	X	X	X	X	X	X
2. assess the quality of the process of knowledge creation	X	X	-	X	X	X	-
3. measure incremental and radical innovation	-	-	-	-	-	-	-
4. generate possibilities for improvement	-	-	-	-	-	-	-
5. develop a plan for knowledge management	X	X	-	X	X	X	-
6. improve communication about knowledge productivity	X	X	-	X	-	-	-

Judged by the effects as perceived by the clients, the method fulfils most of the functional requirements as formulated in the design of the method (Table 8.4). However, a distinction can be made between the effects as perceived immediately after completing the method and the effects after some time. In most of the cases awareness (Requirement 1), insight in the current situation (Requirement 2) and the plan for KM (Requirement 5) were perceived to be the main results immediately after completing the method. After some time, the plan for KM (Requirement 5) and improved communication (Requirement 6) were perceived to be the main results.

Until now we have focused only on the intended effects. When applying the method, we were also confronted with several unintended (though desirable) effects. The main unintended effect was that applying the KP-enhancer resulted in increased awareness (among participants) about the strategic objectives of the organization and increased involvement in the strategic dialogue. The main cause of this effect is that the process of generating a KP-statement starts with translating the organizational objectives into a knowledge narrative.

Another unintended effect of the KP-enhancer was that it contributed to creating awareness about the connection between existing KM initiatives and strategic objectives. Whereas the KP-enhancer had been designed to translate strategy in KM action, several case studies used the KP-enhancer the other way round, i.e. from action to strategy. In these cases, existing KM initiatives needed an explicit connection to strategic objectives. The KP-enhancer appeared to be an effective instrument to make this connection. Based on the latter experience we should add to the functional requirements of the method that it also contributes to connecting existing KM initiatives to strategic objectives.

Based on the effects of applying the method in the seven case studies, we can now refine the functional requirements as formulated in the initial design of the method. Applying the KP-enhancer contributes to:

1. Creating awareness about the importance of KP;
2. Assessing the quality of the process of knowledge creation;
3. Developing a plan for KM;

4. Aligning (existing) KM initiatives with strategic objectives;
5. Improving (internal) communication about KM.

Table 8.4 also clearly illustrates what the method does not do (compared to the functional requirements as formulated in the design of the method). The method failed to measure KP in terms of incremental and radical innovation (Requirement 3). Neither was it perceived to generate possibilities for improvement (Requirement 4). The former can be explained by the failure to apply Zegveld's Quantitative Framework and subsequently the failure to find or develop a suitable alternative (see next section). The latter reveals a weakness of the method in the sense that the method did not systematically diagnose underlying causes of poor performance. Although the intention of the method was to diagnose the underlying causes during the workshops (together with the participants), in hindsight it has to be acknowledged that the method fell short in doing so. As a consequence we jumped from assessment to solutions, without thoroughly analyzing underlying causes. The conclusion is therefore that the method should more explicitly pay attention to analyzing the causes of a poor quality of the process of knowledge creation.

8.3.3 Design of the method

When assessing the main findings with regard to the functioning of the method, a distinction can be made between different elements of the method: Quantitative Framework; Survey Innovation; Survey Corporate Curriculum; KP board game; KP-statement. In this section we reflect on the effectiveness of these different elements. At the end of this section we also reflect on the effectiveness of the guideline of the method.

Quantitative Framework

In order to diagnose incremental and radical innovation, we used Zegveld's Quantitative Framework. This element of the method was only applied in the first two cases. The main reasons for this were the "technical" difficulties with applying the method, and the difficulties with Zegveld's interpretation of the concepts of incremental and radical innovation. Another reason was that we found out that we did not need these measurements in order to be able to make a plan for KM.

Due to practical reasons, the application of the Quantitative Framework had been reduced from twelve to five years (which was seen as the minimum to detect a trend). However, even this limited number of years appeared to cause serious problems within the first two case studies. Whereas adding mid term figures seemed to be a solution to this problem, gathering these data confronted us with new problems (availability of data, estimations, seasonal pattern). Another problem related to the application of the Quantitative Framework appeared to be that the outcome was seriously influenced by (financial) restructuring in the period under investigation. This obvious disturbing effect negatively affected the credibility of the outcome and the instrument. Although data smoothing might have corrected the disturbing effect, it would not have restored the credibility of the instrument. Furthermore, the interpretation of the data was also complicated as a result of different interpretations of the concepts of incremental and radical innovation. In particular the fact that the Quantitative Framework interprets incremental innovation as a change in management focus (from one to another generic strategy), seemed to be an interpretation that was hard for participants to translate to everyday practice. The fact that a company was qualified either as incremental innovation or not, was difficult to relate to the idea of everyday improvements, which was the most common interpretation of the concept of incremental innovation. Though the participants seemed to understand Zegveld's interpretation, they refused to accept the conclusion that their organization did not qualify as incremental innovation. As a consequence of all these

experiences in the first two cases, we decided to leave out this element in the following iterations.

Survey on innovation

After we decided to remove the Quantitative Framework from the method, we decided to further explore the possibilities of diagnosing KP in terms of incremental and radical innovation. Therefore, in Cases 2 to 7, we experimented with three different questionnaires. The aim of this element was to stimulate thinking about knowledge in terms of results. The aim was also to stress the relationship between the process of knowledge creation and the ability to generate different types of results. The reasoning was that a combination of insight in both process and results, and the suggested relationship between these two would support organizations in giving direction to their policy for enhancement.

Based on the experiences in this research, it seems this element did in fact stimulate thinking about KP in terms of incremental and radical innovation. In several cases the awareness about different types of results and the outcome of the questionnaire did impact the challenges and initiatives that were decided upon in the KP-statement. However, this element did not sufficiently satisfy the initial requirement of the method to diagnose KP in terms of incremental and radical innovation.

Survey Corporate Curriculum

In order to diagnose the quality of the process of knowledge creation, we developed a survey based on the seven learning functions of the Corporate Curriculum. Based on the experiences within this research it seems we can conclude that this element proved to be an effective instrument, not only to diagnose the quality of the process of knowledge creation, but also to generate input for, and give direction to, the process of developing a plan for KP enhancement.

As the aim of this research was to test and improve the design of the KP-enhancer, we statistically analyzed the questionnaire between the iterations. The main subject of analysis has been the reliability (Cronbach α) of the learning functions. Based on these analyses we attempted to improve the questionnaire through deleting and rephrasing of items.

Table 8.5: Reliability (Cronbach α) per learning function in each iteration

		Case 1-2		Case 3-4		Case 5-7	
	Learning function	n	α	n	α	n	α
1	Subject matter expertise	111	.844	243	.794	405	.781
2	Ability to solve problems	99	.811	228	.848	397	.652
3	Ability to reflect	95	.803	217	.792	377	.711
4	Communicative and social skills	110	.833	243	.808	395	.709
5	Self-regulation of motivation	97	.893	220	.883	385	.771
6	Peace and stability	105	.845	211	.771	369	.824
7	Creative turmoil	100	.784	211	.584	372	.796

Table 8.5 gives an overview of the reliability scores per learning function in each iteration. Although the reliability scores gradually decreased, they seem to be relatively stable at a satisfactory level. Exceptions might be the score with regard to creative turmoil (.584) in the second iteration (Case 3-4), and the score with regard to the ability to solve problems (.652) in the third iteration (Case 5-7). However, the former considerably improved in the third iteration, and the latter was to a large extent caused by one item (PO5: “I like to experiment with unconventional approaches”), which did not cause reliability problems in any of the earlier iterations. Removing this item would result in a reliability score of .700 for this learning function.

The main objective of the survey was that it generated input for diagnosing the process of knowledge creation. Within this research we collected evidence that the survey succeeded in this objective. The outcome of the survey proved to be useful and stimulating input for examination of the current situation. In addition, the concept of the Corporate Curriculum appeared to be an effective framework to support the process of planning for KM initiatives. However, some contra indications have to be noted with regard to the survey and the concept of the Corporate Curriculum. First, the terminology related to the concept of the Corporate Curriculum was sometimes considered to be too theoretical (e.g. *self-regulation of motivation and affection*). In two of the cases (Case 2 and 7) this resulted in reluctance with regard to the acceptance of the method. Second, the fact that the outcome of the questionnaire had to be analyzed and interpreted by the participants themselves appeared to be disappointing in some of the cases (Case 1 and 7). In these cases, expectation was that the questionnaire would not only provide insight in the quality of the process, but would also automatically suggest measures that had to be taken to improve the current situation. Furthermore, in some of the cases the lack of an objective benchmark was seen as an obstacle for effective interpretation. Third, in some of the cases (Case 4 and 7) participants had difficulties with translating the overall outcome of the survey to their specific department. The latter might be explained by the relatively large size of these organizations.

Board game

In order to enhance coherence between the diagnostic phase and the planning phase, we introduced a board game after the first iteration. This game is based on the KP-flywheel, as presented in Chapter 3. The aim of the game is to collect shared findings after presentation and discussion of the outcome of the survey. These findings serve as input for the process of generating a KP-statement in the final phase of the method.

Based on the experiences in the five cases where the board game was played, we can conclude that it succeeded in its objective of collecting shared findings. In all these cases the findings that emanated from the game were accepted as the starting point for the KP-statement. In all these cases one or more of the initiatives that are suggested in the KP-statement can be converted to the conclusions from the game.

Another important contribution of the game seems that it helped to make the method more participative. Through introducing this game the emphasis of the first workshop shifted from explaining the theory to diagnosing the specific situation earlier in the process. Moreover, the board game seems to be an effective instrument for changing participation from passive to active. It functioned as an effective bridge between the survey and the KP-statement and thus succeeded in its objective of enhancing coherence within the method.

Process of generating a KP-statement

The aim of the final phase of the KP-enhancer was to make a plan to enhance KP. The process of this phase was based on the process of generating an Intellectual Capital Statement, as suggested by the Danish Guideline. Within the KP-enhancer, the product of this phase is referred to as a KP-statement (plan to enhance KP).

Within this research, the process of generating a KP-statement appeared to be an effective instrument to make a plan for improvement. Whereas in two of the cases the starting point had been the strategy of the organization, in five of the cases the starting point had been the existing (knowledge management) initiatives. In both types of situations the process appeared to be useful. The starting point for generating a KP-statement can be either the organizational strategy or the existing initiatives. Within some of these cases it was stressed by the participants that the effect of the process of generating a KP-statement had not been that they would do more or other things, but that it helped to align the things they were already doing.

The outcome of this process – the KP-statement – appeared to be an effective instrument to develop a plan for KM and to communicate this plan throughout the organization (both to management and employees). The main reason for this was its communicative power, as it was compact (one page), it had a "hermetic" logic, and that it was action-oriented. Within one of the cases the KP-statement appeared to be a more effective instrument to communicate to the management than the existing action plan.
In the course of this research, several alterations were made with regard to the process of formulating a KP-statement (Phase 3 of the method). In the initial design of the method it was suggested to follow the process of the Danish Guideline. However, in the first two cases we found that this process was too complex and too time consuming to fit into two workshops. As we suspected that the time and resources available to apply this method within mid-sized firms would be limited, and therefore the time available for this method would be limited too, we decided to simplify the process by deleting the first step (the inventory of existing initiatives and underlying challenges) and by using the time between the two workshops to formulate the knowledge strategy. Despite these simplifications we did not succeed in our aim of limiting the method to two workshops. In all cases that followed (Cases 3-7) an extra (third) workshop was needed. However, in four of the five cases this was not perceived as a problem. As a consequence we suggest adding an extra workshop to the final design of the method.
Furthermore, the final step of the Danish Guideline (formulating indicators) in most of the cases has only been performed pro forma. In none of the cases this step was performed during the workshops. This could have been caused by the lack of time in the workshops. However, none of the clients seemed to attach much value to the final column in the KP-statement. In some of the cases the method was finished before the indicators had been formulated, in others the indicators had been formulated pro forma by the researcher or the internal project leader. Therefore, it seems the final step of formulating indicators was more or less taken for granted. One exception to the latter is the first case in which the management, in the year after applying the method, not only agreed about initiatives to be taken, but also about indicators to be measured in order to monitor the progress of the initiatives. So, maybe it is too early to draw any conclusions about the added value of the indicators.
With regard to the logic of the KP-statement, two more findings should be noted. First, although the statement is designed to construct and present a logic and coherent plan, some of the challenges and subsequent initiatives and indicators could not be related to the knowledge strategy. The cause of this deficiency was that some of the challenges directly emanated from the diagnosis of the current situation. The second finding was that whereas the KP-statement model assumes the organizational objectives to be known among the people involved, in practice this appeared not always to be true. Based on these two experiences, we suggest adding an extra column to the KP-statement model in which we present the overall organizational objectives and the main conclusions from the diagnosis of the current situation (like we did in Case 2). This addition will not only strengthen the logic and cohesion of the method, but also provide a connection to the strategic objectives, which will contribute to the legitimacy and communicative power of the statement.
Finally, as the β-tests revealed, successful completion of the method does not automatically result in a high quality final product. Furthermore, the β-tests uncovered that participation in the process does not automatically imply that the logic of the KP-statement is understood, or automatically can be taken over by others. As it is the aim of this method that the final product is transferable to others (e.g. the management team) we suggest adding a quality check to the final phase of the method in which the internal logic of the KP-statement is tested.

Supporting material

The aim of this research was to produce generalizable and transferable knowledge. Therefore we also produced a guideline that can be used by the professional in the field. Testing this guideline was one of the aims of the β-tests (Case 5-7).
In all the cases the guideline appeared to be useful. However, judged by the number of times the β-testers asked for explanation, the material appeared to fall short. In particular the β-testers needed extra assistance with understanding and explaining the concepts of "user value" and "knowledge resources" in the first step of the planning phase (Phase 3). Therefore, the final guideline should pay more attention to these concepts. In addition, when preparing the facilitators for applying the method, these concepts deserve extra attention.

8.3.4 Context of application

When defining the application domain of the KP-enhancer (Chapter 4) we made a distinction between the class of problems and the class of contexts. The former describes the type of problems the method tries to solve, the latter describes the type of situation the method has been developed for. Based on the seven case studies, the following conclusions can be drawn with regard to the class of problems and the class of contexts.

Class of problems

The KP-enhancer has been developed to solve internal management problems, in particular KM-related problems. Based on the experiences in the seven case studies, and the analysis of the effects of applying the method above, we can describe the KP-enhancer as a method that contributes to solving internal knowledge management planning problems. To be more precise, the KP-enhancer can be characterized as a method that helps to plan KM initiatives through creating awareness about and assessing the quality of the process of knowledge creation. The method can be used either to translate organizational strategy into KM initiatives, or to connect existing KM initiatives to strategic objectives. The outcome of the method (the KP-statement) helps to improve internal communication about KM initiatives during the implementation phase.

Class of contexts

The KP-enhancer has been developed for Dutch medium-sized (50-250) knowledge-intensive organizations. As we needed financial data (to apply the Quantitative Framework) we first focused on commercial service firms. As we deleted this element after the second test, and as we wanted to explore the boundaries of the context of application, we decided also to include two units of a department of the Dutch Ministry of Justice (Case 5 and 6) and the Dutch subsidiary of a multinational pharmaceutical firm (Case 7). Based on the seven cases we can further specify the context in which the method can be applied effectively.
With regard to the size of the company this research project seems to confirm the initial demarcation (50-250 employees). As the method leads to a relative large increase of work pressure in small organizations, the organization should not be too small. Based on the experience within the second case, it seems the lower design limit is around fifty employees. Based on the experience in a larger organization (>250 employees, Case 4 and 7), apparently the context should not be too large either. As the differences between the various units of the organization can be substantial, the outcome of the method will lose relevance. If used in larger contexts, the application of the method should be limited to a particular entity, or a clear distinction should be made between the different entities.
As noted above, one of the aims of the β-tests was to explore the boundaries of the context of application. Based on the β-tests we can conclude that the method also appears to be

applicable to not-for-profit organizations. And, although we initially aimed at developing a method for mid-sized organizations, the method also appears to be applicable in departments of a larger organization (>250 employees).

8.3.5 Generative mechanisms

As described in Chapter 2, solution concepts are grounded in generative mechanisms (Van Aken, 2004a). A generative mechanism is the answer to the question "why does this intervention (in this context) produce this outcome?" When grounding solution concepts, one is interested in both driving and blocking mechanisms, because these will support the translation of the solution concept to other contexts.
Based on the analysis of the effects of the method above, the KP-enhancer can be characterized as a method that helps medium-sized knowledge-intensive organizations (50-250 employees), or knowledge-intensive departments of large organizations, to plan KM initiatives through creating awareness about KP and assessing the quality of the process of knowledge creation. The method can be used either to translate organizational strategy into KM initiatives, or to connect existing KM initiatives to strategic objectives. The result of the method (the KP-statement) helps to improve communication about KM initiatives during the implementation phase that follows the planning phase. The KP-enhancer may produce these effects on the basis of the following reasoning:

1. It makes sense of the phenomenon of knowledge productivity. The process of sense making (Weick, 1995) leads to awareness and creates a collective sense of urgency and commitment (to enhance KP).
2. It is participative in the sense that it involves employees in the process. It acknowledges that the employees are the real experts (Drucker, 1999), and invites them to cooperate. Participation is a necessary requirement for creating acceptance throughout the organization. As KP is related to personal abilities, and as enhancing KP implies enhancing personal abilities, acceptance is a necessary foundation for enhancement.
3. It is stimulating in the sense that it activates people and motivates them to contribute to the process of diagnosing and planning for enhancement. The method appeals to the personal responsibility (Drucker, 1993) and the self-motivation (Quinn et al., 1996) of knowledge workers. Motivation is an important driver for knowledge workers and thus an important requirement for active participation in the process.
4. It is collaborative. Collaboration is necessary because KP is related to all functions and all aspects of the organization (Weggeman, 1997). Enhancing knowledge productivity is not the responsibility of one (KM) department. Enhancing KP requires collaboration across departments and hierarchies (Van der Spek & Spijkervet, 1994).
5. It is reflective. Reflection is a necessary requirement for learning in order to enhance (Kessels, 1996, 2001b; Van Lakerveld, 2005), which is the essence of the KP-enhancer.
6. It is purposeful. Connection to the objectives of the organization justifies KM initiatives (Davenport & Prusak, 1998; Drew, 1999; Manville & Foote, 1996; Zack, 1999), helps the management to set priorities and give direction to actions. It provides a framework to hold on to in everyday practice.
7. It is action-oriented, which is a necessary requirement to get accepted by the professional (manager) in the field.

8. It helps to explain the logic of KM, which contributes to understanding the need for KM, and communicating the message to the organization (Mouritsen et al., 2002). Improved understanding and communication helps to convince the organization (employees) about the necessity of actions to be taken.
9. It supports the management decision process in the sense that it helps to set priorities and allocate resources. In this sense the KP-enhancer contributes to improving internal (knowledge) management (Andriessen, 2004a; Mouritsen et al., 2002; STI, 2003b).

The main blocking mechanisms of the KP-enhancer are: the terminology related to the Corporate Curriculum (e.g. self-regulation of motivation and affections) is sometimes perceived as too theoretical, and the concept of KP sometimes arouses wrong expectations. The former could result in difficulties with accepting the method. The latter could result in disappointment with regard to the outcome. More about the latter in the final section (8.4) of this chapter.

8.3.6 Conditions for successful application of the KP-enhancer

Finally, testing the method also resulted in knowledge about a series of conditions that contribute to its effective application. This section gives a broad overview of these conditions.

The facilitator

We found that the effectiveness of the method is to a large extent dependent on the knowledge, and skills of the person applying the method. Particularly the β-tests uncovered that the facilitator should not only have knowledge about the main concepts of the method, but also about the context in which it is applied. Furthermore, the person applying the method should not only have the ability to "technically" understand and apply the method, but also the ability to facilitate the participants through the process of analyzing, diagnosing and planning.

Problem-driven, not person-driven

When considering the motives for applying the method, it should be noted that in two of the cases (Cases 3 and 7) important motivation of the client for applying the method had been to provide a platform for the person applying the method. In these "person-driven" cases, the clients primarily agreed to participate in order to offer the researcher or the β-tester an opportunity to apply the method. When relating these motives to the effects of the method, it seems these two cases were less successful than the other cases. Therefore, effective application of the method apparently requires a "problem-driven" motivation, not a person-driven motivation.

Urgency and dedication

In five of the seven case studies the method was applied in the context of an existing (KM) initiative. The urgency of these existing initiatives, and the dedication of the persons involved seemed to contribute to the successful application of the method. In one of the two remaining cases (Case 3), the lack of a dedicated problem owner resulted in a long lead time, a subsequent loss of momentum and questionable effectiveness. Therefore we think the method is more effective within the context of an existing KM initiative.

Management participation

Management support is necessary, but not sufficient. In all cases the application of the method was initiated by, or explicitly supported by the top management. In three of the cases, the top management also actively participated in the application of the method. When considering the

effectiveness of the method, it seems that the cases in which the management actively participated were more successful than those in which the management merely supported the method. Therefore, active participation seems to contribute to successful application of the method.

Alignment of epistemologies

Finally, in one of the cases (Case 7), it seemed the acceptance of the method was hindered by a different corporate epistemology. In particular the fact that the data from the survey could be interpreted in various ways resulted in questions from the participants about the validity of the method. Whereas the epistemology of the KP-enhancer is *connectionist* (experts define what is considered truth), the epistemology of this case organization seemed to be *cognitivist* (there is only one truth). Therefore, effective application of the method apparently requires that the epistemology of the organization is in line with the epistemology of the method.

8.3.7 Further improvement of the method

Considering the findings in the case studies and the subsequent changes in the design, the major changes to the method took place in the first four case studies. The cases that followed seemed to confirm the initial findings and helped to uncover patterns between different cases. Unveiling these patterns helped to further refine the design. However, the point of theoretical saturation has not been reached yet and the end of this research does not mean that the development process is completed. Based on the experiences in the β-tests and the cross-case analysis in this chapter, we see several possibilities for further improvement and testing of the method.

Add an epistemology check to Phase 1

Within this research we neglected the issue of epistemology in the sense that we did not make the epistemology of the KP-enhancer explicit, nor did we investigate the epistemology of the organizations in which we applied the method. Consequently we could not qualify the appropriateness of the method for the organization from an epistemological point of view.
The literature suggests that understanding the epistemological assumptions contributes to effective knowledge management (Venzin et al., 1998; Von Krogh et al., 1998). Therefore, in order to prevent a mismatch between the corporate epistemology and the method, an epistemology check should be part of the first phase of the method. Awareness about the corporate epistemology will contribute to selecting KM initiatives (Phase 3) that fit in the organizational context.

Explicitly address the issue of relationships

The underlying assumption of the KP-enhancer is that there is a relationship between the learning functions of the Corporate Curriculum and the ability to generate incremental and radical innovation (Keursten et al., 2004; Van Lakerveld, 2005). The assumption is that improving the quality of the learning functions will increase the ability to generate both incremental and radical innovation.
Within this research, our main concern was to express the concept of KP, in terms of both process and results. What we did not take into account was the relationship between the two, in terms of which learning function contributes to which type of result. In order to improve the method we suggest explicitly incorporating the element of relationships between learning functions and results in the method. We expect that this improvement will result in a more focused plan for enhancement. However, adding this element requires further explanatory research into the relationships between learning functions and results.

Diagnose underlying causes of poor quality of the process of knowledge creation

The aim of this research is to develop a method about how to diagnose KP in order to plan for enhancement. Although the intention of the method was to analyze the underlying causes of poor quality of the process of knowledge creation together with the participants during the workshops, the method fell short in doing so. As a consequence we more or less jumped from assessment to solutions.

However, an analysis of the underlying causes is too important to leave to chance as it is this analysis that leads the way to finding the right initiatives for improvement. Therefore, we suggest adding a systematic analysis of the underlying causes for poor performance of the learning functions to the diagnosis phase.

8.4 How we can help organizations to make a diagnosis of their knowledge productivity and plan for enhancement

After answering Sub question 6 (What have we learned from applying the method in practice?) in the previous section, we now return to the main research question. A preliminary answer to this question has already been given in Chapter 4 in which we presented the initial design of our method (Sub question 5). Combined with the findings from the empirical tests, we can now finish by sketching the final design of the KP-enhancer: a method that helps organizations to make a diagnosis of their knowledge productivity and that helps to develop a plan to enhance it. This section gives a broad overview of the main elements of the KP-enhancer, a more detailed description can be found in the guideline for applying the KP-enhancer (Appendix 1).

The KP-enhancer

The KP-enhancer can be characterized as a method that helps to plan KM initiatives through creating awareness about and assessing the quality of the process of knowledge creation. The method can be used either to translate organizational strategy into KM initiatives, or to connect existing KM initiatives to strategic objectives. The result of the method (the KP-statement) helps to improve communication about KM initiatives. In terms of effects, applying the KP-enhancer contributes to:

1. Creating awareness about the importance of KP;
2. Assessing the quality of the process of knowledge creation;
3. Developing a plan for KM;
4. Aligning (existing) KM initiatives with strategic objectives;
5. Improving (internal) communication about KM.

Although the method is called KP-enhancer, it does not lead to KP enhancement itself. The final product of applying the method is a plan for enhancement (plan for knowledge management). In a sense, the method could also be called a "KP enhancement planner".

Not a solution, but a solution concept

The KP-enhancer is a "solution concept", which means that this method is not a standardized solution, but should be translated to the specific context of application. Therefore, this method is not developed for the layman, but for the (knowledge management) professional. In order to be able to successfully apply the KP-enhancer, the person applying the method should:

- be familiar with the main concepts of the method (knowledge productivity, Corporate Curriculum, incremental and radical innovation, knowledge management);
- be familiar with the organization in which the method is applied;

- not only be able to technically understand and apply the method, but also have the ability to facilitate the process.

Context of application

The KP-enhancer can be applied to mid-sized (50-250 employees) knowledge-intensive organizations, or knowledge-intensive departments (50-250 employees) within large organizations. These can be private or public organizations, profit or not-for-profit.

Design of the method

The KP-enhancer consists of three phases. The method starts with defining the problem at hand, goes through a phase of diagnosing the current situation, and finishes with formulating a plan (KP-statement) for improvement. The implementation of the initiatives that are mentioned in the KP-statement are not part of this method.

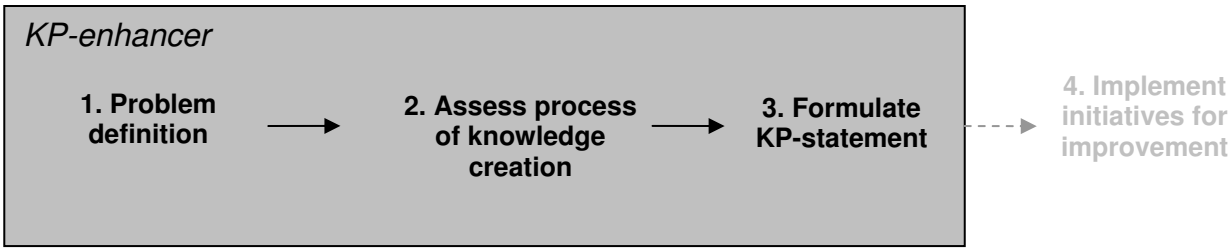


Figure 8.1: Three phases of the KP-enhancer

The KP-enhancer consists of a web-based questionnaire (with a response time of ±25 minutes) for all employees within the organization (or department), three workshops of three hours with a representative selection of the employees, an interview (two hours) with the client at the beginning of the project, and a presentation to the client or MT at the end of the project. The lead-time of the method is between four and six months.
The remainder of this section provides a broad description of the three phases of the KP-enhancer, a more detailed description of the final design can be found in (Appendix 1). The description focuses on the aim of each phase, the main elements and the result of each phase.

Phase 1: Problem definition

The aim of the first phase of the method is to determine the scope of application, define and verify the problem at hand, and check the necessary preconditions for applying the method. Some important questions that have to be answered in this phase are:

- does the organization fit into the class of contexts (see context above) for which the method has been designed?
- does the problem fit into the class of problems (diagnosing and planning KM initiatives) for which the method has been designed?
- does the organization (and the persons involved) meet the necessary preconditions for successful application of the method?

The result of this phase is the verification that the method suits the situation, a validated problem statement, and a concrete planning for applying the method.

Phase 2: Diagnose current situation

The aim of the second phase of the method is to diagnose the current situation with regard to knowledge productivity, and come to an agreement about possibilities for improvement.

The main elements of this phase are a survey among all employees within the scope of application and a workshop for a representative selection of the employees.
The survey consists of two parts. The first part consists of about seventy items related to the quality of the seven learning functions of the Corporate Curriculum (Appendix 2). The second part consists of a set of ten items related to the innovation profile of employees in terms of incremental and radical innovation (Appendix 3). The aim of the workshop is to introduce the main concepts, present and discuss the outcome of the survey, and collect and formulate shared findings with regard to possibilities for improvement. One important element in the workshop is the KP board game, in which participants are literally asked to match their cards to the learning functions that, according to them, should be improved (Appendix 4). The important contribution of this game is that it helps change perspective from (passive) diagnosing to (active) planning.
The result of this phase is a set of possibilities for improvement of the current situation with regard to knowledge productivity.

Phase 3: Formulate KP-statement

The aim of the third phase of the method is to formulate a plan for knowledge management objectified in a KP-statement. This phase consists of two workshops and a presentation of the final product to the client.
The main elements of a KP-statement (Appendix 5) are the Knowledge Strategy, KP-challenges, KM initiatives and a set of indicators. A Knowledge Strategy is a way of expressing the organizational objectives in knowledge terms. The KP-challenges describe the challenges (related to KP) the organization has to face in order to be able to realize its strategic objectives. The KM initiatives describe the actions that follow from the challenges and the indicators help organizations to monitor the progress of the KM initiatives. As internal consistency is an important element of the (communicative) strength of the method, the consistency of the statement is continuously tested. A final check is performed within this phase to guarantee the quality of the final product (Appendix 6).
The result of this phase is a completed KP-statement. The KP-statement tells us which initiatives have to be put in place in order to improve the current situation from a knowledge perspective.

8.5 Knowledge productivity revisited

Based on our experiences in this research we came to several insights about the concept of knowledge productivity that might help to better understand, describe and explain this phenomenon. These insights are related to the combination of the two different approaches of knowledge productivity, the term knowledge productivity, and the positioning of the concept. Due to the methodology of this research, these insights are based on a limited number of cases. Therefore they should be regarded as indicative for further research.

8.5.1 Combining two approaches to KP

Literature suggests that intellectual capital measurement and knowledge management should go together (Bontis, 2002; Marr et al., 2003; Montequin, Fernandez, Cabal, & Gutierrez, 2006; Mouritsen et al., 2002; Roos et al., 1997; Wiig, 1997), because measurement leads to better understanding of the knowledge creation process, and subsequently to the development of effective knowledge management policies aiming at improving or enhancing this process. Intellectual capital measurement enhances the effectiveness of knowledge management,

because measurement leads to better understanding, better communication and better management of knowledge resources, which eventually leads to better organizational performance. This assumption is in line with the underlying assumptions of intellectual capital measurement (Edvinsson & Malone, 1997; Stewart, 1997; Sveiby, 1997) and performance management (Kaplan & Norton, 1999, 2004). The process of measuring within these concepts is more than only assigning scaled numbers to items. Within these concepts, measurement should also be seen as a qualitative process of sense making (Andriessen, 2004a). Through measurement, the knowledge-based performance becomes manageable (Mouritsen et al., 2002; Roos et al., 1997). Through communicating and interpreting the measurements we make sense of the social world.

In line with this reasoning, an important initial design feature of the KP-enhancer was the combination of Kessels' Corporate Curriculum (Kessels, 1996) and Zegveld's Quantitative Framework (Zegveld, 2000). The first approach interprets KP as a process and aims at creating an environment that enables the process of knowledge creation. The main aim of this (knowledge management) approach is to improve the conditions for knowledge creation, based on the belief that this will eventually lead to better results. The second approach interprets KP as a result and aims at measuring the extent of KP. The starting point of this intellectual capital-based approach is that measurement (or explanation) of the rate of KP is a necessary precondition for improvement. The question then is: did the combination of these two approaches result in better understanding of the concept of knowledge productivity and subsequently to the development of effective knowledge management policies? In other words, should measurements precede management?

Based on the experiences in the first two case studies we concluded that Zegveld's Quantitative Framework did not contribute to better understanding: at least, not in combination with Kessels' Corporate Curriculum. Although both approaches theoretically agree about the different types of results (incremental and radical innovation), combining them in practice appeared to be problematic. The main reason for this was that the Quantitative Framework does not detect incremental innovation as everyday improvements, but as a change in management focus from one to another generic strategy. Within the context of this research people had difficulty translating this idea into everyday practice. The fact that a company was assessed either as an incremental innovation company or not, was difficult to relate to the idea of everyday improvements. Therefore, instead of contributing to a better understanding of the concept of knowledge productivity, the Quantitative Framework resulted in confusion and rejection among participants.

Does this mean that we should reject the assumption that knowledge management and intellectual capital measurement should go together? Not necessarily. Although the measurements from the Quantitative Framework did not contribute to better understanding, the awareness about the two different types of innovation did contribute to the process of planning for their enhancement. In several cases the awareness about the different types of results clearly influenced the challenges and initiatives that were chosen in the process of formulating a KP-statement. Based on these experiences we could argue that managing the knowledge creation process does not necessarily require intellectual capital measurement, but it does require awareness about the results of the knowledge creation process.

8.5.2 Knowledge productivity is an anachronism too

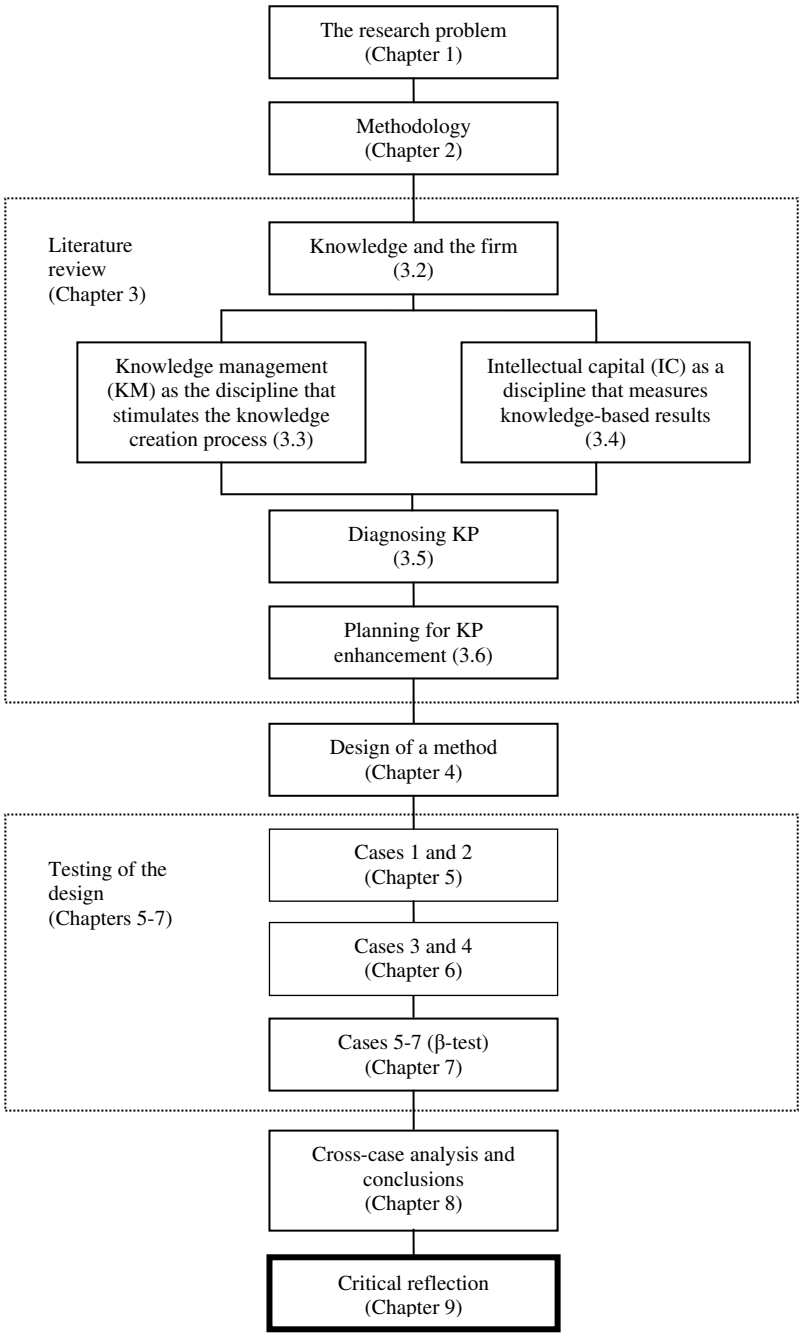
The concept of knowledge productivity was introduced by Kessels (1996) in opposition to the concept of knowledge management. According to Kessels, knowledge management in the sense of planning and control, seems to be a remainder of the industrial economy, and will appear to be an anachronism – assigning a phenomenon to the wrong time period. Within the

knowledge economy, the capacity to create value rests with the knowledge workers and therefore the power shifts from the manager to the worker (Drucker, 1993). Therefore, organizations should not try to manage (control) knowledge, but create a workplace that enables knowledge production through learning (Kessels, 1996, 2001b).
Within this research we have experienced that several practitioners at first interpreted the concept of knowledge productivity as the amount of (knowledge) output per unit of input. In this sense, using the word productivity in relation to the process of knowledge creation might be interpreted as an anachronism too. The knowledge production process fundamentally differs from the industrial production process. The knowledge production process is circular rather than linear, which implies that any output can also serve as input. Any unit of output is unique and cannot be compared to any other unit of output (variability), and an important part of the output is non-financial and non-material (intangibility). All these aspects hinder the measurement of knowledge productivity in simple terms of output per unit of input.
Within this research we experienced that the concept of knowledge productivity appealed to clients and provided easy access to case organizations. The motivation however, appeared to differ from Kessels' reasoning. Whereas Kessels used the word productivity as a metaphor to refer to the ability to create knowledge, practitioners at first seem to interpret it as a ratio that measures output per unit of input. Whereas Kessels introduced the concept of knowledge productivity to create distance from the industrial concept of management, he created a new concept that seems to be as closely related to the industrial era as the concept of knowledge management. As a result, in several cases the concept appeared to arouse wrong expectations that consequently led to disappointment about the outcome of the method.
Referring to intangible assets, Sveiby (1998) argued that if we measure the new (intangible assets) with tools from the past, we will never fully understand the new. In line with this reasoning we could argue that, if we keep labeling new phenomena with words from the past, we will keep creating wrong expectations and never fully understand the essence of these new phenomena. This reasoning does not only relate to the concepts of knowledge management and knowledge productivity, but also to the concept of *intellectual capital* (*knowledge assets*) which carries a similar kind of reference to the industrial age and thus provokes unwanted expectations too.
Perhaps, based on our experiences and the reasoning above, it might have been better in the context of this research to refer to the main concept as *knowledge creating ability* or, as knowledge creation leads to innovation, to *innovation effectiveness*. These terms seem to fit the knowledge creation process better, would have expressed the essence of our research better, and might have prevented misunderstanding and disappointment.

8.5.3 The Corporate Curriculum refers to an enabling approach to KM

A basic assumption of the concepts of Kessels' (1996; 2001b) interpretation of knowledge productivity is that knowledge creation takes place in the minds of people. Therefore knowledge cannot be managed or controlled: it can merely be supported by an enabling environment. In this sense Kessels prefers not to use the term knowledge *management,* but knowledge *productivity*.
In Chapter 3 we argued that this is confusing because in KM literature, the concept knowledge management usually refers to the activities that aim at improving knowledge productivity (Weggeman, 1997, 2001). Therefore we suggested to make a distinction between the Corporate Curriculum as the approach and knowledge productivity as the purpose. In this sense, the Corporate Curriculum could be considered as an enabling approach to KM (Davenport & Prusak, 1998; Kessels, 1996, 2001b; Rondeel & Wagenaar, 2001; Stam, 2004; Von Krogh et al., 2000; Weggeman, 2000), which distinguishes itself from the codification or

personalization strategy (Hansen et al., 1999). In line with this reasoning we used the concept of KM to further operationalize the concept of the Corporate Curriculum.
Combining the concepts of the Corporate Curriculum and knowledge management worked out well. Knowledge management appeared to be a useful concept to provide substance to the learning functions of the Corporate Curriculum and to develop a reliable questionnaire. This questionnaire was a useful tool for diagnosing the quality of the knowledge creation process and it produced stimulating input for the process of planning knowledge management initiatives. Our experiences seem to confirm that the Corporate Curriculum, and knowledge management very well go together in the sense that both concepts share the same purpose. In addition, the Corporate Curriculum is a further specification of the concept of KM in the sense that it refers to an enabling approach. Both knowledge management and the Corporate Curriculum serve the same cause: stimulating the knowledge creation process in order to enhance knowledge productivity.



Sub questions
to be answered:

1. How can we design and test a management method?

2. What is meant by knowledge productivity (KP)?

3. How can we diagnose knowledge productivity?

4. How can we plan KP enhancement?

5. What does the initial design of the management method look like?

6. What can we learn from testing the method in practice?

Main Question:
How can organizations diagnose KP and plan for enhancement?

9 Critical reflections

9.1 Introduction

The aim of our research, as formulated in Chapter 1, has been to develop a management method that helps knowledge-intensive organizations to diagnose knowledge productivity in order to plan for enhancement. This question was divided in six sub questions, which subsequently have been answered before we came to our final conclusions in Chapter 8.
As the aim was to develop a management method, we decided to follow the design approach as developed by Van Aken (1994; 1996). The main characteristic of this approach is that it takes place in two parallel streams of knowledge production (Andriessen, 2007): the practice stream of solving problems of case companies and the knowledge stream of scientific investigation. In this chapter we want to reflect on this research design and on some of the choices that we have made. Did we make the right decisions and if not, what could we have done differently? These reflections will lead to a number of remarks about the nature and merits of the design-based research (DBR) approach.

Considering the results of the practice stream, it seems that we succeeded in contributing to solving the problems at hand in the majority of the cases. At least in five of the cases the client seemed to be predominantly satisfied immediately after the method had been applied. Considering the results of the knowledge stream, we can conclude that we know more about the application domain and the functioning of the KP-enhancer. Another result of the knowledge stream is that we now know more about the concept of knowledge productivity, its different interpretations, and the relationship between knowledge productivity and the concepts of knowledge management and intellectual capital measurement.

Thus it seems the research design of this study worked. However, what about the validity and generalizability of the research findings? How does our methodology stand up against the scrutiny of scientific inquiry? There are two angles to answer this question. The first angle is to look at the rigor of the DBR approach in general. The second angle is to look at the way DBR has been implemented in this study.

9.2 The rigor of the DBR approach

The main objective of the design sciences is to develop general knowledge to be used to solve specific problems. This general knowledge or design knowledge is developed through testing solution concepts in real life situations. As a consequence, design-based research takes place in two distinct streams of knowledge production. As we discussed in Chapter 2, these two streams of knowledge production are characterized by different objectives (client and research), different types of learning (regulative and reflective cycle) and different results (solution and solution concept). In Chapter 2 we already described some methodological consequences of this dual knowledge production. Within this section we elaborate on several dilemma's, related to the dual objective of DBR, with which we were confronted during this research project.

Bias

Whereas in traditional (positivist) research everything possible is done to eliminate bias – subjective wishes and prejudices of the researcher – in order to obtain objective evidence, it seems bias is a necessary precondition for success in DBR. In particular in the practice stream

of this research project we experienced that a priori belief in the appropriateness and effectiveness of the solution concept was a necessary precondition in order to get the opportunity to apply the method in practice. The flipside of this coin is of course that this may blind the researcher to objective evaluation of the object under investigation. The "intimate association with the concept and its implementation causes the action researcher to lose neutrality and be a less-than-credible source for independent evaluation" (Kaplan, 1998, p.110).

Intimacy

Another characteristic of DBR, is the intimate working relationship between the researcher and the client. On the one hand this intimate relationship is necessary to get access to the case site. On the other hand this intimate relationship endangers objective evaluation of the solution concept and its implementation.

The question (or dilemma) that rises is how to get involved (in order to get access) without losing the necessary distance (in order to secure objective evaluation)? We should engage to get access to the case site and at the same time stay detached in order to bring about "prospective adjustments". Adjustments that do not aim at improving the fit between the concept and the setting that was studied (retrospective), but adjustments that aim at improving the fit with future cases (Van Raaij, 2001).

Within this research we experienced how difficult it is to maintain detachment, in particular in the first series of cases (1-4) in which the researcher was directly involved in applying the method. In addition to this, the β-tests (Cases 5-7) at the end of the empirical research evidently delivered an important contribution to creating detachment and increasing the objectivity of the outcome of the α-tests (Cases 1-4).

Priority and efficiency

Another characteristics of DBR is that it commits itself to solving local problems in specific situations (practice stream). However, the aim of DBR is to generate general (non-local) knowledge that can be transferred to other contexts than the one in which it was developed (knowledge stream). The question then is, which of the knowledge streams do we give priority? How far do we go in solving specific problems? How much research inefficiency – tasks not directly related to the research objectives – do we accept?

Within this research we went quite far, because we believe that the interest of the client overrides the interest of the researcher (Schein, 1987), and thus developing design knowledge always comes secondary to solving the problem.

> This means that the researcher has certain obligations to the organization and the change process, that may require him to perform activities for the better of the organization that go beyond those activities that may have been sufficient for data collection. Improved access and rapport come at the cost of less research efficiency. (Van Raaij, 2001, p.61)

Reciprocity

The main criterion for selecting cases was that we wanted to apply (test) the method in real life situations. In order to qualify as a case study (Yin, 2003), situations had to fit into the class of contexts and problems had to fit into the class of problems for which the method was designed. What we did not take into account was the motivation for participating in the research project. In some cases the motivation to apply the method was to provide a platform for the researcher. As described in Chapter 8, it seems this motivation contributed negatively to the effectiveness of the method. Therefore, we concluded that participating in DBR should be problem-driven and not person-driven. "Companies should not view the involvement of

action researchers with implementations … as a favor they are doing for the researchers, or granting them permission to do research on their sites" (Kaplan, 1998, p.113).
One aspect related to this issue is the aspect of reciprocity (Gummesson, 1991) or mutuality. Applying the method should be equally valuable for both the researcher and the client (organization). In this respect Van Raaij (2001) refers to the importance of mutual commitment between the researcher and the research setting. However, based on the experiences within this research it can be questioned whether commitment alone is sufficient. It seems to be more about motivation and a balance in perceived value. Whereas the researcher in DBR is motivated by solving problems and improving human conditions, the organization is not necessarily interested in contributing to the development of transferable design knowledge. Moreover, the awareness of contributing to the development of a method, in some cases seemed to hinder the effectiveness of the method. Therefore, the most powerful motivation for organizations to participate in a DBR project seems to be the belief that participating in the research creates value for the organization. In this respect Argyris (1970) stresses the importance of showing the relevance of a research project (external validity) and refers to the concept of "researcher added value". In order to stimulate reciprocity, Kaplan (1998) suggests that compensation (payment) is critical for successful action research. Compensation emphasizes that implementation of the concept creates value for the organization. As a consequence, the implementation of the concept will be taken more seriously, will raise more support and improve the quality of the feedback.
Within this research the organizations did not have to compensate the implementation of the method. Although several organizations indicated that "getting a free ride" was an important reason to apply the method, it can be questioned whether this has been a constructive motivation.

Scientist and practitioner

Doing design-based research requires researchers that are able to (simultaneously) meet the demands and expectations of both the knowledge stream and the practice stream. Whereas the researcher is expected to believe in and defend the appropriateness and effectiveness of the method in the practice stream, at the same time he is expected to continuously question the method in the knowledge stream. Whereas the practice stream demands that the researcher gets involved in a specific context and commits himself to solving a specific problem, the knowledge stream demands that the researcher keeps distance. Within management science "the business of science and the business of management are not separable" (Argyris, 1996, p.390). The researcher continuously has to combine (or switch between) the role of the practitioner (problem solver) and the role of the scientist (Table 9.1).

Table 9.1: The two worlds of the design-oriented researcher (Van Raaij, 2001)

Scientist	**Practitioner**
Solitary activity	Group interaction
Rational process	Political process
Emphasis on general approach	Emphasis on specific solutions
Focus on theory development	Focus on changing social systems

Based on the experiences within this research, apparently the role of the researcher in the practice stream comes closest to the role of the (business) consultant. This implies that the competences the researcher needs in the practice stream should reflect the competences of the

business consultant[37]. This suggests the need for understanding of the nature of problems in organizations, the nature of client-centered activities, the issues involved in building and sustaining a consultant-client relationship, and the nature of power and politics in the context of intervention (Eden & Huxham, 1996). The practice stream requires that the researcher does not only have a lot of knowledge about the concept under investigation, but also has the skills to put the same concept into practice (Kaplan, 1998). The researcher should not only have the ability to bring about intended consequences (Argyris, 1996), but also the ability to establish conditions for the development of others (Susman & Evered, 1978).
The design-oriented researcher is moving back and forth between the two worlds of solving problems and generating design knowledge. The knowledge stream represents the world of the scientist, while the practice stream represents the world of the practitioner. The researcher should not only have the knowledge and skills to operate effectively in both worlds, but also possess the ability to continuously switch between these two worlds.

Participant and observer

Next to awareness about the different "hats" a design-based researcher wears, he should also be aware of his contribution in the process of solving the problem in the practice stream. The question then is: what is the contribution of the researcher to this process? What does the researcher add to the process of applying the solution concept?
Inherent to the combination of the regulative and the reflective cycle, the researcher has to be a (problem solving) participant and a (reflective) observer at the same time. The question however is, how much of a participant and how much of an observer the researcher will be. Whereas participation provides access to the organization and the process, the role of the observer is needed for objective reflection. This implies that, in order to be effective in DBR, the researcher should establish a balance between the role of observer and participant ('t Hart et al., 1998).
Reflecting on the role we have played within this research, a distinction can be made between the alpha tests (Cases 1-4) and the β-tests (Cases 5-7). Whereas the researcher was more directly involved in the former, he was more indirectly involved in the latter. Considering our active role in the alpha tests, the role of the researcher could probably be described as "participant as observer" (Lee, 1999), or "active member researcher" (Adler & Adler, 1987). Considering our distant role in the β-tests, the role of the researcher could probably be described as "observer as participant" (Lee, 1999) or "peripheral member researcher" (Adler & Adler, 1987).

DBR: How to balance adequate subjectivity with adequate objectivity

The main methodological issue related to the rigor of DBR seems to be the dilemma how to balance adequate subjectivity with adequate objectivity. On the one hand the researcher has to believe in the appropriateness and effectiveness of the solution concept, has to build (intimate) working relationships, and commits itself to solving specific problems. On the other hand the researcher has to stay detached in order to secure objective evaluation and generate knowledge that can be transferred to other contexts than the one in which it was developed.
This dilemma is also reflected in the role of the design-oriented researcher in general and his role in the practice stream in particular. Awareness about this dilemma and the options a researcher has, will contribute to better adjust the role of the researcher to the objectives of the research and thus contribute to generating more objective results.

[37] According to Eden and Huxham (1996), this implies that action research is likely to be a problematic research methodology for doctoral students, which (based on the experiences within the beta tests) seems to be confirmed in this research.

9.3 Issues related to rigor in this research

The aim of DBR is to develop knowledge that can be used to help solve practical problems. In Chapter 2 we argued that the validity of the solution concept will not only be judged by the scientific community (has the research been conducted properly?), but also by the users in the field of application (does the solution work in practice?). This combination of scientific and practical validity is called *pragmatic validity* (Worren et al., 2002).
After testing the method in seven cases, we concluded that it seems to work under certain conditions. However, several remarks can be made with regard to the validity of this conclusion. These have to do with the exclusion of rival explanations, the level of theoretical saturation, and the generalizability of the solution concept.

9.3.1 Rival explanations

At first we did not explicitly take the concept of rival explanations (Campbell & Stanley, 1963; D.J. Cook, 1983; Yin, 2000, 2003) into account. The literature suggests that the researcher should actively look for, and be aware of, all potential alternative explanations for an effect, and then find those that are the most plausible.
In our analysis we assumed that the effects observed were the result of applying the method. We did not systematically address all possible rival explanations, and thus did not provide the opportunity to draw different conclusions from the same observations.
In the literature (Yin, 2000, 2003), distinction is made between "craft rivals" and "real-life rivals". Craft rivals deal specifically with methodological issues, such as concerns about internal validity and problems with biased data collection. Real-life rivals on the other hand, take into account forces that may or may not be controllable. In a sense, the previous section (rigor in the DBR approach) elaborated on the craft rivals in DBR.
In our research we tried to rule out the threat of "researcher bias" (Yin, 2003) through performing a series of β-tests (Case 5-7). However, considering the dilemma in the previous section (how to balance adequate subjectivity with adequate objectivity in DBR?) we should have built in more methods to further reduce the threat of researcher bias. For example, we could have employed triangulation (Baumgartner & Bell, 2002), and we could have made our values and ethics explicit (Susman & Evered, 1978).
With regard to the real-life rivals, we think we should have paid more attention to the rivals related to the targeted intervention (Yin, 2003). Were the effects observed really the result of applying our method? Did other (related) interventions account for the result?

9.3.2 Theoretical saturation

Second, in Chapter 2 we argued that the aim of a DBR project is to reach the point of *theoretical saturation* (Eisenhardt, 1989). This is the point where any additional testing does not add substantially to our understanding. As suggested in literature (Van Aken, 2005), we developed our solution concept (the KP-enhancer) through multiple case studies. In total we tested the method seven times. We went through a stage of alfa testing (Case 1-4) and a stage of β-testing (Case 5-7) in order to increase the objectivity of the findings. We continuously improved the design during the process and performed a cross-case analysis (Yin, 2003) before drawing up the final version of the method.
Considering the findings in the case studies and the subsequent changes in the design, the major findings and changes took place in the first four of case studies. The cases that followed seemed to confirm the initial findings and helped to uncover patterns between different cases. Unveiling these patterns helped to further refine the design. However, we did not reach the point of theoretical saturation. The far reaching proposals for further improvement of the KP-

enhancer at the end of Chapter 8 indicate that still much can be learned from further improving and testing the method. To come closer to the point of theoretical saturation, the method should be further tested, in particular the elements that are suggested after the final iterations (Case 5-7).

9.3.3 Generalizability

Generalizability of research findings is considered an important criterion for scientific rigor. This is indeed important when the research aims at developing explanatory knowledge. However, the aim of DBR is to produce prescriptive solution concepts. These concepts use heuristic rules that will never be generalizable as they always need to be adjusted by a skilled professional to the local context. Therefore, in DBR the issue is not generalizability but transferability of knowledge. Transferability of solution concepts requires two things: first, it requires that the solution concept is applicable and effective in other contexts than the one in which it was developed. Second, it requires that the solution concept is well documented and can be transferred from the developer to the potential user (professional in the field).

Applicability and effectiveness in other contexts

Inherent to solution concepts, the method has to be interpreted by the (KM) professional in the field, and adjusted to the specific context of application. In our research, in particular in the β-tests, we concluded that the facilitator is inextricable bound up with the method. Therefore, DBR should not only focus on describing the intervention, but also on describing the interventionist. What are the general requirements with regard to a facilitator? What are the specific knowledge and skills he/she should possess in order to be able to apply the method successfully?

Transfer from developer to user

According to Van Aken (2004a), a solution concept should be "well-documented". A completed design should give all the information needed (Van Aken, 2007). Therefore, solution concepts require "thick descriptions" (Geertz [1973] in Van Aken, 2004a) to support their understanding and to facilitate their translation from the general to the specific context. Within this research, in particular in the β-tests, we experienced how difficult it is to transfer a management method to third parties. Not because it is difficult to produce thick descriptions, but because it is difficult to produce practical descriptions which provide the minimum of information necessary to apply the method successfully.

On reflection, it can be questioned whether thick descriptions contribute to the transferability of the method. In this research we experienced that direct (person-to-person) knowledge transfer was much more effective than the indirect (via documents) knowledge transfer. So, the challenge is not to produce thick descriptions, but "thin descriptions". Because a guideline can only partly frame the experiences with the method, transfer of the method also requires direct (person-to-person) knowledge transfer in order to enrich the information in the guideline. In this sense, the transfer of a solution concept also requires "thick conversations".

Another issue related to transferability is that we experienced that the professionals in the field did not only want to be an executor of the method. They also wanted to add elements based on their own experience. Having the possibility to add elements seemed to contribute to the motivation and effectiveness of the facilitators. As solution concepts are developed for professionals, and as professionals are to a large extent self-motivated, it could be argued that solution concepts should leave room for some degrees of "professional freedom".

As we believe that the person applying the method is part of the method we do not believe that this method can completely be transferred through a guideline. Some parts of the method,

like the skills of the facilitator, will always remain implicit. We can describe them as good as possible, but we cannot transfer them. Therefore, in the context of a design-based research project, *guidance* would perhaps be a better name than guideline, because the intention is not to provide a fixed set of routines, but to provide direction and advise.

Summary

KNOWLEDGE PRODUCTIVITY

DESIGNING AND TESTING A METHOD TO DIAGNOSE KNOWLEDGE PRODUCTIVITY AND PLAN FOR ENHANCEMENT

Problem statement and research question

Our economy has changed from an industrial into a knowledge economy in which the competitive advantage of organizations is based on the capability of exploiting knowledge resources (Drucker, 1993). The consequence of this transformation is that managers have lost sight of the sources of productivity and productivity growth, because the existing management methods and concepts are based on an industrial model of the organization. The lack of appropriate techniques to reveal knowledge productivity (KP) hinders organizations to design effective policies aimed at improving knowledge-based performance.

Therefore, the objective of this research is to develop a method that helps organizations to make a diagnosis of their knowledge productivity and develop a plan for enhancement. This objective is translated into the following research question:

> *How can we design and test a management method that helps knowledge-intensive organizations to make a diagnosis of their knowledge productivity and develop a plan to enhance it?*

In order to answer this question we broke down the main question into six sub questions. In this summary we will answer these questions before returning to the main question.

1. How can we design and test a management method?
2. What is meant by knowledge productivity?
3. How can we diagnose knowledge productivity?
4. How can we plan knowledge productivity enhancement?
5. What does the (initial) management method look like?
6. What can we learn from applying the method in practice?

Methodology (Sub question 1)

As the aim is to design and test a method, this research follows a design-based research (DBR) approach as developed by Van Aken (1994; 1996; 2004a; 2005; 2007). DBR is driven by the desire to increase the practical relevance of research and reconcile the rigor-relevance dilemma. The defining characteristics of DBR are its interest in solving field problems on the one hand, and its focus on developing solution concepts on the other. As a consequence, DBR simultaneously takes place in and contributes to both theory and practice. As science and practice operate in different reputation systems, the outcome of DBR is justified by pragmatic validity.

Based on these characteristics we designed our research in three phases. The first phase is mainly academic and descriptive and aims at the development of an initial design of our method. In the second phase the method is applied in its intended context of application, in order to assess its effectiveness and to improve the initial design. Finally, in the third phase transferable knowledge is developed; knowledge that can be used by others than those involved in this research for solving similar problems in similar contexts.

Literature review (Sub questions 2-4)

In the literature about knowledge productivity, we see two different approaches (Stam et al., 2004). Whereas the first emphasizes the word *knowledge* and aims at improving the process of knowledge creation (Kessels, 1996, 2001b; Nonaka & Takeuchi, 1995; Weggeman, 1997, 2001), the second emphasizes the word *productivity* and aims at measuring the rate of KP (Andriessen, 2004a; Edvinsson & Malone, 1997; Stewart, 1997; Sveiby, 1997; Zegveld, 2000, 2004a). Although distinct approaches, they are related in the sense that they both search for more appropriate instruments to reveal and improve knowledge-related performance. Within the context of this research, the first approach is labelled *knowledge management* (KM). The second approach is labelled *intellectual capital measurement*. Knowledge management refers to deliberate activities that aim at improving knowledge productivity. Intellectual capital measurement refers to the discipline of identifying and measuring intangible resources. The concept of knowledge management and of intellectual capital measurement enhance each other because the increased awareness about knowledge-based performance through measurement stimulates the ability to develop policies for improvement (Mouritsen et al., 2002). This relationship between knowledge management and intellectual capital measurement is used and tested in this research.

What is meant by knowledge productivity (Sub question 2)?

In this research we define knowledge productivity as *the process of knowledge creation that leads to incremental and radical innovation*. The three core elements in this definition are "the process of knowledge creation", "incremental and radical innovation", and "leads to". First, the process of knowledge creation refers to a combination of related activities in which knowledge is created. The activities in the knowledge creation process are referred to as knowledge processes such as: developing knowledge; sharing knowledge; applying knowledge; and evaluating knowledge. Second, incremental and radical innovation refers to the results that follow from applying the knowledge that was created in the process of knowledge creation. Incremental innovation refers to improvements of existing practice (doing things better). Radical innovation refers to radical changes that deviate from existing practice (doing better things). Third, leads to refers to the application of knowledge in the sense of personal abilities. This implies that the process of knowledge creation does not automatically lead to innovation. Knowledge creation leads to knowledge which is used to generate incremental and radical innovation.

How can we diagnose knowledge productivity (Sub question 3)?

As Kessels' (1996) Corporate Curriculum provides insight in the process of knowledge creation, and as Zegveld's (2000) Quantitative Framework provides insight in incremental and radical innovation, the combination of these two models covers the main elements in our definition of knowledge productivity. Therefore we decided to combine the Corporate Curriculum and the Quantitative Framework in our conceptual framework for diagnosing knowledge productivity.

The Corporate Curriculum (Kessels, 1996) is a plan for learning and consists of seven learning functions: the ability to acquire subject matter expertise, the ability to solve problems, the ability to reflect, the ability to communicate and collaborate, self-regulation of motivation, stability and peace, and creative turmoil. Improvement of these learning functions leads to an enhanced ability to improve and renew.

The Quantitative Framework (Zegveld, 2000) defines the result of the knowledge creation process in terms of incremental and radical innovation. The Quantitative Framework helps to detect these two types of innovation. Whereas incremental innovation is detected by

calculating the contribution of a generic strategy to the build up of Operational Cash Flow, radical innovation is detected by calculating the build up of the residual. The aim of both calculations is to detect change in the build up.

How can we plan knowledge productivity enhancement (Sub question 4)?

After the diagnosis of knowledge productivity, the aim is to develop a plan to enhance it. Based on a comparison of different intellectual capital measurement methods we concluded that the Danish Intellectual Capital Statement Model (Danish Guideline) (STI, 2003b) is a useful method to support the process of planning for knowledge productivity enhancement. The Danish Guideline fits the aim of this research because it provides an intellectual capital measurement framework to plan knowledge management initiatives.

Design of the method (Sub question 5)

Combining the Corporate Curriculum, the Quantitative Framework, and the Danish Intellectual Capital Statement Model led to a first design of our method, which we named the Knowledge Productivity Enhancer (KP-enhancer). It consists of three phases (Figure 1). The aim of the first phase is to identify problems to be solved and to set the objectives for applying the method. The aim of the second phase is to gather data and to diagnose the current situation with regard to knowledge productivity. The aim of the third phase is to formulate a plan for knowledge productivity enhancement (KP-statement).

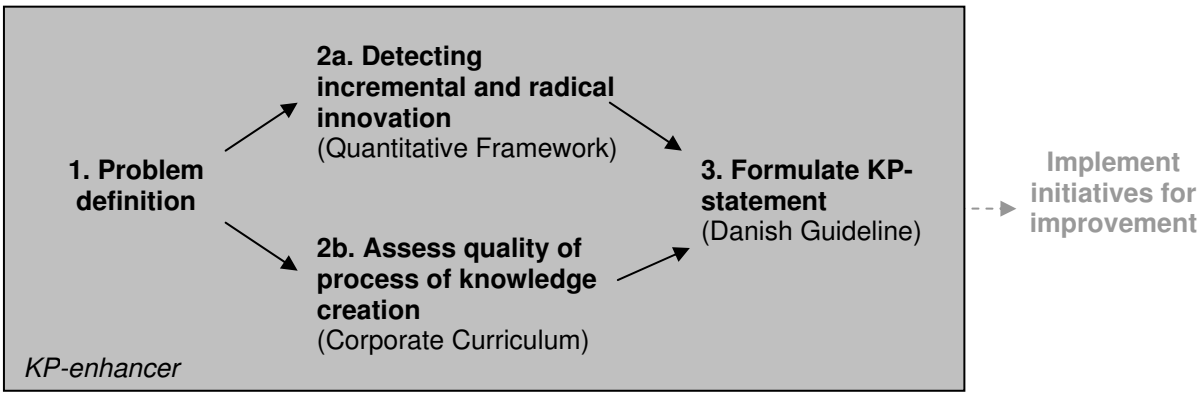


Figure 1: The initial design of the KP-enhancer

The initial method consisted of a web-based questionnaire that assesses the quality of the learning functions of the Corporate Curriculum. Based on the literature review, each of the learning functions was operationalized in ten statements, which resulted in a survey of seventy statements. In order to make the Quantitative Framework more practical we decided to reduce the number of measurements. In order to plan for enhancement we decided to follow the steps as suggested by the Danish Guideline.

In practice, the method consisted of a questionnaire for all the employees (±25 min.); application of the Quantitative Framework based on financial data; two workshops of three hours with a representative selection of the employees (5-10); an interview (two hours) with the client about the problem to be solved at the beginning of the project; and a presentation of the final product (KP-statement) to the client at the end of the project. The expected lead-time was three months.

Empirical study (Sub question 6)

In order to test the effectiveness of the KP-enhancer, we applied our method in seven cases. In the first four cases the method was applied by the researcher himself (α-test). In order to increase the objectivity of the outcome of this research, the method was applied by third parties in the last three cases (β-test).

During the test phase we modified our method three times. The main change we made was the removal of the Quantitative Framework from our method. The main reasons for this were the difficulties to get access to sufficient data and the difficulties the client had translating the concepts of incremental and radical innovation (in this framework) to their own practice. Another reason was that we came to the conclusion that we did not need these measurements in order to be able to make a plan for knowledge management.

Another change we made was that we added a KP board game in order to enhance coherence between the different phases and to make the method more participative. In addition, as we found out that the process of formulating a KP-statement (based on the Danish Guideline) was too complex and too time-consuming, we decided to simplify this process. Furthermore, we continuously tried to improve our questionnaire through statistical analysis.

The final version of the KP-enhancer consists of a web-based questionnaire that assesses the quality of the learning functions of the Corporate Curriculum and the innovation profile of the employees (±25 min.), three workshops of three hours with a representative selection of the employees (5-10), an interview (two hours) with the client about the problem to be solved at the beginning of the project, and a presentation of the final product (KP-statement) to the client at the end of the project. The lead time of the method is between four and six months.

Conclusion

Through our research, we gained insight into the effectiveness of the KP-enhancer, the class of problems for which it can be used, the generative mechanisms that make the method work, the class of contexts in which it can be effective and its conditions for success. We also identified several possibilities for further improvement of the method. In addition, we developed further insight into the usefulness of the concept of knowledge productivity and the way it can be assessed and enhanced.

Considering the effects of applying the method in practice, it seems we succeeded in helping organizations to diagnose knowledge productivity and plan for enhancement. However, based on our experiences in the final tests and the subsequent far-reaching suggestions for further improvement, we conclude that the point of theoretical saturation has not been reached yet. Additional research is needed to further develop and test the KP-enhancer.

Class of problems

Based on a cross-case analysis of the seven case studies we gained insight into the class of problems for which the KP-enhancer can be used. We concluded that it seems the KP-enhancer can be described as a management method that helps an organization to plan KM initiatives through creating awareness about KP in general and through assessing the quality of the process of knowledge creation in particular. The method can be used either to translate organizational strategy into KM initiatives, or to connect existing KM initiatives to strategic objectives. The result of the method (the KP-statement) helps to improve communication about KM initiatives during the implementation phase that follows the planning phase. Therefore, the KP-enhancer seems to contribute to:

1. creating awareness about the importance of knowledge productivity;
2. assessing the quality of the process of knowledge creation;
3. developing a plan for knowledge management;

4. aligning (existing) KM initiatives with the strategic objectives;
5. improving (internal) communication about knowledge management.

Generative mechanisms

With regard to the generative mechanisms that can explain why it works, we argue that the KP-enhancer might produce these effects because:

1. it makes sense of knowledge productivity;
2. it is participative in the sense that it involves people;
3. it is stimulating, in the sense that it activates people;
4. it is collaborative, across departments and hierarchies;
5. it is reflective, which is necessary to learn;
6. it is purposeful, which justifies KM initiatives;
7. it is action-oriented, which is appreciated by the management;
8. it helps to explain the logic of KM;
9. it supports the management decision process.

Class of contexts

With regard to the class of contexts in which it can be effective we learned that the KP-enhancer can be applied to mid-sized (50-250 employees) knowledge-intensive organizations, or knowledge-intensive departments (50-250 employees) within large organizations. These can be private or public organizations, profit or not-for-profit.

Conditions for successful application

We also gained more insight into the conditions under which the KP-enhancer is most effective. It seems that the method is most effective when:

1. the person applying the method does not only have knowledge about the main concepts of the method, but also about the context in which it is applied. In addition he/she should have the ability to facilitate the participants through the process;
2. the motive for applying the method is problem-driven;
3. the method is applied in the context of an existing KM initiative;
4. the management actively contributes to the application of the method;
5. the epistemology of the organization is in line with the epistemology of the method.

Further improvement

Based on the experiences in the β-tests and the cross-case analysis, we see several possibilities for further improvement of the method. We suggest:

1. to add an epistemology check to the first phase of the method;
2. to explicitly address the issue of relationships between the different learning functions and the different types of results to our diagnosis framework;
3. adding a systematic analysis of the underlying causes for poor performance of the learning functions.

Knowledge productivity revisited

In addition to better insight into the functioning of the our method, we gained insight into the concept of knowledge productivity and the relation of this concept to other concepts. First, we learned that thinking about KP in terms of incremental and radical innovation may contribute to planning for knowledge management. Second, we learned that the concept of knowledge

productivity may arouse wrong expectations related to the industrial meaning of the word productivity. Third, we learned that the concept of the Corporate Curriculum and the concept of knowledge management, both in theory and in practice, go together very well.

Samenvatting

KENNISPRODUCTIVITEIT

HET ONTWERPEN EN TESTEN VAN EEN METHODE OM EEN DIAGNOSE TE MAKEN VAN KENNISPRODUCTIVITEIT EN EEN PLAN TE MAKEN VOOR VERBETERING.

Probleemstelling en onderzoeksvragen

Onze economie is veranderd van een industriële economie naar een op kennis gebaseerde economie waarin het concurrentievoordeel van organisaties wordt bepaald door de mate waarin zij in staat zijn hun kennisbronnen te benutten (Drucker, 1993). De consequentie van deze transformatie is dat managers geen zicht meer hebben op de bronnen van productiviteit en de productiviteitsontwikkelingen, omdat de bestaande management methoden en concepten gebaseerd zijn op een industrieel model van de organisatie. Het ontbreken van geschikte technieken om kennisproductiviteit (KP) zichtbaar te maken verhindert organisaties om effectief beleid te ontwikkelen gericht op het verbeteren van op kennis gebaseerde prestaties.

Daarom is het doel van dit onderzoek om een methode te ontwikkelen waarmee organisaties een diagnose kunnen maken van hun kennisproductiviteit en vervolgens een plan kunnen maken voor verbetering van hun op kennis gebaseerde prestaties. Dit doel hebben we vertaald in de volgende onderzoeksvraag:

> *Hoe kunnen we een management methode ontwikkelen en testen om kennisintensieve organisaties te helpen om een diagnose te maken van hun kennisproductiviteit en een plan te maken voor verbetering van hun kennisproductiviteit?*

Om deze vraag te beantwoorden hebben we zes subvragen geformuleerd. In deze samenvatting geven we kort antwoord op deze vragen om vervolgens terug te keren bij de hoofdvraag van dit onderzoek.

1. Hoe kunnen we een management methode ontwikkelen en testen?
2. Wat wordt bedoeld met kennisproductiviteit?
3. Hoe kunnen we een diagnose maken van kennisproductiviteit?
4. Hoe kunnen we een plan maken voor verbetering van kennisproductiviteit?
5. Hoe ziet de management methode er uit?
6. Wat kunnen we leren van de toepassing van de methode in de praktijk?

Methodologie (Subvraag 1)

Aangezien het doel van dit onderzoek is om een methode te ontwikkelen en te testen, volgen we de ontwerpbenadering zoals ontwikkeld door Van Aken (1994; 1996; 2004a; 2005; 2007). Ontwerpgericht onderzoek wordt gemotiveerd door de wens tot vergroting van de relevantie van onderzoeksuitkomsten. Ontwerpgericht onderzoek wordt gekenmerkt door enerzijds de interesse in het oplossen van specifieke problemen in de praktijk en anderzijds het ontwikkelen van algemene oplossingsconcepten. Als gevolg hiervan vindt ontwerpgericht onderzoek tegelijk plaats in een wetenschappelijke- en in een praktijkstroom. Aangezien wetenschap en praktijk er verschillende maatstaven voor betrouwbaarheid op na houden, wordt de uitkomst van ontwerpgericht onderzoek verantwoord op basis van pragmatische validiteit.

Gebaseerd op deze kenmerken van ontwerpgericht onderzoek hebben we ons onderzoek opgezet in drie delen. Het eerste deel is vooral academisch en beschrijvend en richt zich op het ontwikkelen van een eerste ontwerp van onze methode. In het tweede deel wordt de

methode toegepast in het toepassingsgebied waarvoor hij ontwikkeld is. Het doel hiervan is de effectiviteit van de methode te onderzoeken en mogelijk te verbeteren. Tenslotte, in het derde deel wordt algemeen toepasbare en overdraagbare kennis ontwikkeld: kennis die kan worden gebruikt door derden (niet betrokken bij het onderzoek) voor het oplossen van soortgelijke problemen in soortgelijke situaties.

Literatuuronderzoek (Subvragen 2-4)

In de literatuur over kennisproductiviteit zien we twee verschillende benaderingen (Stam et al., 2004). Terwijl in de eerste benadering de nadruk wordt gelegd op het woord *kennis* en wordt gestreefd naar de verbetering van het proces van kenniscreatie (Kessels, 1996, 2001b; Nonaka & Takeuchi, 1995; Weggeman, 1997, 2001), wordt in de tweede benadering de nadruk gelegd op het woord *productiviteit* en wordt de nadruk gelegd op het meten ervan (Andriessen, 2004a; Edvinsson & Malone, 1997; Stewart, 1997; Sveiby, 1997; Zegveld, 2000, 2004b). Hoewel verschillend, deze benaderingen zijn aan elkaar verwant omdat ze allebei op zoek zijn naar betere concepten om uitdrukking te geven aan kennisproductiviteit (zodat deze vervolgens kan worden verbeterd). In dit onderzoek wordt verwezen naar de eerste benadering als *kennismanagement* (KM) en naar de tweede als het *meten van intellectueel kapitaal*. Kennismanagement wordt in dit onderzoek gedefinieerd als bewuste activiteiten die er op gericht zijn de kennisproductiviteit te verbeteren. Het meten van intellectueel kapitaal is de discipline die zich bezighoudt met het identificeren en meten van immateriële bedrijfsmiddelen. Het concept kennismanagement en het meten van intellectueel kapitaal kunnen elkaar versterken omdat meer bewustzijn over de op kennis gebaseerde prestaties bijdraagt aan het vermogen om beleid te maken voor verbeteringen. Deze relatie tussen kennismanagement en het meten van intellectueel kapitaal wordt in dit onderzoek gebruikt en getest.

Wat wordt bedoeld met kennisproductiviteit (Subvraag 2)?

In dit onderzoek wordt kennisproductiviteit gedefinieerd als *het proces van kenniscreatie dat leidt tot incrementele en radicale vernieuwingen*. Ten eerste, het "proces van kenniscreatie" heeft betrekking op de combinatie van activiteiten waarin kennis tot stand komt. In de literatuur wordt naar deze activiteiten verwezen als kennisprocessen, zoals het ontwikkelen van kennis, het delen van kennis, het toepassen van kennis en het evalueren van kennis. Ten tweede, "incrementele en radicale vernieuwingen" heeft betrekking op de resultaten die het gevolg zijn van de toepassing van kennis die tot stand is gekomen in het proces van kenniscreatie. Incrementele vernieuwingen verwijst naar de verbeteringen van bestaande activiteiten (de dingen beter doen). Radicale vernieuwingen verwijst naar veranderingen die fundamenteel afwijken van de bestaande activiteiten (betere dingen doen). Ten derde, "dat leidt tot" verwijst naar de toepassing van kennis die tot stand is gekomen in het proces van kenniscreatie. Hieruit kan worden afgeleid dat het proces van kenniscreatie niet automatisch leidt tot incrementele en radicale vernieuwingen. Kenniscreatie leidt tot kennis, die vervolgens wordt toegepast om vernieuwingen te realiseren.

Hoe kunnen we een diagnose maken van kennisproductiviteit (Subvraag 3)?

Aangezien het Corporate Curriculum van Kessels (1996) inzicht geeft in het proces van kenniscreatie, en aangezien het Quantitative Framework van Zegveld (2000) inzicht geeft in incrementele en radicale vernieuwingen, dekt de combinatie van deze modellen de hoofdelementen in onze definitie van kennisproductiviteit. Daarom hebben we besloten het Corporate Curriculum en het Quantitative Framework in onze methode te combineren als conceptueel raamwerk voor het maken van een diagnose van kennisproductiviteit.

Het Corporate Curriculum (Kessels, 1996) is een leerplan en bestaat uit zeven leerfuncties: materiedeskundigheid, het vermogen om problemen op te lossen, het vermogen om te reflecteren, het vermogen om te communiceren en samen te werken, zelfregulatie van motivatie, stabiliteit, en rust en creatieve onrust. Verbetering van deze leerfuncties leidt tot versterking van het vermogen om te verbeteren en te vernieuwen.

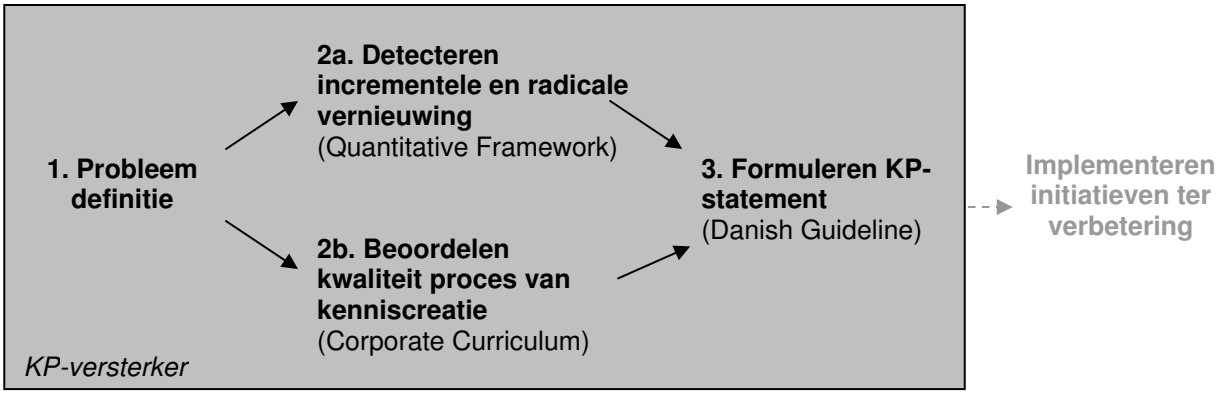
Het Quantitative Framework (Zegveld, 2000) definieert het resultaat van het proces van kenniscreatie als incrementele en radicale innovaties. Het Quantitative Framework helpt om deze twee typen innovatie te detecteren. Incrementele innovatie wordt gedetecteerd door de bijdrage van een generieke strategie aan de opbouw van de operational cash flow te berekenen. Radicale innovatie wordt gedetecteerd door het berekenen van de opbouw van het residu. Bij beiden gaat het om het detecteren van een verandering in de opbouw.

Hoe kunnen we een plan maken voor verbetering van kennisproductiviteit (Subvraag 4)?

Gebaseerd op een vergelijking van verschillende methoden voor het meten van intellectueel kapitaal hebben we de conclusie getrokken dat het Deense Intellectual Capital Statement Model (Danish Guideline) (STI, 2003b) een bruikbaar model is voor het maken van een plan voor verbetering van kennisproductiviteit. De Danish Guideline sluit goed aan bij dit onderzoek omdat het richting geeft aan kennismanagement vanuit het perspectief van het meten van intellectueel kapitaal.

Ontwerp van de methode (Subvraag 5)

Vervolgens hebben we een eerste ontwerp gemaakt van onze methode, die we de naam Kennisproductiviteit Versterker (KP-versterker) hebben gegeven. De KP-versterker combineert het Corporate Curriculum, het Quantitative Framework en de Danish Guideline en bestaat uit drie fasen (Figuur 1). Het doel van de eerste fase is om het probleem vast te stellen en het doel van de toepassing van de methode te bepalen. Het doel van de tweede fase is om data te verzamelen en een diagnose te maken van de kennisproductiviteit. Ten slotte het doel van de derde fase is om een plan te maken voor de versterking van kennisproductiviteit (KP-statement).



Figuur 1: Het aanvankelijke ontwerp van de KP-versterker

De aanvankelijke methode bestond uit een electronische vragenlijst die inzicht geeft in de kwaliteit van de zeven leerfuncties van het Corporate Curriculum. Gebaseerd op het literatuuronderzoek hebben we iedere leerfunctie geoperationaliseerd in tien stellingen, hetgeen resulteerde in een vragenlijst van zeventig stellingen. Teneinde het Quantitative Framework praktischer te maken, besloten we het aantal metingen terug te brengen. Voor het opstellen van het KP-statement besloten we de stappen te volgen zoals gesuggereerd in de Danish Guideline.

In praktijk bestond de methode uit een vragenlijst voor alle medewerkers (±25 min.), de toepassing van het Quantitative Framework op basis van aangeleverde financiële gegevens, twee workshops voor een representatieve selectie van medewerkers (5-10), een interview met de klant (twee uur) over het op te lossen probleem en een presentatie van het eindproduct (KP-statement) aan het einde van het project. De verwachte doorlooptijd was drie maanden.

Empirisch onderzoek (Subvraag 6)

Teneinde de effectiviteit van KP-versterker te testen hebben we onze methode in zeven situaties toegepast. In de eerste vier gevallen is de methode toegepast door de onderzoeker zelf (α-test). Om de objectiviteit van de uitkomsten te vergroten is de methode vervolgens ook nog eens drie keer toegepast door personen die niet betrokken zijn geweest bij het ontwikkelproces (β-test).
Gedurende de test fase hebben we onze methode drie keer aangepast. De meest ingrijpende aanpassing was de beslissing om niet door te gaan met het Quantitative Framework. De belangrijkste redenen hiervoor waren problemen met beschikbaarheid van voldoende data en problemen met de vertaling van de gebruikte concepten naar de situatie van de klant. Een andere conclusie was, dat we ontdekten, dat we de metingen uit het Quantitative Framework niet nodig hadden voor het opstellen van een plan voor kennismanagement.
Een andere aanpassing aan het ontwerp was de toevoeging van een bordspel teneinde de samenhang tussen de verschillende fasen te vergroten en om de methode participatiever te maken. Verder, omdat we de Danish Guideline te complex en te tijdrovend vonden, hebben we het proces voor het opstellen van een KP-statement eenvoudiger gemaakt. Tenslotte hebben we aldoor geprobeerd de vragenlijst te verbeteren met behulp van statistische analyse.
De laatste versie van de KP-versterker bestaat uit: een elektronische vragenlijst met betrekking tot de kwaliteit van de zeven leerfuncties van het Corporate Curriculum en het innovatieprofiel van de medewerkers (±25 min.); drie workshops van drie uur met een representatieve selectie van medewerkers (5-10); een interview met de opdrachtgever (twee uur) aan het begin van het project en een presentatie van het eindproduct (KP-statement) aan het einde van het project. De doorlooptijd van de methode is tussen de vier en zes maanden.

Conclusies

Door ons onderzoek hebben we inzicht verkregen in de effectiviteit van de KP-versterker, het toepassingsgebied en het toepassingsdomein van de methode, de *generative mechanisms* die er voor zorgen dat de methode werkt en tenslotte de condities waaronder de methode het best kan worden toegepast. Verder hebben we een aantal mogelijkheden voor verdere verbetering van de KP-versterker geidentificeerd. Tenslotte hebben we door dit onderzoek beter inzicht gekregen in de bruikbaarheid van het concept kennisproductiviteit, de manier waarop inzicht kan worden verkregen in kennisproductiviteit en de manier waarop het kan worden verbeterd.
Kijkend naar de effecten van de toepassing van de methode in de praktijk, lijken we er in te zijn geslaagd om organisaties te helpen bij het maken van een diagnose van hun kennisproductiviteit en het maken van een plan voor verbetering. Echter, wanneer we kijken naar de resultaten van de laatste tests en de daaruit volgende ingrijpende suggesties voor verdere verbetering, moeten we concluderen dat we het punt van verzadiging van bewijsvoering (theoretical saturation) nog niet hebben bereikt. Aanvullend onderzoek is nodig om de KP-versterker verder te ontwikkelen.

Toepassingsgebied

Gebaseerd op een vergelijking van de zeven gevalsstudies hebben we beter inzicht gekregen in het soort problemen (toepassingsgebied) waarvoor de KP-versterker kan worden gebruikt. Samenvattend lijkt het er op dat we de KP-versterker kunnen

omschrijven als een management methode die organisaties helpt een plan te maken voor kennismanagement door het creëren van bewustzijn over kennisproductiviteit in het algemeen en het beoordelen van het proces van kenniscreatie in het bijzonder. De methode kan worden gebruikt om de strategie van de organisatie te vertalen in een plan voor kennismanagement, of om bestaande kennismanagement initiatieven te verbinden met strategische doelen. Het resultaat van de methode (het KP-statement) helpt om de communicatie over kennismanagement initiatieven te verbeteren in de implementatie fase die volgt op de planning fase. Gebaseerd op onze analyse lijkt de methode bij te dragen aan het:

1. creëren van bewustzijn met betrekking tot het belang van kennisproductiviteit;
2. beoordelen van de kwaliteit van het proces van kenniscreatie;
3. ontwikkelen van een plan voor kennismanagement;
4. op één lijn brengen van (bestaande) KM initiatieven met de strategische doelstellingen;
5. verbeteren van de (interne) communicatie over kennismanagement.

Generative mechanisms

Met betrekking tot de redenen waarom de methode werkt, argumenteren wij dat de KP-versterker kan bijdragen aan deze effecten omdat:

1. het betekenis geeft aan het begrip kennisproductiviteit;
2. het participatief is in de zin dat het mensen betrekt;
3. het stimulerend is in de zin dat het mensen activeert;
4. het gericht is op samenwerking tussen afdelingen en hiërarchische niveaus;
5. het reflectief is, hetgeen een voorwaarde is om te leren;
6. het verbinding legt met de doelen van de organisatie;
7. het actiegericht is, hetgeen door het management wordt gewaardeerd;
8. het uitleg geeft aan de logica van KM;
9. het ondersteunend is aan het besluitvormingsproces in organisaties.

Toepassingsdomein

Met betrekking tot het toepassingsdomein waarin deze methode kan worden toegepast, hebben we geleerd dat de methode kan worden toegepast in middelgrote (50-250 medewerkers) kennisintensieve organisaties, of kennisintensieve afdelingen (50-250 medewerkers) van grote organisaties. De methode kan worden toegepast in zowel publieke als private ondernemingen, en zowel in commerciële als niet-commerciële ondernemingen.

Condities voor succesvolle toepassing

De tests hebben ons ook beter zicht gegeven op de condities waaronder de KP-versterker het beste kan worden toegepast. Het lijkt alsof de methode het meest effectief is wanneer:

1. de persoon die de methode toepast niet alleen grondige kennis van de belangrijkste concepten in de methode heeft, maar ook van de situatie waarin de methode wordt toegepast. Verder dient hij/zij te beschikken over het vermogen om een groep door het proces te begeleiden;
2. het motief om de methode toe te passen ‘probleem gedreven’ is;
3. deze wordt toegepast binnen de context van een bestaand KM-initiatief;
4. het management actief deelneemt aan de toepassing van de methode;
5. de epistemologie van de organisatie in lijn is met de epistemologie van de methode.

Verdere verbetering van de KP-versterker

Verder hebben de laatste tests en de vergelijking van de uitkomsten van alle gevalsstudies verschillende mogelijkheden ter verdere verbetering opgeleverd. We suggereren om:

1. een epistemology-check toe te voegen aan de eerste fase;
2. expliciet de relaties tussen het proces van kenniscreatie en de verschillende soorten van vernieuwingen aan het diagnose raamwerk toe te voegen;
3. een systematische analyse van de onderliggende oorzaken van lage scores op de leerfuncties toe te voegen.

Kennisproductiviteit "revisited"

Tenslotte, naast een beter inzicht in de werking van onze methode heeft dit onderzoek ons ook beter inzicht gegeven in het concept kennisproductiviteit en in de relatie van dit concept met andere concepten. Ten eerste hebben we geleerd dat het denken over kennisproductiviteit in termen van incrementele en radicale vernieuwingen bij kan dragen aan het maken van een plan voor kennismanagement. Ten tweede hebben we geleerd dat het concept kennisproductiviteit de verkeerde verwachtingen kan wekken, gerelateerd aan de industriële betekenis van het woord productiviteit. Ten derde hebben we geleerd dat het concept Corporate Curriculum en het concept kennismanagement, zowel in de theorie als in de praktijk, heel goed samen gaan.

References

Abell, A., & Ward, S. (2000). *Skills for knowledge management: building a knowledge economy*. London: TFPL.

Abell, D. F. (1999). Competing today while preparing for tomorrow. *Sloan Management Review, 40* (3), 73-81.

Adler, P. A., & Adler, P. (1987). *Membership roles in field research (Qualitative research methods series 6)*. Newbury Park, CA: SAGE.

Alwert, K. (2005). *Wissensbilanzen fur mittelstandische Organisationen (PhD-thesis).* [Knowledge accounts for mid-sized organizations], Technischen Universitat, Berlin.

Amidon, D. M. (2003). *The innovation superhighway*. Amsterdam: Butterworth-Heinemann.

Andriessen, D. G. (2003). *The value of weightless wealth. Designing and testig a method for the valuation of intangible resources.* Proefschrift, Universiteit Nyenrode, Leiderdorp.

Andriessen, D. G. (2004a). *Making sense of intellectual capital*. Amsterdam: Elsevier Butterworth-Heinemann.

Andriessen, D. G. (2004b). Reconciling the rigor-relevance dilemma in intellectual capital research. *The Learning Organization, 11* (4/5), 393-401.

Andriessen, D. G. (2007). Designing and testing an OD intervention. Reporting intellectual capital to develop organizations. *The Journal of Applied Behavioral Science, 43* (1), 89-107.

Ansoff, H. I., & Sullivan, P. A. (1993). Optimizing profitability in turbulent environments: a formula for strategic success. *Long Range Planning, 26* (5), 11-23.

Argyris, C. (1970). *Intervention theory and method: A behavioral science view*. Reading, MA: Addison-Wesley.

Argyris, C. (1996). Unrecognized defenses of scholars: Impact on theory and research. *Organization Science, 7* (1), 79-87.

Argyris, C., & Schön, D. A. (1978). *Organizational learning*. New York: Addison Wesley.

Argyris, C., & Schön, D. A. (1991). Participatory action research and action science compared: a commentary. In W. F. Whyte (Ed.), *Participatory action research*. London: Sage.

Ausubel, D. P. (1960). The use of advance organizers in the learning and retention of meaningful verbal material. *Journal of Educational Psychology, 51*, 267-272.

Baarda, D. B., & de Goede, M. P. M. (2001). *Basisboek methoden en technieken* [A basic book for research methods and techniques]. Groningen: Stenfert Kroese.

Bateson, G. (1972). *Steps to an ecology of mind*. New York: Ballantine Books.

Baumgartner, E., & Bell, P. (2002). Design-based research: An emerging paradigm for educational inquiry. *Educational Researcher, 32* (1), 5-8.

Bertrams, J. (1999). *De kennisdelende organisatie* [The knowledge sharing organization]. Schiedam: Scriptum.

Blair, M. M., & Wallman, S. M. H. (2001). *Unseen wealth. Report of the Brookings task force on intangibles*. Washington D.C.: Brookings Institution Press.

Boisot, M. H. (1998). *Knowledge assets*. Oxford: Oxford University Press.

Bolhuis, S., & Simons, R. (2001). Naar een breder begrip van leren. [Towards a broader understanding of learning] In J. W. M. Kessels & R. Poell (Eds.), *Human Resource Development. Organiseren van het leren* (pp. 37-52). Groningen: Samsom.

Bonner, S. (1997). Beta testing: Partnering to share the cost of R&D. *Apparel Industry, 58* (4), 74-77.

Bontis, N. (2001). Assessing knowledge assets: a review of the models used to measure intellectual capital. *International Journal of Management Reviews, 3* (1), 41-60.

Bontis, N. (2002). Managing organizational knowledge by diagnosing Intellectual Capital. Framing and advancing the state of the field. In N. Bontis & C. W. Choo (Eds.), *The strategic management of Intellectual Capital and organizational knowledge* (pp. 621-642). Oxford, New York: Oxford University Press.

Bontis, N., Dragonetti, N. C., Jacobsen, K., & Roos, G. (1999). The knowledge toolbox: A review of the tools available to measure and manage intangible resources. *European Management Journal, 17* (4), 391-402.

Campbell, D. T., & Stanley, J. C. (1963). *Experimental and quasi-experimental designs for research*. Chicago: Rand McNally.

Castells, M. (1996). *The rise of the network society. The information age: economy, society and culture*, (Vol. 1). Cambridge, MA; Oxford, UK: Blackwell.

CEC. (2006). *Reporting Intellectual Capital to augment research, development and innovation in SME's. Report to the Commission of the High Level Expert Group on RICARDIS* (No. EUR 22095 EN). Brussels: European Commission, DG-Research.

Choo, C. W. (1998). *The knowing organization. How organizations use information to construct meaning, create knowledge and make decisions*. New York: Oxford University Press.

Christensen, C. M. (2005). *The innovators dilemma*. New York: Collins Business Essentials.

Cook, D. J. (1983). Quasi-experimentation: its ontology, epistemology, and methodology. In G. Morgon (Ed.), *Beyond method: Strategies for social research* (pp. 74-93). London: Sage.

Cook, R. G., Belliveau, P., & VonSeggern, K. L. (2001). A case study of microenterprise training: Beta test findings and suggestions for improvement. *Journal of Developmental Entrepreneurship, 6* (3), 255-267.

Davenport, T. H., & Prusak, L. (1997). *Information ecology: Mastering the information and knowledge environments*. New York: Oxford University Press.

Davenport, T. H., & Prusak, L. (1998). *Kennismanagement in de praktijk* [Working knowledge]. Amsterdam: Contact.

DBRC. (2003). Design-based research: An emerging paradigm for educational inquiry. *Educational Researcher, 32* (1), 5-8.

Dixon, N. (2000). *Common knowledge*. Boston, MA: Harvard Business School Press.

Dolan, R. J., & Matthews, J. M. (1993). Maximizing the utility of customer product testing: Beta test design and management. *Journal of Product Innovation Management, 10* (4), 318-330.

Drew, S. (1999). Building knowledge management into strategy: Making sense of a new perspective. *Long Range Planning, 32* (1), 130-136.

Drucker, P. F. (1981). *Managing in turbulent times*. London: Pan Business Management.

Drucker, P. F. (1993). *De post-kapitalistische maatschappij* [Post-capitalist society]. Schiedam: Scriptum.

Drucker, P. F. (1999). Knowledge-worker productivity: the biggest challenge. *California Management Review, 41* (2), 79-94.

Eden, C., & Huxham, C. (1996). Action research for management research. *British Journal of Management, 7* (1), 75-86.

Edvinsson, L. (2002). *Corporate longitude*. London: Pearson Education.

Edvinsson, L., & Malone, M. S. (1997). *Intellectual capital. The proven way to establish your company's real value by measuring its hidden brainpower*. London: Harper Business.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review, 14* (4), 532-550.

Ekhaml, P., & Ekhaml, L. (1998). Beta testing. What is it and should we do it? , *Technology Connection, 5* (3), 16-17.

Eldredge, N., & Gould, S. J. (1972). Punctuated equilibria: an alternative to phyletic gradualism. In T. J. M. Schopf (Ed.), *Models in Paleobiology* (pp. 82-115). San Francisco: Freeman, Cooper & Co.

Eustace, C. (2000). *The intangible economy. Impact and policy issues. Report of the European High Level Expert Group on the Intangible Economy*: European Commission, Enterprise Directorate-General.

EZ. (1999). *Immateriele productiemiddelen. Balanceren met kennis* [Intangible assets. Balancing with knowledge] (No. 25 B 19). Den Haag: Ministerie van Economische Zaken.

Florida, R. (2002). *The rise of the creative class*. New York: Basic Books.

Garvey, R., & Williamson, B. (2002). *Beyond knowledge management, dialogue, creativity and the corporate curriculum*: FT Prentice Hall.

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, P. S. S., Scott, P., & Trow, M. (1994). *The new production of knowledge - The dynamics of science and research in contemporary societies*. London: Sage Publications.

Giddens, A. (1994). Living in a post-traditional society. In U. Beck, A. Giddens & S. Lash (Eds.), *Reflexive modernization. Politics, tradition and aesthetics in the modern social order.* (pp. 56-109). Cambridge: Polity Press - Blackwell.

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Chicago: Aldine Publishing Company.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal, 17* (10 (Winter Special)), 109-122.

Groen, T., & Vasbinder, J. W. (1999). *Kennis, mensen en organisaties* [Knowledge, people and organizations]. Groningen: Kempen Conseil.

Grossbauer, S. (1998). The benefits to f/s of software beta-tests. *FoodService Director, 11* (11), 158.

Gu, F., & Lev, B. (2001). *Intangible assets. Measurement, drivers, usefulness*.Unpublished manuscript, Boston University/New York University, available at: www.stern.nyu.edu/~blev/.

Gummesson, E. (1991). *Qualitative methods in management research*. Newbury Park, CA: SAGE.

Guthrie, J. (2001). The management, measurement and the reporting of intellectual capital. *Journal of Intellectual Capital, 2* (1), 27-41.

Halman, J. I. M. (1994). *Risicodiagnose in produktinnovatie, Ontwikkeling van de risicodiagnosemethode RDM.* PhD thesis, Technische Universiteit, Eindhoven.

Hamel, G., & Prahalad, C. K. (1993). Strategy as stretch and leverage. *Harvard Business Review, 71* (2), 75-86.

Hamel, G., & Prahalad, C. K. (1994). *Competing for the future*. Boston, Massachusetts: Harvard Business School Press.

Hansen, M. T., Nohria, N., & Tierney, T. (1999). What's your strategy for managing knowledge? , *Harvard Business Review, 77* (2), 106-116.

Harrison, R., & Kessels, J. W. M. (2004). *Human Resource Development in a knowledge economy. An organisational view*. New York: Palgrave Macmillan.

Hedberg, B. L. T. (1981). How organizations learn and unlearn. In P. C. Nystrom & W. H. Starbuck (Eds.), *Handbook of organizational design* (pp. 15-23). New York: Oxford University Press.

Itami, H. (1991). *Mobilizing invisible assets*. Cambridge, MA: Harvard University Press.

Jacobs, D. (1999a). *Het kennisoffensief; slim concurreren in de kenniseconomie* [The knowledge offensive; smart competition in the knowledge economy]. Deventer: Samson.

Jacobs, D. (1999b). *Spel en discipline. Wanneer draagt strategie bij?* [Game and Discipline. When does strategy add value?]. Schiedam: Scriptum Management.

Kaplan, R. S. (1998). Innovation action research: Creating new management theory and practice. *Journal of Management Accounting Research, 10*, 89-118.

Kaplan, R. S., & Norton, D. P. (1999). *Op kop met de Balanced Scorecard* [The Balanced Scorecard]. Amsterdam: Uitgeverij Contact.

Kaplan, R. S., & Norton, D. P. (2004). Measuring the strategic readiness of intangible assets. *Harvard Business Review, 82* (2), 52-63.

Karnani, A. (1984). Generic competitive strategies - an analytical approach. *Strategic Management Journal, 5* (4), 367-380.

Katt, S. F. (2002). Advice to consultancy: Beta test your name. *Rumors & Rants* (June 17), 58.

Kessels, J. W. M. (1996). *Het Corporate Curriculum, Rede uitgesproken bij de aanvaarding van het ambt van bijzonder hoogleraar in de onderwijskundige studie van opleidingen in arbeidsorganisaties* [The Corporate Curriculum]. Leiden: Rijksuniversiteit Leiden.

Kessels, J. W. M. (2000). Kennismanagement: een anachronisme. In E. H. Halbertsma (Ed.), *Dilemma's te lijf. Management van mensen en organisaties* (pp. 53-58). Assen: Van Gorcum.

Kessels, J. W. M. (2001a). Learning in organisations: a corporate curriculum for the knowledge economy. *Futures, 33*, 497-506.

Kessels, J. W. M. (2001b). *Verleiden tot kennisproductiviteit - Rede uitgesproken bij het aanvaarden van het ambt van hoogleraar Human Resource Development aan de faculteit der Toegepaste Onderwijskunde* [Enticing to Knowledge Productivity]. Enschede: Universiteit Twente.

Kessels, J. W. M. (2002a). *De student koning, de school hofleverancier?* [The Student King, the School Purveyor?], Paper presented at the HBO-raad Jaarcongres 2002: De Student is Koning, Pulchri Den Haag, 11 November.

Kessels, J. W. M. (2002b). You cannot be smart against your will. In B. Garvey & B. Williamson (Eds.), *Beyond Knowledge Management* (pp. 47-52). Harlow: Pearson Education.

Kessels, J. W. M., & Keursten, P. (2001). Opleiden en leren in een kenniseconomie: vormgeven van een corporate curriculum. [Education and learning in the knowledge economy: cutting a corporate curriculum] In J. W. M. Kessels & R. Poell (Eds.), *Human Resource Development. Organiseren van het leren* (pp. 5-20). Groningen: Samsom.

Kessels, J. W. M., & Van der Werff, P. (2002). What is beyond knowledge productivity? In T. v. Aken & T. v. Engers (Eds.), *Beyond knowledge productivity: report of a quest* (pp. 19-28). Utrecht: LEMMA.

Keuning, D., & Eppink, D. J. (1998). *Management & organisatie* [Management & organization]. Houten: Stenfert Kroese.

Keursten, P. (1995). De opkomende kennis-economie: kansen en vragen voor opleidingsprofessionals. [The rising knowledge economy: opportunities and questions for educational professionals], *Opleiding en Ontwikkeling* (6), 5-9.

Keursten, P. (2001). Werken aan kennisproductiviteit. Vormgeven aan de leerfuncties van het Corporate Curriculum. [Working at Knowledge Productivity. Cutting the learning functions of the Corporate Curriculum], *Opleiding & Ontwikkeling, Tijdschrift voor Human Resource Development, 14* (6), 25-30.

Keursten, P., Verdonschot, S., Kessels, J., & Kwakman, K. (2006). Relating learning, knowledge creation and innovation: case studies into knowledge productivity. *International Journal of Learning and Intellectual Capital, 3* (4), 405-420.

Keursten, P., Verdonschot, S., Kessels, J. W. M., & Kwakman, K. (2004). Welke factoren zijn bepalend voor kennisproductiviteit. Zestien concrete vernieuwingsprojecten onderzocht. [Which factors are decisive for knowledge productivity. Researching sixteen concrete innovation projects] In C. D. Stam, A. Evers, P. Leenheers, A. De Man & R. Van der Spek (Eds.), *Kennisproductiviteit: het effect van investeren in mensen, kennis en leren* (pp. 153-170). Amsterdam: Pearson Education.

Kuhn, T. S. (1996). *The structure of scientific revolutions*. Chicago: The University of Chicago Press.

Lee, T. W. (1999). *Using qualitative methods in organizational research*. Thousand Oaks, CA: SAGE.

Leenheers, P. (2004). Het creeren van zingeving voor kennisproductiviteit. [Making sense for knowledge productivity] In C. D. Stam, A. Evers, P. Leenheers, A. De Man & R. Van der Spek (Eds.), *Kennisproductiviteit: het effect van investeren in mensen, kennis en leren* (pp. 217-232). Amsterdam: Pearson Education.

Leonard-Barton, D. (1995). *Wellsprings of knowledge, building and sustaining the sources of innovation*. Boston, MA: Harvard Business School Press.

Lev, B. (2001). *Intangibles. Management, measurement, and reporting*. Washington, D.C.: Brookings Institution Press.

Levy, D. (1994). Chaos theory and strategy: theory, application, and managerial implications. *Strategic Management Journal, 15* (Special Summer Issue), 167-178.

Lewin, K. (1946). Action research and minority problems. *Journal of Social Issues, 2* (4), 34-46.

A long winding road out of beta. (2005). Retrieved 4-2, 2007, from http://news.zdnet.com/2102-9588_22-5571590.html

Luehrman, T. A. (1997). What's it worth? A general manager's guide to valuation. *Harvard Business Review, 75* (3), 132-142.

Machlup, F. (1972). *The production and distribution of knowledge in the United States*. Princeton, New Jersey: Princeton University Press.

Mador, M. (Ed.). (2003). *Research methods*. Kingston upon Thames: Kingston University.

Maister, D. (1993). *Managing the professional service firm*. New York: The Free Press.

Malhotra, Y. (2000). Role of organizational controls in knowledge management: is knowledge management really an "oxymoron"? In Y. Malhotra (Ed.), *Knowledge management and virtual organizations*. Hershey: Idea Group Publishing.

Manville, B., & Foote, N. (1996). Strategy as if knowledge mattered. *FastCompany* (02), 66.

March, J. G. (1991). Exploration and exploitation in organizational learning. *Organization Science, 1* (1), 71-81.

Marr, B. (Ed.). (2005). *Perspectives on intellectual capital*. Burlington, MA: Elsevier Butterworth Heinemann.

Marr, B., Gupta, D. K., Pike, S., & Roos, G. (2003). Intellectual capital and knowledge management effectiveness. *Management Decision, 41* (8), 771-781.

MERITUM. (2002). *Guidelines for managing and reporting on intangibles*. Madrid: Commission of the European Communities (TSER-programme).

Mertins, K., Alwert, K., & Heisig, P. (2005). *Wissensbilanzen. Intellektuelles Kapital erfolgreich nutzen und entwickeln* [Knowledge accounts. Successful using and developing intellectual capital]. Berlin: Springer Verlag.

Montequin, V. R., Fernandez, F. O., Cabal, V. A., & Gutierrez, N. R. (2006). An integrated framework for intellectual capital measurement and knowledge management implementation in small and medium-sized enterprises. *Journal of Information Science, 32* (6), 525-538.

Mouritsen, J., Bukh, P. N., Larsen, H. T., & Johansen, M. R. (2001a). Reading an intellectual capital statement. Describing and prescribing knowledge management strategies. *Journal of Intellectual Capital, 2* (4), 359-383.

Mouritsen, J., Bukh, P. N., Larsen, H. T., & Johansen, M. R. (2002). Developing and managing knowledge through intellectual capital statements. *Journal of Intellectual Capital, 3* (1), 10-29.

Mouritsen, J., Bukh, P. N., & Marr, B. (2005). A reporting perspective on intellectual capital. In B. Marr (Ed.), *Perspectives on intellectual capital* (pp. 69-81). Amsterdam: Elsevier Butterworth-Heinemann.

Mouritsen, J., Larsen, H. T., & Bukh, P. N. (2001b). Intellectual capital and the 'capable firm': Narrating, visualising and numbering for managing knowledge. *Accounting, Organizations and Society, 26* (7), 735-762.

Noack, D. (2000). So you wanna be a beta tester? , *Link-Up, 17* (6), 8.

Nonaka, I. (1991). The knowledge creating company. *Harvard Business Review, 69* (6), 96-104.

Nonaka, I., & Takeuchi, H. (1995). *The knowledge creating company*. New York: Oxford University Press.

NORDIKA. (2003). *How to develop and monitor your company's intellectual capital - Tools and actions for the competency-based organisation*. Oslo: Nordic Industrial Fund - The Frame project.

Nowotny, H., Scott, P., & Gibbons, M. (2003). 'Mode 2' revisited: The new production of knowledge. *Minerva, 41* (3), 179-194.

Nowotny, H., Scott, P., & Gibbons, M. (2004). *Re-thinking science - Knowledge and the public in an age of uncertainty*. Cambridge: Polity Press.

OECD. (2005). *Science, technology and industry scoreboard. Towards a knowledge-based economy*. Paris: OECD.

OECD. (2006). *OECD in figures - 2006-2007 edition*. Paris: OECD Publications.

Oost, H. A. (1999). *De kwaliteit van probleemstellingen in dissertaties.* [The quality of research problems in dissertations] PhD thesis, University of Utrecht, Utrecht.

Pascale, R. T., & Athos, A. G. (1983). *The art of Japanese management*: Penguin Books.

Penrose, E. T. (1959). *The theory of the growth of the firm*. Oxford: Basil Blackwell.

Petty, R., & Guthrie, J. (2000). Intellectual capital literature review. *Journal of Intellectual Capital, 1* (2), 155-176.

Pfeffer, J., & Sutton, R. I. (2000). *The knowing-doing gap*. Boston, MA: Harvard Business School Press.

Pilat, D., Cimper, A., Karsten, O., & Webb, C. (2006). *The changing nature of manufacturing in OECD economies*. Paris: OECD, STI Working Paper.

Polanyi, M. (1974). *Personal knowledge*. Chicago: University of Chicago Press.

Polanyi, M. (1983). *The tacit dimension*. Gloucester, Mass.: Peter Smith.

Porat, M. (1978). Global implications of the information society. *Journal of Communications, 28* (1), 70-80.

Porter, M. (1980). *Competitive strategy*. New York, NY: Free Press.

Prahalad, C. K., & Hamel, G. (1990). The core competence of the corporation. *Harvard Business Review, 68* (3), 79-91.

PRISM. (2003). *Accounting, financial analysis and audit in the intangible economy - Final report WP4* (No. IST-2000-29665): CEC - IST Program.

PWC. (2002). *Transparancy in corporate reporting. ValueReporting(tm) review 2003*. London: PriceWaterhouseCoopers.

Pyoria, P. (2005). The concept of knowledge work revisited. *Journal of Knowledge Management, 9* (3), 116-127.

Quinn, J. B., Anderson, P., & Finkelstein, S. (1996). Managing professional intellect. Making the most of the best. *Harvard Business Review, 74* (2), 71-80.

Reich, R. (1991). *The work of nations*. New York: Knopf.

Romer, P. (1990). Endogenous technological change. *Journal of Political Economy, 98* (5, part 2), 71-102.

Romme, A. G. (2003). Making a difference: Organization as design. *Organization Science, 14* (5), 559-573.

Rondeel, M., & Wagenaar, S. (2001). Van kennismanagement naar kennisproductiviteit: een actueel overzicht van benaderingen in de literatuur. [From knowledge management to knowledge productivity: an up-to-date overview of approaches in literature] In J. W. M. Kessels & R. F. Poell (Eds.), *Human Resource Development. Organiseren van het leren.* (pp. 21-35). Groningen: Samsom.

Rondeel, M., & Wagenaar, S. (2002). Ondernemer zijn van je eigen talenten. [Being an entrepreneur of your own talents] In M. Rondeel & S. Wagenaar (Eds.), *Kennis maken, leren in gezelschap*. Schiedam: Scriptum.

Roos, G. (2005). An epistemology perspective on intellectual capital. In B. Marr (Ed.), *Perspectives on intellectual capital* (pp. 196-209). Amsterdam: Elsevier Butterworth-Heinemann.

Roos, G., Roos, J., Dragonetti, N. C., & Edvinsson, L. (1997). *Intellectual capital: navigating in the new business landscape*. New York: New York University Press.

Rozemeijer, F. A. (2000). *Creating corporate advantage in purchasing.* PhD thesis, Technische Universiteit, Eindhoven.

Rylander, A. (2006). *Making sense of knowledge work.* Doctorate thesis, KTH Technology and Health, Stockholm.

Sanchez, P., Chaminade, C., & Olea, M. (2000). Management of intangibles. An attempt to build a theory. *Journal of Intellectual Capital, 1* (4), 312-327.

Savage, C. M. (1996). *Fifth generation management: Co-creating through virtual enterprising, dynamic teaming, and knowledge networking*. Boston: Butterworth-Heinemann.

Schein, E. H. (1987). *The clinical perspective in fieldwork (Qualitative research methods series 5)*. Newbury Park, CA: SAGE.

Schon, D. A. (1983). *The reflective practitioner*. London: Temple Smith.

Senge, P. M. (1992). *De vijfde discipline* [The fifth discipline]. Schiedam: Scriptum.

Shapero, A. (1985). *Managing professional people: understanding creative performance*. New York: The Free Press.

Shapiro, C., & Varian, H. R. (2003). The information economy. In J. Hand & B. Lev (Eds.), *Intangible assets. Values, measures, and risks* (pp. 48-62). Oxford: Oxford University Press.

Simon, H. A. (1992). *The sciences of the artificial*. Cambridge (MA): The MIT Press.

Smith, A. (2000). *The wealth of nations*. New York: The Modern Library.

Software testing. (2006). Retrieved 28-11, from http://en.wikipedia.org/wiki/software_testing

Solow, R. M. (1957). Technical change and the aggregate production function. *The Review of Economics and Statistics, 39* (3), 312-320.

Spender, J. C. (1996). Making knowledge the basis of a dynamic theory of the firm. *Strategic Management Journal, 17* (Special Issue), 45-62.

Sprenger, C. C., Poell, R., & Boot, M. J. (2002). Leren binnen en buiten de spelregels van de organisatie. [Learning within and outside the rules of the organization] In M. Rondeel & S. Wagenaar (Eds.), *Kennis maken. Leren in gezelschap* (pp. 63-75). Schiedam: Scriptum.

Sprenger, C. C., van Eijsden, C. H., ten Have, S., & Ossel, F. (1995). *De vier competenties van de lerende organisatie* [The four competences of the learning organization]. 's-Gravenhage: Delwel - Berenschot Fundatie.

Stacey, R. D. (1995). The science of complexity: an alternative perspective for strategic change processes. *Strategic Management Journal, 16* (6), 477-495.

Stalk, G., Evans, P., & Shulman, L. E. (1992). Competing on capabilities: The new rules of corporate strategy. *Harvard Business Review, 70* (3), 57-69.

Stam, C. D. (1999). Kennismanagement: de derde golf. Het meten van weten. [Knowledge management: the third wave] In J. Bijl, E. van den Honert, C. D. Stam & P. Verver (Eds.), *Managementwijzer kennismanagement* (pp. 11-18). Noordwijk: de Baak - Management Centrum VNO-NCW.

Stam, C. D. (2002, november). KM-effectmeting: een redelijk betrouwbare schatting, *IK Tijdschrift over Intellectueel Kapitaal, 1,* 8-12.

Stam, C. D. (2004). Kennismanagement: van theorie naar de praktijk van kennisproductiviteit. [Knowledge management: from theory to the practice of knowledge productivity] In C. D. Stam (Ed.), *Productiviteit van de kenniswerker* (pp. 9-22). Noordwijk: de Baak.

Stam, C. D. (2005). Intellectual productivity: Measuring and improving productivity in the intangible economy. *International Journal of Learning and Intellectual Capital, 2* (2), 128-146.

Stam, C. D., Evers, A., Leenheers, P., De Man, A., & Van der Spek, R. (Eds.). (2004). *Kennisproductiviteit: het effect van investeren in mensen, kennis en leren* [Knowledge productivity: the effect of investing in people, knowledge and learning]. Amsterdam: Pearson Education.

Stewart, T. A. (1997). *Intellectual capital. The new wealth of organizations*. New York: Doubleday.

Stewart, T. A. (2001). Accounting gets radical. *Fortune, 143* (8), 184-194.

Stewart, T. A. (2002). *The wealth of knowledge. Intellectual capital and the 21st century organization*. London: Nicholas Brealey Publishing.

STI. (2002). *Intellectual capital statements in practice*. Copenhagen: Ministry of Science, Technology and Innovation.

STI. (2003a). *Analysing intellectual capital statements*. Copenhagen: Ministry of Science, Technology and Innovation.

STI. (2003b). *Intellectual capital statements - The new guideline*. Copenhagen: Ministry of Science Technology and Innovation.

Susman, G. I., & Evered, R. D. (1978). An assessment of the scientific merits of action research. *Administrative Science Quarterly, 23* (4), 582-603.

Sveiby, K. E. (1997). *The new organizational wealth. Managing & measuring knowledge-based assets*. San Fransisco: Berret-Koehler Publishers Inc.

Sveiby, K. E. (1998). *Measuring intangibles and intellectual capital - An emerging first standard*. Retrieved 29-6, 1999, from http://www.sveiby.com/portals/0/articles/emergingstandard.html

Sveiby, K. E. (2001). A knowledge-based theory of the firm to guide in strategy formulation. *Journal of Intellectual Capital, 2* (4), 344-358.

Sveiby, K. E. (2004, April 2004). *Methods for measuring intangible assets*. Retrieved April 5th, 2004, from www.sveiby.com/articles/intangiblemethods.htm

Sveiby, K. E., & Lloyd, T. (1988). *Managing knowhow. Increase profits by harnessing the creativity in your company*. London: Bloomsbury.

Swanborn, P. G. (1981). *Methoden van sociaal-wetenschappelijk onderzoek*. Meppel: Boom.

Swanborn, P. G. (1988). *Schaaltechnieken*. Amsterdam: Boom.

't Hart, H., van Dijk, J., de Goede, M., Jansen, W., & Teunissen, J. (1998). *Onderzoeksmethoden* [Research methods]. Amsterdam: Boom.

Teece, D. J. (2000). *Managing intelectual capital*. Oxford: Oxford University Press.

Thorbjornsen, S., & Mouritsen, J. (2003). Accounting for the employee in the intellectual capital statement. *Journal of Intellectual Capital, 4* (4), 559-575.

Tissen, R., Andriessen, D. G., & Lekanne Deprez, F. (1998). *Value-based knowledge management*. Amsterdam: Addison Wesley Longman.

Toffler, A. (1981). *De derde golf* [The third wave]. Utrecht/Antwerpen: Veen Uitgevers.

Tsang, E. W. K., & Kwan, K. M. (1999). Replication and theory development in organizational science: a critical realist perspective. *Academy of Management Review, 24* (4), 759-780.

Tushman, M. L., & O'Reilly III, C. A. (1996). Ambidextrous organizations: managing evolutionary and revolutionary change. *California Management Review, 38* (4), 8-30.

Tushman, M. L., & Romanelli, E. (1990). Organizational evolution: a metamorphisis model of convergence and reorientation (1985). In L. L. Cummings & B. M. Staw (Eds.), *The evolution and adaptation of organizations*. Greenwich: JAI Press.

Van Aken, J. E. (1994). De bedrijfskunde als ontwerpwetenschap. [The organization science as design science], *Bedrijfskunde, 66* (1), 16-26.

Van Aken, J. E. (1996). Methodologische vraagstukken bij het ontwerpen van bedrijfskundige systemen. [Methodological issues related to the design of managerial systems], *Bedrijfskunde, 68* (2), 14-22.

Van Aken, J. E. (2001). *Mode 2 knowledge production in the field of management*.Unpublished manuscript, Eindhoven University of Technology.

Van Aken, J. E. (2004a). Management research based on the paradigm of the design sciences: The quest for field-tested and grounded technological rules. *Journal of Management Studies, 41* (2), 219-246.

Van Aken, J. E. (2004b). *Strategievorming en organisatiestructurering: Organisatiekunde vanuit de ontwerpbenadering.* [Strategy development and organizational structuring: Organization science from a design perspective]. Deventer: Kluwer.

Van Aken, J. E. (2005). Management research as a design science: articulating the research products of mode 2 knowledge production. *British Journal of Management, 16* (1), 19-36.

Van Aken, J. E. (2007). Design science and organization development interventions. *The Journal of Applied Behavioral Science, 43* (1), 67-88.

Van den Akker, J., Gravemeijer, K., McKenney, S., & Nieveen, N. (Eds.). (2006). *Educational design research*. London: Routledge.

Van der Spek, R. (2004). Een kennisgerichte strategie: time-to-knowledge. [A knowledge-focussed strategy: time-to-knowledge] In C. D. Stam (Ed.), *Productiviteit van de kenniswerker* (pp. 27-37). Noordwijk: de Baak.

Van der Spek, R., & Spijkervet, A. (1994). *Kennismanagement: intelligent omgaan met kennis* [Knowledge management: dealing intelligently with knowledge]. Utrecht: CIBIT.

Van Lakerveld, J. (2005). *Het Corporate Curriculum: Onderzoek naar werk-leeromstandigheden in instellingen voor zorg en welzijn.* [The corporate curriculum] Phd thesis, Universiteit Twente, Enschede.

Van Lakerveld, J., Van den Berg, J., de Brabander, K., & Kessels, J. W. M. (2000). *The Corporate Curriculum: A working-learning environment*, Paper presented at the AHRD Conference (Symposium 13), Raleigh-Durham, NC, March 8-12.

Van Poucke, A. (2005). *Towards radical innovation in knowledge-intensive service firms.* Phd thesis, Erasmus Universiteit, Rotterdam.

Van Raaij, E. M. (2001). *The implementation of a market orientation.* Phd thesis, University of Twente, Enschede.

Van Strien, P. J. (1997). Towards a methodology of psychological practice, the regulative cycle. *Theory and Psychology, 7* (5), 683-700.

Vansteenkiste, M., Simons, J., Lens, W., Sheldon, K. M., & Deci, E. L. (2004). Personality processes and individual differences: Motivating learning, performance, and persistence: The synergistic effects of intrinsic goal contents and autonomy-supportive context. *Journal of personality and social prychology, 2*, 246-260.

Venzin, M., Krogh, G. v., & Roos, J. (1998). Future research into knowledge management. In G. v. Krogh, J. Roos & D. Kleine (Eds.), *Knowing in firms: understanding, managing and measuring knowledge* (pp. 26-66). London: SAGE.

Von Krogh, G., Ichijo, K., & Nonaka, I. (2000). *Enabling knowledge creation*. Oxford: Oxford University Press.

Von Krogh, G., Roos, G., & Slocum, K. (1994). An essay on corporate epistemology. *Strategic Management Journal, 15* (Summer Special Issue), 53-71.

Von Krogh, G., & Roos, J. (1995). *Organisation epistemology*. London: Macmillan Press.

Von Krogh, G., Roos, J., & Kleine, D. (1998). *Knowing in firms: Understanding, managing and measuring knowledge*. London: Sage Publications.

Walz, & Bertels. (1995). *Das intelligente unternehmen. Schneller lernen als der wettbewerb* [Intelligent enterprises. Learning faster than the competition]. Landsberg/Lech: Verl. Moderne Industrie.

Warsh, D. (2006). *Knowledge and the Wealth of Nations. A story of economic discovery*. New York: Norton.

Weggeman, M. (1997). *Kennismanagement; inrichting en besturing van kennisintensieve organisaties* [Knowledge management; design and management of knowledge intensive organizations]. Schiedam: Scriptum.

Weggeman, M. (2000). *Kennismanagement: de praktijk* [Knowledge management in practice]. Schiedam: Scriptum.

Weggeman, M. (2001). Een bedrijfskundige opvatting over kennisproductiviteit. [A managerial perception on knowledge productivity], *Opleiding & Ontwikkeling, Tijdschrift voor Human Resource Development, 14* (6), 7-11.

Weick, K. E. (1995). *Sense-making in organizations*. London: Sage Publications.

Wenger, E., McDermott, R., & Snyder, W. M. (2002). *Cultivating communities of practice. A guide to managing knowledge*. Boston, MA: Harvard Business School Press.

Wiig, K. M. (1997). Integrating intellectual capital and knowledge management. *Long Range Planning, 30* (3), 399-405.

Wolfl, A. (2003). *Productivity growth in service industries: an assessment of recent patterns and the role of measurement*. Paris: OECD - STI Working Paper.

Worren, N., Morrell, K., & Elliott, R. (2002). When theories become tools: Towards a framework for pragmatic validity. *Human Relations, 55* (10), 1227-1250.

Yin, R. K. (2000). Rival explanations as an alternative to reforms as "experiments". In L. Bickman (Ed.), *Validity and social experiments (Vol.1)*. Thousand Oaks: Sage.

Yin, R. K. (2003). *Case study research. Design and methods.* Thousand Oaks: SAGE Publications.

Youngman, R. (2003). *Understanding today's economy and its residuals*. London: PRISM.

Zack, M. H. (1998). Managing codified knowledge. *Sloan Management Review, 40* (4), 45-58.

Zack, M. H. (1999). Developing a knowledge strategy. *California Management Review, 41* (3), 125-145.

Zegveld, M. A. (2000). *Competing with dual innovation strategies. A framework to analyse the balance between operational value creation and the develpment of resources.* Phd thesis, Katholieke Universiteit Brabant, Tilburg.

Zegveld, M. A. (2004a). De productiviteit van kennis. In C. D. Stam, A. Evers, P. Leenheers, A. De Man & R. Van der Spek (Eds.), *Kennisproductiviteit: het effect van investeren in mensen, kennis en leren.* (pp. 79-92). Amsterdam: Pearson Education.

Zegveld, M. A. (2004b). *The productivity and governance of company specific knowledge*, Paper presented at the IC-congress, Hanken University, Helsinki, Finland

Zegveld, M. A., Berger, L., Van Asseldonk, A. G. M., & Den Hartigh, E. (2002). *Turning knowledge into cash-flow. Governing knowledge-based productivity*. Veldhoven: TVA developments bv.

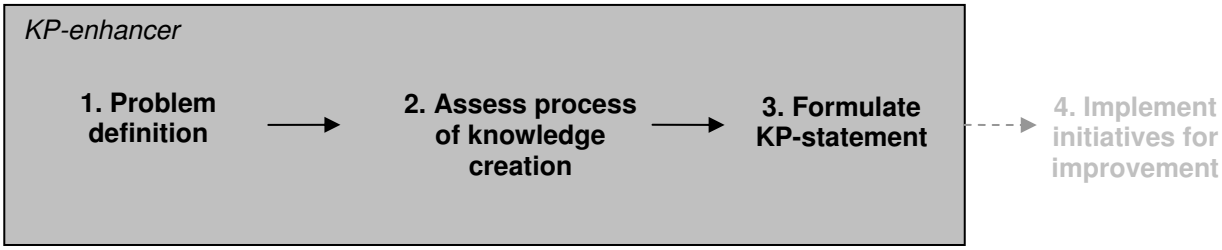
Zegveld, M. A., & den Hartigh, E. (2007). *De winst van productiviteit* [The return on productivity]. Den Haag: Van Gorcum.

Zegveld, M. A., Zegveld, W. C. L., & den Hartigh, E. (2004). *Sturen op productiviteit in de kenniseconomie* [Steering at productivity in the knowledge economy]. Den Haag: Stichting Maatschappij en Onderneming.

Appendices

Appendix 1: Guideline KP-enhancer (final version)

The KP-enhancer consists of three phases and 10 steps. The product of applying the method is a plan for enhancement (KP-statement). The implementation of the initiatives that are mentioned in the KP-statement are not part of this method.



This guideline should be regarded as a solution *concept*. This implies that the steps below should be translated by a (knowledge management) professional to the specific context in which the method will be applied.

Phase 1: Problem definition

The aim of this phase is to determine the scope of application, verify the applicability of this method within this context, and to come to an agreement about the problem to be solved.

Step 1: Determine the scope

Before investigating the problem at hand, it should be perfectly clear what the scope of the project (i.e. application of the KP-enhancer) is. This can be the organization as a whole, but also a business unit or a department.

Step 2: What is the problem at hand?

The next step is to determine what problem has to be solved through applying the KP-enhancer and to verify the applicability of the method within this context.

In a formal conversation with the (internal) client, objective, expectations and intended results are discussed. The main question to be answered is whether the problem at hand fits into the class of problems for which the method is designed.

Step 3: Check preconditions

In order to find out if the organization (or department) meets the necessary preconditions for successful application of the method, the following points might be considered:

- Will the method be applied in the context of an existing initiative?
- Who will take care of the continuity of the process after the method has been completed (who will implement the suggested initiatives)?
- Does the management support the application of the method, and will the management actively participate in the application of the method?
- Does the method fit into the corporate epistemology of the organization?
- Are the organizational objectives known and available (fill in first column of statement)?
- Is this the right moment to apply the method?

Finally, when the scope and objective are clear, and the organization (or department) meets all the requirements, a formal planning for applying the method can be made (Table 1).

Step 4: Approve the problem statement

The aim of the final step of the First phase is that the client approves the problem which has to be solved. The problem statement is the starting point of the method.

Table 1: A (draft) plan for applying the KP-enhancer

	Phase	What	Objective	Who
Week 1	1	Interview	Determine scope and formulate problem that has to be solved, verify applicability of method within this context and make formal planning	Client
Week 2	1	Validate problem statement	Receive explicit commitment from client	Client
Week 3	2	Start survey	Gather data for analysis current situation	All employees within scope of application
Week 5	2	Deadline survey		
Week 7	2	Workshop 1	Presentation and collective analysis of outcome of survey.	Representative selection of employees
Week 9	3	Workshop 2	Formulate KP-statement (part 1)	Idem
Week 11	3	Workshop 3	Formulate KP-statement (part 2)	Idem
Week 12	3	Presentation final KP-statement	Finish method	Client

Phase 2: Diagnose knowledge productivity

The aim of this phase is to diagnose the current situation with regard to knowledge productivity and come to a set of shared findings with regard to possibilities for improvement.

Step 5: Questionnaire

The first step within this phase is to assess the quality of the process of knowledge creation. All employees, within the scope of the project, are asked to participate in an electronic survey. The first and main part of the survey consists of about 70 items related to the seven learning conditions of the Corporate Curriculum (Appendix 2). The final part of the survey is related to the innovation profile of the employees (Appendix 3).

In order to stimulate response, it might help to send a personal invitation to participate in the survey. Necessary requirement to participate in the questionnaire is that respondents have access to internet. Participating in the questionnaire takes about 20-30 minutes per respondent. The lead-time of the survey is two weeks. After the initial invitation, two reminders are send to those who did not yet finish the questionnaire.

Requirements for sending a personalized invitation are a list with names and e-mail addresses of all respondents, and a customized invitation to participate in survey. If distinction has to be made between different types of respondents (e.g. departments, locations, function groups) these data are also required per respondent.

Step 6: Processing data from questionnaire

After the deadline has expired, the data of the questionnaire are processed. The following data is reported:

- average score per learning function of the Corporate Curriculum
- average scores innovation profile
- average scores all items
- possible distinctions between departments, etc.

Step 7: Collective interpretation of the data (Workshop 1)

The aim of this workshop is to introduce the concept of knowledge productivity, to present the outcome of the questionnaire, and to collect shared findings about possibilities to improve the process of knowledge creation. This workshop consists of four sub steps:

- 7a. short introduction knowledge productivity (30 min.)
- 7b. presentation and discussion outcome of survey (60 min.)
- 7c. board game (60 min.)
- 7d. formulate shared findings (30 min.)

Step 7a. short introduction knowledge productivity (30 min.)

For most of the participants knowledge productivity will be a relatively new concept. Therefore it is suggested to start with an introduction to the subject. However, do not make this introduction too long, otherwise it will probably be perceived as too theoretical. Outline of the presentation could be:

- Definition knowledge productivity
- Introduction process of knowledge creation and the learning functions of Corporate Curriculum
- Introduction KP in terms of incremental and radical innovation
- Introduction KP-flywheel (combination of process and results)

Step 7b. presentation and discussion outcome of survey (60 min.)

Next step is to present the outcome of the survey. As we work from general to specific, it might help to start with the average scores per learning function, and then go into the underlying scores per item. As the total number of items is too large to discuss in one workshop, it might help to focus on the high and low scores. As we are after possibilities for improvement, the latter are of more importance than the former. The main questions to discuss (per learning function, per item) are:

- Do you recognize the score, or not?
- Is this score desirable, or not?

Whereas the first question helps to validate the picture that arises from the questionnaire, the second question helps to find out whether the score refers to something that we should try to enhance.

Step 7c. board game (60 min)

After presenting and discussing the outcome, the board game (Appendix 4) might help to prioritize possibilities for improvement. Within this game, participants are literally asked to put their cards on the learning functions that, according to them, have to be improved.

Players:	5-10
Duration:	60 min
Necessaries:	One playing board (see Appendix 4), and a set of two priority cards of same color per player (numbered 1 and 2)
Main question:	Considering the outcome of the questionnaire, which of the learning functions should be enhanced?
Rules of the game:	The game is played in two rounds: 1. First round a. Everyone is asked to put *priority-card 1* on the precondition that according to him/her needs to be enhanced b. As soon as all the participants have put their cards on the table, each player is asked to elaborate on his/her choice c. After all players have explained their choice, they are asked to reconsider their initial choice 2. Second round a. like first round, but now with *priority-card 2*

For the host of the game it is important to note how many cards, and with which priority number (1 or 2) are put on which precondition. This is needed to come to the shared findings in the next phase.

Step 7d. formulate shared findings (30 min.)

Final element of the first workshop is to gather all the findings and formulate a (limited) number of conclusions. These conclusions will be used in the next phase to give direction to KM initiatives. The main questions to be addressed are:

- which learning functions need to be enhanced?
- can we order them according to priority?

As we eventually want to formulate a limited (realistic) number of concrete initiatives, it might help to limit the number of conclusions, and to make them as specific as possible.

Phase 3: Formulating a KP-statement

The aim of the third phase is to translate the collective findings of the previous phase into a KP-statement. The KP-statement tells us which initiatives have to be put in place in order to improve the current situation from a knowledge perspective.

Step 8: Report findings workshop 1 and prepare workshop 2

Within this step, in between workshop 1 and 2, the findings of the first workshop are written down and reported back to the participants. These findings are also written down in the lower-left corner of the KP-statement (Appendix 5).

In addition, the participants are asked to answer a series of questions to be answered before the second workshop. These questions enable the facilitator to formulate a draft knowledge strategy (second column of the KP-statement) which can serve as a starting point for the second workshop. The questions to be answered are:

- What products/services does the organization deliver?
- What is the *user value* of these products and services?

- What *knowledge resources* are needed to deliver these products/services?

Within these questions, the concepts of *user value* and *knowledge resources* are critical. Whereas the first concept covers all the products and services and provides insight in the overall value an organization wants to deliver, the second concept provides insight in the specific resources that are needed to deliver the specific products and services.

Knowledge resources should be interpreted widely. When formulating these resources, it might help to refer to (specific elements within) the learning functions of the Corporate Curriculum. Knowledge resources might refer to subject matter expertise, specific skills, or a desired attitude of employees, but also to the culture, structure and networks needed for knowledge sharing.

The input from the participants is used to formulate a first and draft version of the knowledge strategy. Doing this beforehand not only saves a lot of time within the workshops, but also helps to explain the meaning of the difficult concepts of *user value* and *knowledge resources*.

Step 9: Formulating a KP-statement (Workshop 2 and 3)

The aim of this step is to collect all the information needed to formulate a KP-statement (Appendix 5). The process of formulating a KP-statement is based on the Danish Guideline, and consists of two workshops.

Step 9a Workshop 2: strategy and challenges

The aim of this workshop is to reach agreement about the knowledge strategy and to formulate knowledge productivity challenges. The main issues in this workshop are:

1. reflection on first workshop (30 min.)
2. formulate knowledge strategy (90 min.)
3. determine KP-challenges (60 min.)

Ad 1: Before presenting the first version of the knowledge strategy, it is suggested to reflect on the first workshop. The main issue to discuss here are the findings that emerged from diagnosing KP. Do the participants still agree with the findings as formulated during the first workshop? Should they be reconsidered?

Ad 2: Next it is suggested to explain the concept of the knowledge strategy. In order to illustrate this concept and the underlying concepts of *user value* and *knowledge resources*, it is suggested to use the input from the participants (answers to the three questions in step 7).

What products/services does the organization deliver?
The answer to this question represents the middle part of the Knowledge Strategy and usually starts with the word "… through". This part describes what the organization actually does to deliver the value as described in the first part. As we are dealing with knowledge, this part preferably also contains the strategic knowledge areas.

- What is the *user value* of these products and services?
  The answer to this question represents the upper part of the knowledge strategy, and usually starts with the phrase "our organization delivers…". This part describes the value the organization wants to deliver for its clients. This part describes why a client would be interested in the products/services of the organization.

- What *knowledge resources* are needed to deliver these products/services?
  Finally, the answer to this question represents the lower part of the Knowledge Strategy, and usually starts with "Therefore we need:". This part describes the main knowledge resources that are needed to be able to deliver the user value and the products/services as described in the first two parts.

Important objective of this workshop is to reach agreement about the answers to these questions, and combine them in one statement. It is suggested to use the input from the participants (step 7) to formulate a first version of the Knowledge Strategy, and discuss this during the workshop.

Ad 3: Next step is to determine what the main challenges (with regard to enhancing KP) are that the organization is facing. Determining the challenges is based on two elements:

- diagnosis of current situation with regard to KP (outcome workshop 1)
- Knowledge Strategy, as formulated in previous step

As each challenge might lead to several initiatives, and as all these initiatives also have to be implemented, it is suggested to limit the number of challenges within the KP-statement to three or four. In order to reach consensus about these challenges, the following exercise might help:

- Ask each participant to write down what he/she thinks are the two or three main challenges the organization is facing with regard to enhancing KP
- Same as before, but now in couples
- Same as before but now in groups of 4
- Make an inventory of the challenges, discuss them together
- In case the number of challenges is to large, prioritize them together

When determining the challenges, it is important to continuously check whether the challenges refer to either the conclusions from workshop 1, or to the Knowledge Strategy. If not, it might be possible that something is missing in one or the other. Take the time to find out what is missing, and if necessary rephrase the conclusions from the diagnosis or the Knowledge Strategy.

So, at the end of this second workshop we should be able to fill in the second (Knowledge Strategy) and third (KP-challenges) column of the KP-statement. It is suggested to report the updated KP-statement to the participants.

Step 9b Workshop 3: initiatives and indicators

The aim of this workshop is to identify KM initiatives that follow from the KP-challenges and indicators that measure the progress of the initiatives. The main issues in this workshop are:

1. define the KM initiatives
2. formulate the indicators
3. check coherence of KP-statement

Ad 1: The aim of this part is to translate the KP-challenges into concrete KM initiatives. As most organizations already have one or more initiatives in place, we start with making an

inventory of existing initiatives before defining new initiatives. The process of defining KM initiatives could be organized as follows:

- Ask all participants (individually) to write down all current KM initiatives that are related to the challenges as formulated in the previous workshop. Ask them to write down the initiatives on post-its (one initiative per post-it).
- Together make an inventory of all the current KM initiatives related to the each of the KP-challenges. Discuss the outcome. What can be noticed? In case there are already many initiatives related to a particular challenge, why is it still a challenge? Are the current initiatives successful, or not?
- Ask the participants (individually) to write down for each challenge, what initiative should get priority? This can be either an existing or a new initiative.
- Together make an inventory of the initiatives that are suggested. Discuss the outcome. What can be noticed? In case many new initiatives are suggested, what does this mean for existing initiatives? Is the number of initiatives realistic, or not?

Again it is important to continuously check the coherence of the statement through checking whether the proposed KM initiatives can be related to the KP-challenges. If not, it might be possible that the challenges should be rephrased. The outcome of this exercise should be a realistic set of initiatives per challenge.

Ad 2: The aim of this final step is to formulate indicators that can assess the progress or success of the KM initiatives as suggested. It should be noted that indicators are not objective valuations, but reasonable trustworthy estimations. When formulating indicators, important considerations for selecting indicators are:

- indicators should be related to one or more of the KM initiatives
- indicators should say something about the progress (or success) of one or more of the KM initiatives
- the suggested indicator should be realistic in the sense that it should be measurable

Make couples and ask them to formulate indicators for a limited number of initiatives. Next make an inventory of the indicators and discuss the outcome. The outcome of this step should be a set of indicators that measure the progress of the KM initiatives.

Ad 3: Now we have all the data that is necessary to formulate the entire KP-statement. However, as the logic of the KP-statement should be self-explanatory, it is suggested to check the internal consistency of the final product once again. The two sets of questions above and below the model in Appendix 6 help to check the consistency of the final product. Check if the answers to all these questions are formulated in the KP-statement. If not, then something might be missing.

Step 10 Construction of final version

After the coherence is tested, the final version of the KP-statement is constructed and reported back to the participants and presented to the client.

Appendix 2: Survey Corporate Curriculum in English (final version)

The statements below are related to the current situation within your organization (unit, department). Indicate to what extent you agree with these statements. (1 = completely disagree, 5 = completely agree). In case a statement is not applicable to your situation, then choose "not applicable".

Item	Statement
1. Subject matter expertise	
MD1	We know which knowledge we need (to be successful)
MD2	We systematically build up knowledge about topics that are of strategic importance
MD3	We know what we know
MD4	We know what we do not know (but should know)
MD5	Knowledge is developed purposefully
MD6*	Knowledge and experiences are difficult to get access to
MD7	Sharing knowledge is of great importance in our organization
MD8	In our work, we deliberately create opportunities to share knowledge and experiences
MD9	We do not find it hard to share knowledge
MD10	In our organization, sharing knowledge is sufficiently facilitated (e.g. by meetings or automated systems)
2. Ability to solve problems	
PO1	We cannot predict the future, but we are ready to face it
PO2	In new (unexpected) situations, we are able to utilize available knowledge in a creative manner
PO3	In our work, we are given sufficient room to experiment with new insights
PO4	We are used to choosing our own way of solving problems
PO5	I like to experiment with unconventional approaches
PO6	My work provides sufficient room to renew existing procedures
PO8*	Habits and routines obstruct new ways of working
PO9*	Structures and procedures obstruct new ways of working
3. Ability to reflect	
VR2	We understand why we excel in certain areas and why we do not excel in other areas
VR3	We continuously search for better ways of working
VR4	We are used to evaluating activities/projects (e.g. by evaluation forms or evaluation meetings)
VR5	New insights about how we can do our work best, regularly lead to a change in our way of working
VR6	We regularly reflect on our current activities (in order to find out if we can do it better)
VR7	We are given room to reflect on our personal functioning (e.g. through training, coaching, etc.)
VR8*	I am not used to discussing the quality of my work with colleagues
VR9	We discuss the quality of our products/services with our clients regularly
4. Communicative and social skills	
CS2	In our organization, proper manners (such as respect, politeness and collegiality) are well thought-of
CS3	I see collaboration as an opportunity to learn from my colleagues
CS4	Our organizational structure is simple, with few hierarchical levels
CS5*	The structure of our organization hinders collaboration between different departments/business units, etc.
CS6	In our organization, people feel free and safe to share knowledge with each other (knowledge is not misused)
CS7*	Our culture is characterized by strong internal competition (e.g. between individuals, departments, units)
CS8	In our organization, a strong team spirit prevails
CS9	Stimulating and motivating each other characterizes our culture
CS10	In our organization, there is an informal atmosphere. This is seen in such things as open doors and easy access to colleagues.

5. Self-regulation of motivation	
ZM1	In my work I get sufficient room to pursue my personal ambition
ZM2	We are given sufficient room to make our personal preferences known
ZM3	Personal preferences play an important role when dividing projects and tasks
ZM4	We are used to clearly indicating what it is that motivates us
ZM6	I can affect the construction of my job responsibility
ZM7	We are given more than enough room to utilize our capacities
ZM8	"Personal entrepreneurship" (giving direction to activities yourself) is highly appreciated in our organization
ZM9	In our work, we get room to decide for ourselves what is important
ZM10	Our employees are characterized by intense personal involvement with our work
6. Peace and stability	
SR1	We get sufficient time to perform our tasks
SR2	It is well possible to work concentrated on something
SR3	In my work I get sufficient time (opportunity) to keep abreast with current developments in my discipline (e.g. through participating in a course)
SR4	Personal and professional development is sufficiently facilitated
SR5	My work offers me sufficient opportunities for deepening my knowledge and expanding my experiences
SR6	In our work, we allocate sufficient time for reflection (on ongoing or finished projects/activities)
SR7	We are used to disseminate new insights (about the way we do our work) widely throughout the organization (in order to benefit others)
SR8	We take the time to integrate new insights (e.g. from professional literature or from practice) into our way of working
SR9	Our way of working offers sufficient room for moments of relaxation
SR10	We systematically work at gradually improving the things we are doing
7. Creative turmoil	
CO1	Our organization is characterized by a high level of ambition
CO2	We realize that continuous renewal is a necessary precondition for survival
CO4	External developments keep us attentive and force us to renew regularly
CO5	In our work, exciting things frequently happen (e.g. new assignments that require a great deal of attention)
CO6	We decided to do things radically different
CO7	My work is characterized by continuous change
CO10	We experiment with radical new ways of working
CO11	Regularly decisions are being taken with far-reaching consequences for the way I do my work
CO12	I enjoy the exciting atmosphere of renewal at work

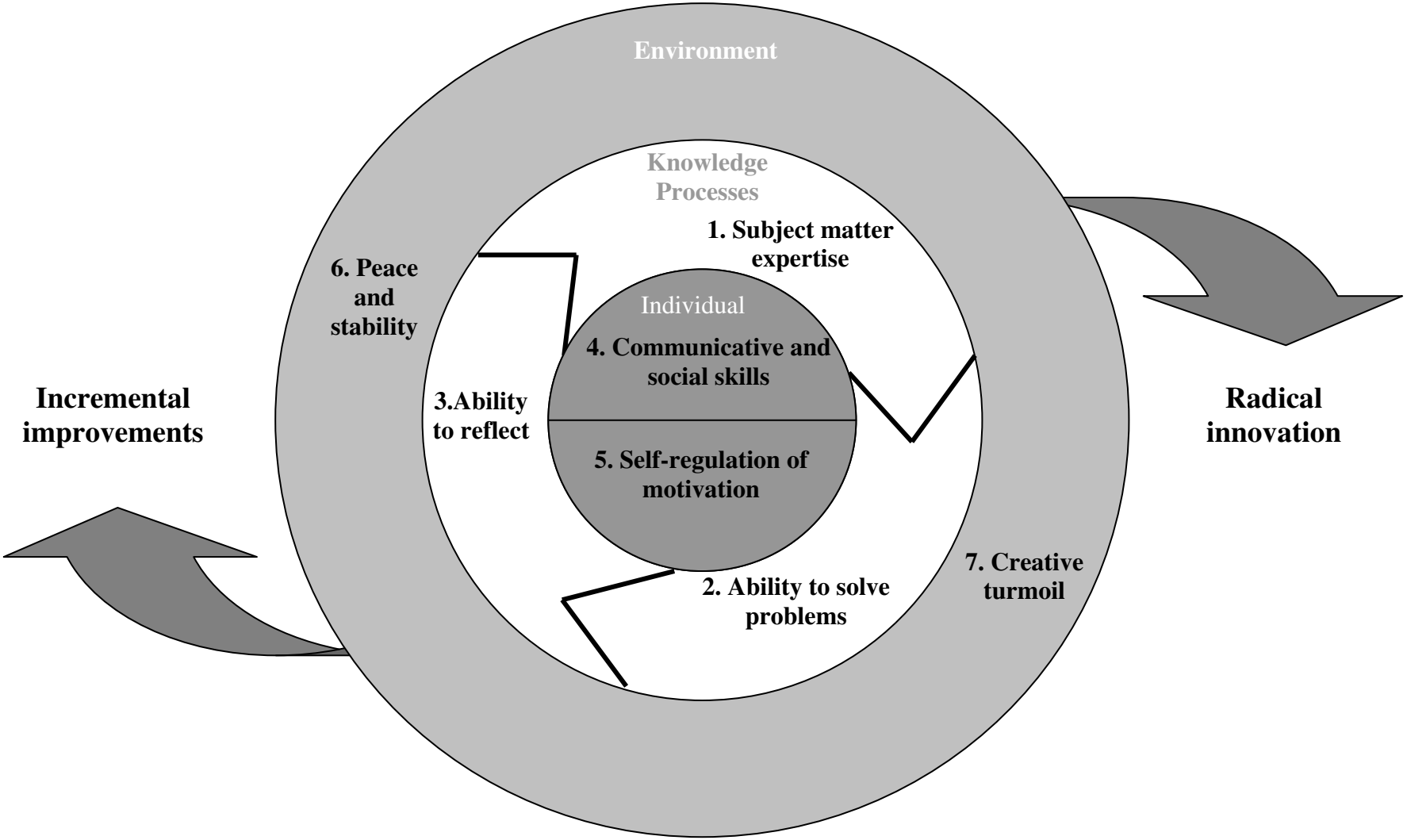
** reversed item*

Appendix 3: Survey innovation profile in English

The statements below make an inventory of different profiles of employees from the perspective of knowledge productivity. How would you finish these sentences? Choose the option that suits you best.

item	*Statement*	*Option*
WB1	In order to be successful …	a. we should consider new solutions b. we should better exploit existing solutions
WB2	Existing structures and procedures …	a. should be replaced b. should be improved
WB3	We should search for opportunities in …	a. new services and/or new markets b. existing services and/or existing markets
WB4	I think our clients want …	a. unexpected solutions b. predictable solutions
WB5	In the choices we make …	a. we should radically break with the past b. we should continue building on proven successes
WB6	I especially find satisfaction in …	a. inventing something completely new b. making a success of something that already exists
WB7	I like to …	a. play with a problem b. solve a problem as soon as possible
WB8	I do not like to …	a. work out something into detail b. solve vague problems
WB9	Rules are there to …	a. deviate from b. live up to
WB10	Change is a …	a. challenge, which I enjoy a lot b. necessary evil

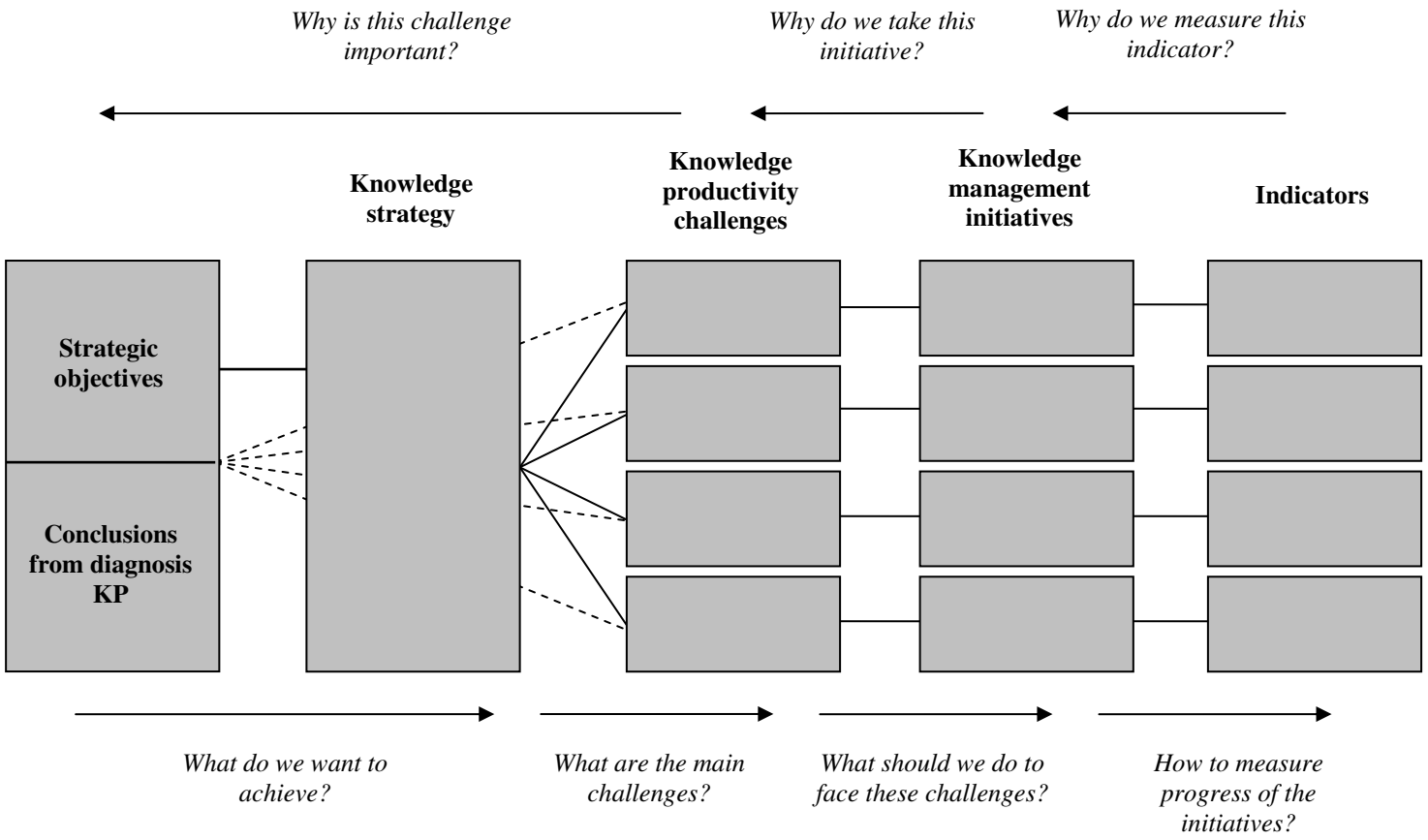
Appendix 4: Knowledge productivity board game



Appendix 5: Knowledge Productivity Statement Model

	Knowledge strategy	**Knowledge productivity challenges**	**Knowledge management initiatives**	**Indicators**
- Strategic objectives	- User value - Products/services - Knowledge resources	- Priority 1	- Initiative 1 - Initiative 2	- Indicator 1 - Indicator 2
		- Priority 1	- Initiative 3 - etc.	- Indicator 1 - etc.
		- Priority 1		
- Conclusions diagnosis KP		- Etc.		

Appendix 6: Help questions to obtain coherence in KP-statements



Based on: STI (2003), Intellectual Capital Statements – The New Guideline

Appendix 7: Survey Corporate Curriculum in Dutch (initial version)

Onderstaande stellingen hebben betrekking op de huidige situatie in uw organisatie(onderdeel). Geef aan in hoeverre u het eens bent met deze stellingen (1 = zeer mee oneens, 5 = zeer mee eens). Indien een stelling niet van toepassing is, kies dan "n.v.t."

Item	Statement
1. Materiedeskundigheid (MD)	
MD1	Wij weten welke kennis we nodig hebben (om succesvol te zijn)
MD2	Wij bouwen systematisch kennis op over onderwerpen die van strategisch belang zijn
MD3	Wij weten welke kennis we in huis hebben
MD4	We weten welke kennis we niet in huis hebben (maar wel zouden moeten hebben)
MD5	In onze organisatie vindt ontwikkeling van kennis doelgericht plaats op basis van een inventarisatie van kennistekorten
MD6	In onze organisatie zijn kennis en ervaringen goed toegankelijk
MD7	Het belang van het delen van kennis wordt algemeen onderkend
MD8	In ons werk creëren wij bewust gelegenheden om onze kennis en ervaringen met elkaar te delen
MD9	Medewerkers hebben geen moeite met het delen van kennis
MD10	Het delen van kennis wordt in onze organisatie voldoende gefaciliteerd (bijv. via bijeenkomsten of geautomatiseerde systemen)
2. Vermogen om problemen op te lossen (PO)	
PO1	Onze organisatie is voorbereid op de toekomst (wat er ook gebeurt)
PO2	Onze medewerkers zijn in staat om in nieuwe situaties op een creatieve manier gebruik te maken van bestaande/beschikbare kennis
PO3	Wij krijgen voldoende ruimte om te experimenteren met nieuwe inzichten
PO4	Mijn werk biedt ruimte om zelf oplossingsrichtingen te kiezen
PO5	Wij worden gestimuleerd soms eens een ongewone aanpak uit te proberen
PO6	Wij krijgen voldoende ruimte om bestaande procedures te vernieuwen
PO7	Wij worden in ons werk uitgedaagd zelf problemen op te lossen
PO8*	Nieuwe manieren van werken worden gehinderd door gewoontes en routines
PO9*	Nieuwe manieren van werken worden gehinderd door structuur en procedures
PO10	We werken bewust aan het ontwikkelen van nieuwe werkwijzen
3. Vermogen om te reflecteren (VR)	
VR1	Wij weten wat onze sterktes en zwaktes zijn
VR2	We begrijpen waarom we op bepaalde terreinen heel goed zijn en waarom we op andere terreinen minder goed zijn
VR3	Wij zijn continu op zoek naar nieuwe (betere) manieren van werken
VR4	Werkzaamheden/projecten worden stelselmatig geëvalueerd (bijv. m.b.v. evaluatieformulieren of evaluatiebijeenkomsten)
VR5	De uitkomsten van evaluaties leiden regelmatig tot verandering in onze werkwijze
VR6	Wij worden gestimuleerd om regelmatig te reflecteren op onze lopende werkzaamheden
VR7	Wij krijgen ruimte voor reflectie op ons persoonlijke functioneren (bijv. in de vorm van opleidingen, coaching, etc.)
VR8	Wij zijn gewend met elkaar te spreken over de kwaliteit van ons werk
VR9	Wij hebben geregeld contact met klanten/opdrachtgevers over de kwaliteit van ons werk
VR10	In onze organisatie wordt bewust aandacht besteed aan verbetering van de kennisuitwisseling
4. Communicatieve en sociale vaardigheden (CS)	
CS1	Het kost ons geen moeite om toegang te krijgen tot de kennis van elkaar
CS2	In onze organisatie staan goede omgangsvormen (zoals respect, beleefdheid en collegialiteit) hoog aangeschreven
CS3	In onze organisatie wordt samenwerken gezien als een kans om te leren van anderen
CS4	Onze organisatiestructuur is eenvoudig, met weinig hiërarchische niveaus
CS5*	Onze structuur vormt een belemmering voor communicatie en samenwerking tussen verschillende afdelingen/business units/etc.

CS6	In onze organisatie voelt men zich vrij en vertrouwd om kennis met elkaar te delen (er wordt geen misbruik gemaakt van elkaars kennis)
CS7*	Onze cultuur wordt gekenmerkt door sterke onderlinge competitie (bijv. tussen individuele medewerkers, afdelingen, units)
CS8	In onze organisatie heerst een hechte groepsband
CS9	Onze cultuur wordt gekenmerkt door het stimuleren en motiveren van elkaar
CS10	In onze organisatie heerst een informele sfeer. Dit uit zich o.a. door open deuren en makkelijk toegankelijke collega's
5. Zelfregulatie van motivatie (ZM)	
ZM1	In onze organisatie krijgt men voldoende ruimte om te werken aan zijn/haar persoonlijke ambitie
ZM2	Wij krijgen alle ruimte om onze persoonlijke voorkeuren kenbaar te maken
ZM3	Bij het verdelen van werk wordt rekening gehouden met persoonlijke voorkeuren
ZM4	In onze organisatie zijn wij gewend duidelijk aan te geven wat ons motiveert
ZM5	Wij worden geacht zelf invulling te geven aan ons takenpakket
ZM6	In onze organisatie hebben medewerkers invloed op de invulling van hun takenpakket
ZM7	Wij krijgen alle ruimte om onze capaciteiten ten volle te benutten
ZM8	In onze organisatie wordt "persoonlijk ondernemerschap" gestimuleerd
ZM9	In ons werk krijgen wij de ruimte om zelf te bepalen wat belangrijk is
ZM10	Onze medewerkers kenmerken zich door een grote persoonlijke betrokkenheid bij het werk
6. Rust en stabiliteit (SR)	
SR1	In onze organisatie krijgen medewerkers voldoende tijd om hun taken uit te voeren
SR2	Het is bij ons mogelijk geconcentreerd ergens aan te werken
SR3	Wij krijgen voldoende tijd om de ontwikkelingen in ons vakgebied bij te houden
SR4	In onze organisatie wordt persoonlijke en professionele ontwikkeling voldoende gefaciliteerd
SR5	Mijn werk biedt voldoende gelegenheid voor verdieping of verbreding van kennis en vaardigheden
SR6	In onze organisatie ruimen wij voldoende tijd in voor reflectie op lopende of afgeronde projecten/werkzaamheden
SR7	Nieuwe inzichten worden breed verspreid door de organisatie (zodat iedereen z'n voordeel er mee kan doen)
SR8	De manier waarop wij ons werk hebben ingericht, biedt voldoende gelegenheid om nieuwe inzichten (bijv. uit vakliteratuur of van collega's) te integreren in onze aanpak
SR9	Onze manier van werken biedt voldoende gelegenheid om even te ontspannen
SR10	Wij zijn vooral gericht op het stap voor stap verbeteren van onze werkwijzen, diensten en producten
7. Creatieve onrust (CO)	
CO1	Onze organisatie wordt gekenmerkt door een hoog ambitieniveau
CO2	We beseffen terdege dat voortdurende vernieuwing een noodzaak is om te overleven
CO3	Wij houden onze concurrenten zorgvuldig in de gaten
CO4	De ontwikkelingen in de markt dwingen ons om te vernieuwen
CO5	In ons werk gebeuren regelmatig spannende dingen (bijv. nieuwe opdrachten die veel aandacht vragen)
CO6	Onze strategische doelstellingen dwingen ons nieuwe wegen in te slaan
CO7	In onze organisatie worden continu veranderingen doorgevoerd
CO8*	Of onze organisatie in deze vorm over enkele jaren nog bestaat, is niet zeker
CO9	In onze organisatie is sprake van een hoge werkdruk
CO10	Wij stimuleren elkaar om onconventionele manieren van werken te onderzoeken

** reversed item*

Appendix 8: Survey Corporate Curriculum in Dutch (final version)

Onderstaande stellingen hebben betrekking op de huidige situatie in uw organisatie(onderdeel). Geef aan in hoeverre u het eens bent met deze stellingen (1 = zeer mee oneens, 5 = zeer mee eens). Indien een stelling niet van toepassing is, kies dan "n.v.t."

Item	Statement
1. Materiedeskundigheid (MD)	
MD1	Wij weten welke kennis we nodig hebben (om succesvol te zijn)
MD2	Wij bouwen systematisch kennis op over onderwerpen die van strategisch belang zijn
MD3	Wij weten welke kennis we in huis hebben
MD4	We weten welke kennis we niet in huis hebben (maar wel zouden moeten hebben)
MD5	Ontwikkeling van kennis vindt doelgericht plaats
MD6*	Kennis en ervaring zijn slecht toegankelijk
MD7	Het delen van kennis met elkaar is in onze organisatie van groot belang
MD8	In ons werk creëren wij bewust gelegenheden om onze kennis en ervaringen met elkaar te delen
MD9	Het delen van kennis kost ons geen moeite
MD10	Het delen van kennis wordt in onze organisatie voldoende gefaciliteerd (bijv. via bijeenkomsten of geautomatiseerde systemen)
2. Vermogen om problemen op te lossen (PO)	
PO1	We kunnen de toekomst niet voorspellen, maar we zijn er klaar voor
PO2	In nieuwe (onverwachte) situaties zijn we in staat op een creatieve manier gebruik te maken van bestaande/beschikbare kennis
PO3	In ons werk krijgen we voldoende ruimte om te experimenteren met nieuwe inzichten
PO4	Het is bij ons gebruikelijk om zelf oplossingsrichtingen te kiezen
PO5	Ik hou er van soms eens een ongewone aanpak uit te proberen
PO6	In mijn werk krijg ik voldoende ruimte om bestaande procedures te vernieuwen
PO8*	Gewoontes en/of routines staan nieuwe manieren van werken in de weg
PO9*	Structuur en/of procedures staan nieuwe manieren van werken in de weg
3. Vermogen om te reflecteren (VR)	
VR2	We begrijpen waarom we op bepaalde terreinen heel goed zijn en waarom we op andere terreinen minder goed zijn
VR3	Wij zijn continu op zoek naar nieuwe (betere) manieren van werken
VR4	Het is bij ons gebruikelijk om werkzaamheden/projecten te evalueren (bijv. m.b.v. evaluatieformulieren of evaluatiebijeenkomsten)
VR5	Nieuwe inzichten over de manier waarop we ons werk het beste kunnen doen, leiden regelmatig tot verandering in onze werkwijze
VR6	Wij reflecteren regelmatig op onze lopende werkzaamheden (om te kijken of we het beter kunnen doen)
VR7	Wij krijgen ruimte voor reflectie op ons persoonlijke functioneren (bijv. in de vorm van opleidingen, coaching, etc.)
VR8*	Ik ben niet gewend met collega's te spreken over de kwaliteit van mijn werk
VR9	Regelmatig vragen wij onze klanten/opdrachtgevers naar de kwaliteit van de door ons geleverde producten/diensten
4. Communicatieve en sociale vaardigheden (CS)	
CS2	In onze organisatie staan goede omgangsvormen (zoals respect, beleefdheid en collegialiteit) hoog aangeschreven
CS3	Ik zie samenwerken vooral als een kans om te leren van mijn collega's
CS4	Onze organisatiestructuur is eenvoudig, met weinig hiërarchische niveaus
CS5*	De structuur van de organisatie staat samenwerking tussen verschillende afdelingen (business units, etc.) in de weg
CS6	In onze organisatie voelt men zich vrij en vertrouwd om kennis met elkaar te delen (er wordt geen misbruik gemaakt van elkaars kennis)
CS7*	Onze cultuur wordt gekenmerkt door sterke onderlinge competitie (bijv. tussen individuele medewerkers, afdelingen, units)

CS8	In onze organisatie heerst een hechte groepsband
CS9	Stimuleren en motiveren van elkaar kenmerkt onze cultuur
CS10	In onze organisatie heerst een informele sfeer. Dit uit zich o.a. door open deuren en makkelijk toegankelijke collega's

5. Zelfregulatie van motivatie (ZM)

ZM1	In mijn werk krijg ik voldoende ruimte om te werken aan mijn persoonlijke ambitie
ZM2	Wij krijgen alle ruimte om onze persoonlijke voorkeuren kenbaar te maken
ZM3	Persoonlijke voorkeuren spelen een belangrijke rol bij het verdelen van werk
ZM4	Wij zijn gewend duidelijk aan te geven wat ons motiveert
ZM6	Ik heb invloed op de invulling van mijn takenpakket
ZM7	Wij krijgen alle ruimte om onze capaciteiten ten volle te benutten
ZM8	"Persoonlijk ondernemerschap" (zelf richting geven aan werkzaamheden) staat bij ons hoog aangeschreven
ZM9	In ons werk krijgen wij de ruimte om zelf te bepalen wat belangrijk is
ZM10	Onze medewerkers kenmerken zich door een grote persoonlijke betrokkenheid bij het werk

6. Rust en stabiliteit (SR)

SR1	Wij krijgen voldoende tijd om onze taken/werkzaamheden uit te voeren
SR2	Het is bij ons goed mogelijk ergens geconcentreerd aan te werken
SR3	Ik krijg in mijn werk voldoende gelegenheid om de ontwikkelingen op mijn vakgebied bij te houden (bijv. door deel te nemen aan een cursus)
SR4	Persoonlijke en professionele ontwikkeling wordt voldoende gefaciliteerd
SR5	Mijn werk biedt voldoende gelegenheid voor verdieping of verbreding van kennis en vaardigheden
SR6	In ons werk ruimen wij voldoende tijd in voor reflectie (op lopende of afgeronde projecten/werkzaamheden)
SR7	Het is bij ons gebruikelijk nieuwe inzichten (bijv. over de manier waarop we ons werk doen) breed te verspreiden door de organisatie (zodat iedereen z'n voordeel er mee kan doen)
SR8	Wij nemen de tijd om nieuwe inzichten (uit vakliteratuur of opgedaan in de praktijk) te integreren in onze manier van werken
SR9	Onze manier van werken biedt voldoende gelegenheid om even te ontspannen
SR10	Wij werken stelselmatig aan stapsgewijze verbetering van de dingen die we doen

7. Creatieve onrust (CO)

CO1	Onze organisatie kenmerkt zich door een hoog ambitieniveau
CO2	We beseffen terdege dat voortdurende vernieuwing een noodzaak is om te overleven
CO4	Externe ontwikkelingen houden ons scherp en dwingen ons regelmatig te vernieuwen
CO5	In ons werk gebeuren regelmatig spannende dingen (bijv. nieuwe opdrachten die veel aandacht vragen)
CO6	Wij hebben besloten om het radicaal anders te doen
CO7	Mijn werk kenmerkt zich door continue verandering
CO10	Wij experimenteren met radicaal nieuwe manieren van werken
CO11	Regelmatig worden beslissingen genomen die vergaande consequentie hebben voor de manier waarop ik werk
CO12	Ik geniet van de spannende sfeer van vernieuwing op het werk

** reversed item*

Appendix 9: New statements about incremental (IV) and radical (RI) innovation in Dutch

Code	Statement
Incrementele innovatie	
IV1	Wij werken aan stapsgewijze verbetering van de dingen die we doen.
IV2	Wij werken aan continue verbetering van onze werkprocessen.
IV3	Wij werken aan continue verbetering van onze producten/diensten.
IV4	Onze medewerkers werken continu aan verdere verfijning en specialisatie.
IV5	De kennis en ervaring die nodig is voor de realisatie van onze ambities is reeds in de organisatie aanwezig.
IV6	We laten ons leiden door beproefde concepten.
IV7	Ons motto is: “de dingen die we doen beter doen”.
IV8	Onze ambities bouwen overwegend voort op het verleden.
IV9	De afgelopen periode stond vooral in het teken van de implementatie en realisatie van de bestaande doelstellingen.
Radicale innovatie	
RI1	Wij werken aan radicale vernieuwing van ons producten-/dienstenaanbod.
RI2	Wij hebben besloten bepaalde producten/diensten niet meer te leveren.
RI3	Wij besteden veel tijd/aandacht aan nieuwe producten/diensten.
RI4	Onze medewerkers verkennen (voor de organisatie) nieuwe terreinen.
RI5	Voor de realisatie van onze ambities hebben wij behoefte aan kennis en ervaring die we op dit moment niet in huis hebben.
RI6	Wij laten ons leiden door nieuwe kansen.
RI7	Ons motto is: “betere dingen doen”.
RI8	Onze strategie schetst een nieuw perspectief voor de onderneming.
RI9	De afgelopen periode hebben we radicale strategische keuzes gemaakt met vergaande consequenties voor de toekomst.

Appendix 10: Survey Innovation Profile in Dutch

Onderstaande vragen inventariseren de verschillende profielen van medewerkers vanuit het perspectief van kennisproductiviteit. Hoe zou u onderstaande zinnen afmaken? Kies de formulering die het beste bij u past.

Item	*Statement*	*Option*
WB1	Om succesvol te zijn …	a. moeten we nieuwe oplossingen bedenken b. moeten we bestaande oplossingen beter benutten
WB2	Bestaande structuren en procedures …	a. moeten worden doorbroken b. moeten worden verbeterd
WB3	Onze kansen liggen in …	a. nieuwe diensten en/of nieuwe markten b. bestaande diensten en/of bestaande markten
WB4	Klanten willen volgens mij …	a. onverwachte oplossingen b. voorspelbare oplossingen
WB5	In de keuzes die we maken …	a. moeten we radicaal breken met het verleden b. moeten we voortbouwen op bestaande successen
WB6	Ik haal vooral voldoening uit …	a. het bedenken van iets heel nieuws b. het succesvol maken van een bestaand idee
WB7	Ik hou er van om …	a. te spelen met een probleem b. een probleem zo snel mogelijk op te lossen
WB8	Ik heb vooral moeite met …	a. het in detail uitwerken van een idee b. het oplossen van vage problemen
WB9	Regels zijn er om …	a. van af te wijken b. na te leven
WB10	Verandering is een …	a. uitdaging waar ik veel plezier aan beleef b. noodzakelijk kwaad

Appendix 11: Calculating the contribution of three generic strategies to OCF, Transfer Solutions bv, 2000-2004

	2000	***2001***	***2002***	***2003***	***2004***	***2000-2004***
Turnover (V)	7,749	11,314	10,840	11,658	12,608	
Employment costs	5,161	7,071	6,675	6,532	7,190	
Efficiency (E)*	1,501	1,600	1,624	1,785	1,754	
Depreciation	0,131	0,129	0,124	0,171	0,144	
Tax	0,490	0,822	0,677	1,025	1,100	
Interest and other fin. costs	-0,068	-0,126	-0,119	-0,099	-0,086	
Net profit	0,998	1,350	1,157	1,850	1,906	
Added Value (A)	0,866	0,817	0,785	0,813	0,813	
Performance (P)***	0,200	0,192	0,170	0,253	0,243	
Operational Cash Flow (OCF)****	1,551	2,175	1,839	2,947	3,064	
Increase OCF	na	0,62	-0,34	1,11	0,12	
cash impact						
Volume (V)	na	0,714	-0,091	0,139	0,240	
Added Value (A)	na	-0,379	-0,360	0,300	0,002	
Efficiency (E)	na	0,318	0,104	0,601	-0,116	
cash impact in %						
Volume (V)	na	114%	-27%	13%	205%	76%
Added Value (A)	na	-61%	-107%	27%	2%	-35%
Efficiency (E)	na	51%	31%	54%	-99%	9%

* turnover/employment costs
** (employment costs+depreciation+tax+interest and other fin.costs+net profit)/V
*** A-(1/E)
**** performance (P) x turnover (V)

Appendix 12: Calculating residual change (dR), Transfer Solutions, 2000-2004

	2000	***2001***	***2002***	***2003***	***2004***
Output*	6,712	9,246	8,514	9,479	10,254
Output/employee	0,127	0,142	0,111	0,105	0,109
Capital**	0,131	0,129	0,124	0,171	0,144
Capital/employee	0,002	0,002	0,002	0,002	0,002
Employees	53	65	77	90	94
change output/employee (dOe)	na	0,016	-0,032	-0,005	0,004
capital / output (C/O)	0,020	0,014	0,015	0,018	0,014
change capital/employee (dCe)	na	0,000	0,000	0,000	0,000
dR=1+(dOe-C/O*dCe)	na	1,016	0,968	0,995	1,004

* employment costs+depreciation+tax+interest and other fin.costs+net profit
** depreciation

Appendix 13: Calculating the contribution of three generic strategies to OCF, Midfield Consultants, 2002-2005

	31-6-2002	***31-12-2002***	***31-6-2003***	***31-12-2003***	***31-6-2004***	***31-12-2004***	***31-6-2005***	***2002-2005***
Turnover (V)	1,936	1,019	1,873	1,349	1,829	1,756	2,081	
Employment costs	1,726	0,899	1,594	1,158	1,693	1,420	1,635	
Efficiency (E)*	1,122	1,133	1,175	1,165	1,080	1,237	1,273	
Depreciation	0,026	0,019	0,027	0,015	0,021	0,022	0,044	
Tax	-0,083	-0,083	-0,051	-0,051	-0,070	-0,070	-0,060	
Interest and other fin. costs	-0,025	-0,025	-0,017	-0,017	-0,017	-0,017	-0,017	
Net profit	-0,128	-0,184	-0,211	0,019	-0,252	-0,011	0,006	
Added Value (A)	0,783	0,614	0,716	0,833	0,752	0,765	0,773	
Performance (P)***	-0,108	-0,268	-0,135	-0,025	-0,174	-0,043	-0,013	
Operational Cash Flow (OCF)****	-0,210	-0,273	-0,252	-0,034	-0,318	-0,076	-0,027	
Increase OCF	na	-0,06	0,02	0,22	-0,28	0,24	0,05	
cash impact								
Volume (V)	na	0,099	-0,229	0,071	-0,012	0,013	-0,014	
Added Value (A)	na	-0,327	0,104	0,219	-0,110	0,025	0,013	
Efficiency (E)	na	0,018	0,032	-0,014	-0,091	0,214	0,040	
cash impact in %								
Volume (V)	na	158%	-1089%	32%	-4%	5%	-29%	-154%
Added Value (A)	na	-519%	496%	100%	-39%	10%	26%	13%
Efficiency (E)	na	29%	151%	-6%	-32%	88%	82%	52%

* turnover/employment costs
** (employment costs+depreciation+tax+interest and other fin.costs+net profit)/V
*** A-(1/E)
**** performance (P) x turnover (V)

Appendix 14: Calculating residual change (dR), Midfield Consultants, 2002-2005

	31-6-2002	***31-12-2002***	***31-6-2003***	***31-12-2003***	***31-6-2004***	***31-12-2004***	***31-6-2005***
Output*	1,516	0,626	1,342	1,124	1,375	1,344	1,608
Output/employee	0,029	0,013	0,030	0,027	0,033	0,033	0,038
Capital**	0,026	0,019	0,027	0,015	0,021	0,022	0,044
Capital/employee	0,001	0,000	0,001	0,000	0,001	0,001	0,001
Employees	51,5	47	44,5	42	41,5	41	42
change output/employee (dOe)	na	-0,016	0,017	-0,003	0,006	0,000	0,006
capital / output (C/O)	0,017	0,030	0,020	0,013	0,015	0,016	0,027
change capital/employee (dCe)	na	0,000	0,000	0,000	0,000	0,000	0,001
dR=1+(dOe-C/O*dCe)	na	0,984	1,017	0,997	1,006	1,000	1,005

* employment costs+depreciation+tax+interest and other fin.costs+net profit
** depreciation

Curriculum Vitae

Christiaan Stam (1965) is Research Fellow at the Centre of Research in Intellectual Capital. His appointment is a joint initiative of INHOLLAND University of Professional Education and de Baak - Management Centre VNO-NCW (Dutch Federation of Industries).

Central themes in his work are knowledge management, intellectual capital measurement and knowledge productivity. Before becoming a Research Fellow he worked for de Baak and he runned his own consultancy firm (Intellectual Capital Services). For several years he was Program Director of the Masterclass Knowledge Management, a joint initiative of CIBIT and de Baak. He initiated www.intellectualcapital.nl, a startpage for the intellectual capital community. Since 1998 he wrote many articles and several books.

Christiaan likes to study: In 1988 he received his bachelor's degree in History (Teacher Training College (NLO), Hogeschool Holland, Amsterdam); In 1990 he received a scholarship to study History at the European University Institute in Florence, Italy; In 1992 he received his Master's degree (Doctorandus) History (Vrije Universiteit Amsterdam); In 1998 he received the degree Master of Business Administration (NIMBAS/University of Bradford, UK). Since 2004 he is a Ph.D. student at Twente University.

Christiaan is married to Céline and has two children: Susanna and David.

stam@intellectualcapital.nl