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KNOWLEDGE PRODUCTIVITY

designing and testing a method
for measuring knowledge productivity in order to give direction to
knowledge management initiatives

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Abstract

Research Paper

Purpose
Main objective of this research is to design and test a method for measuring knowledge productivity in order to give direction to knowledge management initiatives. This paper presents the methodological and theoretical framework, the initial design of the method and the results of the first two case-studies.

Methodology/approach
This research project is based on the paradigm of the Design Sciences. Therefore, the research is designed as a multiple case study based on the reflexive cycle.

Findings
The method has been applied in two iterations. Main finding of the first iteration was a lack of coherence between the different elements. Main finding of the second iteration was the redundancy of one of the elements of the method. The next iterations the focus will shift from method development to the implementation of the method. From a methodological point of view, special attention will be paid to the issue of objectivity.

Research implications
A useful source for researchers motivated by solving real life problems and generating transferable knowledge to be used in designing solutions to solve comparable problems.

Originality/value
This paper contributes to the challenge of creating a theory that puts knowledge in the centre of the wealth creating process by combining the concepts of knowledge management and intellectual capital measurement. Further operationalization of the relatively new concept of knowledge productivity.

Keywords: *Knowledge Productivity, Knowledge Management, Intellectual Capital, Innovation, Danish Guidelines, Design Sciences.*

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The sources of productivity have always been the main subject of economic debate because it is the main determinant of profitability and competitiveness. In order to improve productivity we should be able to identify the sources of productivity. The past decades our production process has changed. 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. Knowledge has become the main ingredient in products and services (Drucker, 1993, Castells, 1996, Nonaka and Takeuchi, 1997). Consequence of this transformation is that managers have lost sight of the sources of productivity and productivity growth, which leads to distorted resource allocation and poor (external) communication about organizational performance (Eustace, 2000, Blair and Wallman, 2001, Eustace, 2003, CEC, 2006).

Objective and question

Main objective of this research is to develop a practical method to assess the quality of the sources of knowledge productivity in order to give direction to knowledge management initiatives. Underlying assumption is that knowledge management initiatives aim at improving knowledge productivity (Nonaka and Takeuchi, 1997, Weggeman, 1997). Another assumption of this research is that measurement leads to better understanding, better communication and better resource allocation, which eventually leads to better organizational performance (Edvinsson and Malone, 1997, Stewart, 1997, Sveiby, 1997, Kaplan and Norton, 1999, 2004). In this respect the process of measuring is more than only assigning scaled numbers to items (Swanborn, 1981). The process of measurement should also be seen as an intervention that contributes to improving organizational performance. As the research objective is to acquire knowledge about how to measure knowledge productivity in order to give direction to knowledge management initiatives, the main research question is *how to develop a practical method to measure knowledge productivity in order to give direction to knowledge management initiatives?*

Methodology

Major element of this research is to design a method and test the effectiveness of the method in practice, therefore this research follows the paradigm of the Design Sciences developed by Van Aken (1994, 1996, 2004b, 2004a). In the design sciences the typical research product is the *solution concept*. This means that the solutions can be used to solve similar problems in similar contexts. Solution concepts are 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, the typical research design is the multiple-case (Yin, 2003). 'Through multiple case-studies one can accumulate supporting evidence which can continue until "theoretical saturation" has been obtained' (Van Aken, 2004b: p.235). Although the research will be driven by and take place around local problems, the applicability of the solution concepts will be non-local.

Theoretical framework

The past decades a *resource-based view* of the firm emerged. Authors like Penrose (1959), Hamel and Prahalad (1990, 1994), and Stalk et al (1992) contributed to this new strategic paradigm. Like knowledge management, the concept of knowledge productivity can also be seen as a further specification of the resource-based view (Grant, 1996). Difference however, is the believe that the competitive advantage of organizations does not come from knowledge itself, but from knowledge productivity, or the extent to which knowledge has been put into use. Authors like Machlup (1972, original publication 1962) and Drucker (1993) stressed the relationship between knowledge and value creation in an early stage. However, it was Kessels (1996, 2001) who introduced the concept of knowledge productivity. 'Knowledge productivity concerns the way in which individuals, teams and units across an organization achieve knowledge-based improvements and innovations' (Harrison and Kessels, 2004: p.145). Whereas Drucker interpreted knowledge worker productivity as a management challenge, Kessels puts the individual in the centre of his theory. Main underlying assumption of this concept is 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. (…) As this change of the character of labour takes place, it is inevitable that the workplace turns into a learning environment. (…) The conditions for good work become similar to the conditions for good learning' (Kessels and Van der Werff, 2002: p.20). So 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, 1996, Kessels and Van der Werff, 2002).

Whereas Kessels, and many others, extensively elaborate on the preconditions for knowledge productivity, only very little has been said about the second part of his definition which refers to the results. In his definition, based on Walz and Bertels (1995), Kessels (2001) 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 and Kessels, 2004: p.157). A similar interpretation can be found in Zegveld's *Competing with Dual Innovation Strategies* {, 2000 #490}. Based on the punctuated equilibrium (Eldredge and Gould, 1972) and its application on organizational development (Tushman and Romanelli, 1990, Tushman and O'Reilly III, 1996), Zegveld (2000) makes a distinction between incremental and radical 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). In order to detect incremental and radical innovation, Zegveld (2000) developed a *Quantitative Framework* for measuring exploitation and exploration.

The concept of Knowledge Productivity has been subject to different interpretations. Van Lakerveld (2005) signals three different approaches: the epistemological, the economic (organizational science), and those who stress the importance of learning processes. The main distinction between the latter two seems to be the answer to the question: is knowledge productivity a process or an outcome? Depending on the choice that is made between these two, Stam and Evers (2004) signal two dominant complementary approaches, which they call

economic and *process* approach. Whereas the economic approach dominantly seems to aim at identifying and measuring knowledge productivity, the process approach dominantly aims at identifying the necessary preconditions for enhancing knowledge productivity. Because the aim of this research is both to measure and improve knowledge productivity, this research combines both the *economic* and *process* approach. In order to measure knowledge productivity Zegveld's (2000) Quantitative Framework is used. In order to assess the quality of the preconditions for knowledge productivity Kessels' (1996) concept of the Corporate Curriculum is used. Both Kessels' and Zegveld's approaches are combined in a *Knowledge Productivity Framework* (figure 1). This theoretical framework was used as a starting point for the design of the Knowledge Productivity Enhancer.

--- take in Figure 1 ---

Design of the Knowledge Productivity Enhancer

The design objective within this research is to develop a practical method to measure knowledge productivity in order to give direction to knowledge management initiatives. The process of designing and testing the method consists of four phases (Andriessen, 2004): defining the application domain; creating a list of requirements; designing the method; evaluating the design. This section elaborates on the third phase, in which the method is designed. The Knowledge Productivity Enhancer consists of three phases. Aim of the first phase is to identify problems and set the objectives for applying the method. Main aim of the second phase is to analyse the current situation and define possibilities for improvement. Objective of the final phase is to translate these findings into a plan for action, or *Knowledge Productivity Statement*. The latter is the final product of the method.

Within this research project, applying the method should be seen as a part of the learning cycle of the developing multiple case study. Therefore, 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) and the theoretical reflection (knowledge stream) which is characteristic for Design Based Research (Andriessen, 2006). Aim of the practice stream is to solve specific problems. Aim of the knowledge stream is to develop knowledge that can be transferred to comparable situations.

--- take in Figure 2 ---

Intake (phase 1)

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 with the sponsor and/or contact person. Main questions to be answered are:

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?

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. Moreover, these steps provide the opportunity to establish a good working relationship with the 'customer'. The report of the interview is verified by the informants and serves as a reference point for evaluating the effectiveness of the method.

Analysis of Current Situation (phase 2)

Aim of this phase of the method is to analyse the current situation and define possibilities for improvement. The output of this phase serves as input for the process of generating a Knowledge Productivity Statement in the next phase. The analysis of the current situation is based on Zegveld's Quantitative Framework and Kessels' Corporate Curriculum. The former measures the result of knowledge productivity in terms of incremental and radical innovations. The latter reveals the preconditions for enhancing knowledge productivity.

Measuring incremental and radical innovations (2a)

Due to practical reasons, within this research Zegveld's analysis has been simplified. Main simplification has been the reduction of the number of years from twelve to five. According to Zegveld (interview September 2005), a series of five years would be the minimum to recognize a pattern.

Incremental innovation (exploitation)
As we have seen above, 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. Reasoning behind 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. Moreover, 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, added-value strategy and a volume strategy. 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 (Zegveld, 2000). Companies are either volume or performance driven. If they are performance driven, they can either have a focus on added-value or on efficiency.

Aim of the Quantitative Framework is to detect stability or instability 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). These financial data is used to detect a change in the selection of one of the three generic strategies (volume, efficiency and 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 #490} stability and change 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 (2000) 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 (see Appendix I). 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, which leads to a radical new perspective to the company. Like exploitation, radical innovation is a neutral concept and can lead either to creative destruction or creative accumulation. Moreover, like exploitation, radical innovation may be the result of explicit or implicit developments.

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. 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 (Solow, 1957, Romer, 1990). Nowadays, the assumption that changes in productivity that can not 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. Therefore, based on Solow, Zegveld translates the concept of Total Factor Productivity (TFP) into Total Resource

Productivity (TRP) and proposes to apply the concept to companies instead of countries (figure 3).

--- take in Figure 3 ---

'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. Therefore, the build-up of the residual is a determinant of change of the perspective. Reasoning behind 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 impact 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' (2000: p.59). According to Zegveld, a sudden positive shift in the development of company specific TRP 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 reasoning follows the resource-based view of the company which 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 (see Appendix I) we can determine whether a firm qualifies as a radical innovation firm or not. Radical innovation can be recognized by a significant change in the residual build-up.

Assessment of the preconditions for knowledge productivity (step 2b)

Parallel to measuring incremental and radical innovations data is gathered about the quality of the preconditions for knowledge productivity. 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 preconditions determines the extent to which incremental and radical innovations will be achieved. The assessment of the quality of the preconditions for knowledge productivity is based on Kessels' *Corporate Curriculum* (Kessels, 1996). The Corporate Curriculum consists of seven *learning functions*.

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.

The main elements of the seven learning functions of the Corporate Curriculum (see Appendix II) have been operationalized into a set of statements about the current situation within a company. All employees are invited to give their perception about these statements. Aim of the survey is to make analysis of the current situation possible, generate possibilities for improvement which can serve as input for the next phase, in which the findings are translated into a Knowledge Productivity Statement.

Create a knowledge productivity statement (phase 3)

Main aim within the third phase of this method is to generate a *Knowledge Productivity Statement* (KPS). As the objective of the KP-Enhancer is to give direction to knowledge management initiatives, the process of generating a KPS is based on the process of generating an Intellectual Capital Statement, as developed by the Danish Ministry of Science Technology and Innovation (STI, 2003b).

Intellectual Capital Statement Model

An Intellectual Capital Statement consists of four elements (STI, 2002, 2003a, b). 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). The second element are the *management challenges*, which are the challenges that have to be overcome in order to implement the knowledge narrative. The third element are the *initiatives*, which are the actions that can be taken to do something about the management challenges. Finally, the fourth element are the *indicators*, which monitor the progress of initiatives. They make initiatives visible by making them measurable.

--- take in Figure 4 ---

Though the Intellectual Capital Statement Model is designed to create intellectual capital statements, it seems to fit the concept of knowledge productivity and the aim of this research for several reasons. First, this model is designed to translate strategy into knowledge-based action. Intellectual capital statements translate the knowledge narrative into activities that the firm has to put in place to enhance the performance of its knowledge resources (Mouritsen et

al., 2001). This aspect supports the main aim of this method to give direction to knowledge management initiatives. Second, intellectual capital statements give knowledge an object, which makes it possible to monitor and manage knowledge resources. 'To achieve this, the intellectual capital statement's knowledge narrative is related to a monitoring system, which identifies the knowledge management activities' (Mouritsen et al., 2002: p.20). 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 (Roos et al., 1997, Mouritsen et al., 2002). '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). Third, the lack of existing models for monitoring knowledge resources asks for a model that includes the logic of reading. Reading an intellectual capital statement is different from reading a financial statement, because the intellectual capital statement does not have the institutions that make certain readings conventional, as in the case of the financial statement. 'The logic of reading the indicators can therefore not be "outside" the document but has to be made part of it'(Mouritsen et al., 2001). Fourth, managing knowledge resources is a process. The step-by-step approach of the model guides the manager through the process of formulating a statement. Participating in this process is at least equally important as the outcome. The aim of intellectual capital statements is to visualize the path towards realizing the knowledge narrative. In other words, they create the infrastructure required to make the knowledge narrative possible (Mouritsen et al., 2002). However, the main benefits of the process do not come from the statement itself, but from the act of preparing the statement (STI, 2003b, Andriessen, 2004). This aspect supports the assumption that the process of measuring is more than assigning scaled numbers to items. There is more to an intellectual capital statement than the indicators (Mouritsen et al., 2001). However, aim of the indicators is to monitor the implementation of interventions related to the knowledge narrative and take actions accordingly.

Generating a Knowledge Productivity Statement

The process of generating a Knowledge Productivity Statement (KPS) follows the process of the Intellectual Capital Statement Model. However, some minor modifications have been made. The main difference is that the KPS does not start from the concept of intellectual capital and its different types of intangibles, but from the concept of the Corporate Curriculum and its seven learning functions. Starting point of the process is the output of the analysis of the current situation (phase 2). Generating a KPS takes place in several workshops with a selection (max. 10) of the respondents to the survey. Developing a KP-statement is a process that consists of four steps:

1. Make an inventory of existing initiatives and underlying challenges. As the Corporate Curriculum serves as starting point, the inventory focuses on initiatives and challenges related to the seven learning functions. In a sense, these elements could be translated into 'learning challenges' and 'learning initiatives'.
2. Develop a knowledge narrative. This narrative or knowledge strategy expresses the company's ambition to increase the value a user receives from a company's *goods or services* and translates the so called *use value* into *knowledge resources*. The latter are needed to give direction to the challenges.
3. Reformulate challenges, select initiatives. Based on the ambition (knowledge narrative) and the quality of the preconditions for knowledge productivity (outcome

survey), we now can reformulate challenges and initiatives. Which initiatives deserve priority? Which initiatives should be launched? Which can be eliminated?

4. Define indicators. Finally, after the narrative, challenges and initiatives have been completed, indicators are defined to monitor the progress of the initiatives.

Once fully completed, the analysis will be presented in a Knowledge Productivity Statement, analogue to the Intellectual Capital Statement Model above. This statement serves as the main output of the Knowledge Productivity Enhancer.

Testing the KP-Enhancer

The aim of this research is to design and test a method. Therefore, after the design, the next step was to test the method in various iterations using the developing multiple-case study. This final section of the paper elaborates on the findings within the first two tests.

First Iteration: Testing the Initial Design

The KP-enhancer was first tested by IT Solutions BV, a Dutch ICT service provider specialized in Oracle database systems and Java-technology. IT Solutions BV has about 100 employees divided over four business units: Education, Internet Solutions, Consultancy and DBA Solutions. The method was applied between October 2005 and January 2006. As this was the first time the method was applied, the aim within this case study was to test the initial design of the method. The main problem within this company appeared to be an internal control issue. By applying this method, IT Solutions BV expected to get a better understanding of the sources of knowledge productivity and how to improve knowledge productivity. The main effects of applying the KP-enhancer within this case-study were increased awareness among employees about the importance of knowledge productivity, and increased involvement of employees in translating strategy into action. The most appreciated part of the method was the phase in which we generated a KP-Statement. Although the method generated some progress in the thinking about preconditions for knowledge productivity and indicators for measuring knowledge productivity, this progress was perceived as insufficient.

The main difficulties within this first iteration were caused by applying Zegveld's Quantitative Framework. As a result of the reduction of the analysis to a series of five years, the outcome was seriously disturbed by one deviating accounting figure (2002). This disturbance made the conclusions about the stability or instability questionable, which resulted in rejection of the outcome by the participants of the workshops. Increase of the number of figures would probably have reduced the disturbing effect of 2002. However, due to practical problems we were not able to extend the number of measures. Therefore we decided to ignore the outcome of this analysis and focus on the analysis based on Kessels' Corporate Curriculum. Another problem was caused by Zegveld's conceptualization of incremental innovation. As most of the participants interpreted incremental innovation as everyday (minor) improvements of existing practice they had difficulties with connecting this concept to a shift in generic strategies. Moreover, they did not accept the fact that the analysis did not detect incremental innovations (i.e. minor improvements). Another finding in this case study was that the method lacked coherence. Although the different parts (i.e. survey, quantitative analysis and KP-statement) were suggested to form a coherent method, the relationship between the three was not clear to the participants. On the one hand this lack of coherence was caused by the difficulties with applying the Quantitative Framework. On the other hand, the method seemed to lack connecting elements.

In order to strengthen coherence it seemed as if the method should generate more 'tangible' output through collective analysis of the outcome. Therefore, to discuss the outcome and to collect shared findings that could give direction to a KP-statement, a board-game was developed. Main questions to be answered in this game are: "what result(s) are you aiming at (incremental innovations and/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 innovations. 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 a 'priority' card 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 their initial choice. The third and fourth round are repetitions of the second round. The result of the game is a visualization of the importance of the different results that the company is aiming at (incremental and/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 a starting point for generating a KP-statement.

Second Iteration: Testing Coherence

Midfield Consultants is the second organization where we applied the KP-Enhancer. Midfield has 43 employees (36 consultants and 7 support staff), divided over three locations. The focus of Midfield is on Small and Medium-sized Enterprises (SME's). Specific SME related topics are *company succession & transfer*, *franchise & commercial co-operation*, *expropriation & real estate consultancy* and *project & subsidy management*. The method was applied between February 2006 and May 2006. As the improvements after the first iteration were mainly meant to improve coherence, the main aim of the second iteration was to test coherence between the different elements of the method. Midfield's main motive to apply the KP-Enhancer was that the management expected the method to raise awareness about the importance of two internal projects (*age-conscious personnel policy* and *securing knowledge and networks*), give direction to these internal projects and involve people in implementing the activities related to these projects.

Again, like in the first iteration, the process of generating a KP-statement was perceived to be the most valuable element of the method. It was perceived valuable because Midfield finally managed to get their strategic ambitions on paper. Moreover, the fact that it fitted on one page and that it was action-oriented was also highly appreciated. After completion of the method, the outcome was presented at a special meeting to all employees. As a result many people committed themselves to one or more projects. In this sense the outcome appeared to be very useful and in line with the expectations. To a lesser extent, the method had also been applied to improve corporate reputation and the ability to attract new employees. Asked after the effects related to these issues, it appeared that the KP- statement had successfully been used in interviews with potential employees in order to introduce the company and the challenges they were facing. In this sense it seems as if the KP-statement also contributed to improve external communication.

Main finding of the first iteration was that the method lacked coherence. The efforts to integrate the various elements within the method after the first iteration, seems to have worked out very well within this case-study. The process of generating a KP-statement was perceived as a very "natural next step" after the analysis of the current situation. The collective findings – generated during the KP-board game in the first workshop – seem to have bridged the gap between analysis and action. The game played an important role in

generating these findings and shift gear from passive to active participation. However, the KP board game also generated friction and resistance in the process, which almost resulted in the termination of the method. The introduction of the method and the presentation of the outcome of the analysis during the first workshop confirmed the initial expectation with some of the participants that the method was too "scientific". According to some of the participants, the time that was invested in reflection and in generating collective findings lacked practical relevance. These hesitations about the effectiveness of the method eventually led to an outburst of anger by one of the participants. It seems as if the game at the end of the first workshop served as the trigger. According to this participant, the workshop was "childish, repeating things we had already done before and a loss of time". At first this outburst resulted in an awkward moment which seemed to endanger the continuity of the process. However, the discussion that followed also resulted into increased awareness of the problem they were trying to solve (lack of ability to reflect). In this sense the outburst of anger had been very productive and contributed positively to the final outcome.

Although the analysis of the current situation should have been based on both the survey and the quantitative analysis, Zegveld's Quantitative Framework was not used within this case study. The main reason for this was the fear that presenting these 'academic' calculations (after the crisis) would further endanger the continuity of the process. Though the assumption was that insight in these measurements were necessary to analyse the current situation, the method seemed to work very well without these measurements. It seems as if the quantitative analysis is not a necessary element within the method. Moreover, the outcome of the survey seems to generate sufficient input for making a KP-statement. Therefore, combined with the experiences in the first iteration, we should consider to leave out this element in the next iteration.

Further Research

The objective of this research is to acquire knowledge about how to measure knowledge productivity in order to give direction to knowledge management initiatives. The main focus of this research until now has been on the theoretical design of a method and testing the initial design in two iterations. Within the contexts of the first two case-studies, this method seems to have generated satisfying results. Therefore, the main focus within the next iterations will shift from the development of the method to the implementation of the method. Main objective within these iterations will be to acquire knowledge about implementing the KP-Enhancer. Consequently the main question to be answered will be how to implement the KP-Enhancer? In order to answer this question, special attention will be paid to the next issues:

1. The method seems to contribute to collective sense making. What happens if people within an organization go through a process like this? (Weick, 1995) How to contribute to the construction of meaning?
2. In line with earlier research (Van Lakerveld, 2005), the first two iterations confirm that Reflection is a problem within many organizations. This method forces organizations to practice reflection. How to reflect, when reflection is the problem?
3. As the KP-Enhancer is an intervention method, then what are the specific requirements with respect to the interventionist?

From a methodological point of view, the third question also raises the issues of objectivity and bias. As this research is based on participative observation, the central methodological problem (or dilemma) is balancing adequate subjectivity with adequate objectivity (Bruyn, 1966). How to maintain enough distance to be able to locate the contextual experiences in a wider theoretical and social context? Related to the issue of objectivity, and perhaps helpful in

answering this methodological question is the issue of plausible rival explanations (Campbell and Stanley, 1963). What are alternative conclusions that can be taken from the same data and which of the alternative explanations seems to be the most plausible?

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Appendix I: Detecting incremental and radical innovation

Detecting incremental innovation

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)

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

Detecting radical innovation

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))

Source: (Zegveld, 2000).

Appendix II: Operationalization of the Corporate Curriculum

Learning functions:

1. Subject matter expertise
    - Knowledge grounded in strategy
    - Effective knowledge processes (develop, share/codify)
2. Problem solving
    - Effective knowledge processes (apply)
    - Ability to renew and stretch (creativity)
3. Ability to reflect
    - Effective knowledge processes (evaluate)
    - Reflective skills
4. Communication skills
    - Competences of the knowledge worker
    - Culture of knowledge sharing
    - Structure for knowledge sharing
5. Self regulation of motivation
    - Space
    - Personal entrepreneurship
    - Management support
6. Peace and stability
    - Room for specialization
    - Time for reflection and sharing
    - Organizational redundancy
7. Creative turmoil
    - Strategic ambiguity

Literature

Andriessen, D. G. (2004), "Making Sense of Intellectual Capital", Elsevier Butterworth-Heinemann, Amsterdam.

Andriessen, D. G. (2006), "Design-Based Research to influence managerial Sensemaking. The case of intellectual capital valuation", British Journal of Management, submitted for review.

Blair, M. M. and Wallman, S. M. H. (2001), "Unseen Wealth. Report of the Brookings Task Force on Intangibles", Brookings Institution Press, Washington D.C.

Bruyn, S. T. (1966), "The human perspective in sociology: the methodology of participant observation", Prentice-Hall, Englewood Cliffs.

Campbell, D. T. and Stanley, J. C. (1963), "Experimental and Quasi-Experimental Designs for Research", Rand McNally, Chicago.

Castells, M. (1996), "The Rise of the Network Society, The Information Age: Economy, Society and Culture, Vol.1", Blackwell, Cambridge, MA; Oxford, UK.

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", European Commission, DG-Research, Brussels, EUR 22095 EN.

Drucker, P. F. (1993), "De post-kapitalistische maatschappij: onze maatschappij van organisaties, het staatsbestel en kennis", Scriptum, Schiedam.

Edvinsson, L. and Malone, M. S. (1997), "Intellectual Capital. The proven way to establish your company's real value by measuring its hidden brainpower", HarperBusiness, London.

Eldredge, N. and Gould, S. J. (1972), "Punctuated equilibria: an alternative to phyletic gradualism", in (Ed, Schopf, T. J. M.), Models in Paleobiology, Freeman, Cooper & Co, San Francisco, pp.82-115.

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,

Eustace, C. (2003), "The PRISM Report. Research findings and policy recommendations", European Commission IST-programme,

Grant, R. M. (1996), "Toward a knowledge-based theory of the firm", Strategic Management Journal, 17, 10 (Winter Special), pp.109-122.

Hamel, G. and Prahalad, C. K. (1994), "Competing for the Future", Harvard Business School Press, Boston, Massachusetts.

Harrison, R. and Kessels, J. W. M. (2004), "Human Resource Development in a Knowledge Economy. An organisational view", Palgrave Macmillan, New York.

Kaplan, R. S. and Norton, D. P. (1999), "Op kop met de balanced Scorecard. Strategie vertaald naar actie", Uitgeverij Contact, Amsterdam.

Kaplan, R. S. and Norton, D. P. (2004), "Measuring the Strategic Readiness of Intangible Assets", Harvard Business Review, pp.52-63.

Karnani, A. (1984), "Generic competitive strategies - an analytical approach", Strategic Management Journal, 5, pp.367-380.

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", Leiden, 23 februari, Rijksuniversiteit Leiden.

Kessels, J. W. M. (2001), "Verleiden tot kennisproductiviteit - Rede uitgesproken bij het aanvaarden van het ambt van hoogleraar Human Resource Development aan de faculteit der Toegepaste Onderwijskunde", Enschede, 8 februari, Universiteit Twente.
Kessels, J. W. M. and Van der Werff, P. (2002), "What is beyond knowledge productivity?" in (Eds, Aken, T. v. and Engers, T. v.), Beyond Knowledge Productivity: report of a quest, LEMMA, Utrecht, pp.19-28.
Luehrman, T. A. (1997), "What's it worth? A general manager's guide to valuation", Harvard Business Review, May-June, pp.132-142.
Machlup, F. (1972), "The Production and Distribution of Knowledge in the United States", Princeton University Press, Princeton, New Jersey.
Mouritsen, J., Bukh, P. N., Larsen, H. T. and Johansen, M. R. (2001), "Reading an Intellectual Capital Statement. Describing and prescribing knowledge management strategies", Journal of Intellectual Capital, 2, 4, pp.359-383.
Mouritsen, J., Bukh, P. N., Larsen, H. T. and Johansen, M. R. (2002), "Developing and managing knowledge through intellectual capital statements", Journal of Intellectual Capital, 3, 1, pp.10-29.
Nonaka, I. and Takeuchi, H. (1997), "De kenniscreërende onderneming. Hoe Japanse bedrijven innovatieprocessen in gang zetten." Scriptum, Schiedam.
Penrose, E. T. (1959), "The Theory of the Growth of the Firm", Basil Blackwell, Oxford.
Porter, M. (1980), "Competitive Strategy", Free Press, New York, NY.
Prahalad, C. K. and Hamel, G. (1990), "The Core Competence of the Corporation", Harvard Business Review, 68, 3, pp.79-91.
Romer, P. (1990), "Endogenous Technological Change", Journal of Political Economy, 98, 5, part 2, pp.71-102.
Roos, G., Roos, J., Dragonetti, N. C. and Edvinsson, L. (1997), "Intellectual Capital: navigating in the new business landscape", New York University Press, New York.
Solow, R. M. (1957), "Technical change and the aggregate production function", The Review of Economics and Statistics, 39, pp.312-320.
Stalk, G., Evans, P. and Shulman, L. E. (1992), "Competing on Capabilities: The new rules of corporate strategy", Harvard Business Review, 70, 3, pp.57-69.
Stam, C. D. and Evers, A. (2004), "Kennisproductiviteit en de kunst van het boogschieten", in (Eds, Stam, C. D., Evers, A., Leenheers, P., De Man, A. and Van der Spek, R.), Kennisproductiviteit: het effect van investeren in mensen, kennis en leren, Pearson Education, Amsterdam, pp.1-9.
Stewart, T. A. (1997), "Intellectual Capital, The new wealth of organizations", Doubleday, New York.
STI (2002), "Intellectual Capital Statements in Practice", Ministry of Science, Technology and Innovation, Copenhagen,
STI (2003a), "Analysing Intellectual Capital Statements", Ministry of Science, Technology and Innovation, Copenhagen,
STI (2003b), "Intellectual Capital Statements - The New Guideline", Ministry of Science Technology and Innovation, Copenhagen,
Sveiby, K. E. (1997), "The New Organizational Wealth. Managing & Measuring Knowledge-based Assets", Berret-Koehler Publishers Inc., San Fransisco.
Swanborn, P. G. (1981), "Methoden van sociaal-wetenschappelijk onderzoek", Boom, Meppel.
Tushman, M. L. and O'Reilly III, C. A. (1996), "Ambidextrous organizations: managing evolutionary and revolutionary change", California Management Review, 38, 4, pp.8-30.

Tushman, M. L. and Romanelli, E. (1990), "Organizational evolution: a metamorphisis model of convergence and reorientation (1985)", in (Eds, Cummings, L. L. and Staw, B. M.), The evolution and adaptation of organizations, JAI Press, Greenwich.
Van Aken, J. E. (1994), "De Bedrijfskunde als Ontwerpwetenschap", Bedrijfskunde, 66, 1, pp.16-26.
Van Aken, J. E. (1996), "Methodologische vraagstukken bij het ontwerpen van bedrijfskundige systemen", Bedrijfskunde, 68, 2, pp.14-22.
Van Aken, J. E. (2004a), "The Field-tested and Grounded Technological Rule as Product of Mode 2 Management Research (revised and resubmitted version, 31 March)", British Journal of Management.
Van Aken, J. E. (2004b), "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, pp.219-246.
Van Lakerveld, J. (2005), "Het Corporate Curriculum: Onderzoek naar werk-leeromstandigheden in instellingen voor zorg en welzijn. Proefschrift ter verkrijging van de graad van doctor." Universiteit Twente, Enschede.
Walz and Bertels (1995), "Das Intelligente Unternehmen, Schneller lernen als der wettbewerb", Verl. Moderne Industrie, Landsberg/Lech.
Weggeman, M. (1997), "Kennismanagement; inrichting en besturing van kennisintensieve organisaties", Scriptum, Schiedam.
Weick, K. E. (1995), "Sense-making in organizations", Sage Publications, London.
Yin, R. K. (2003), "Case Study Research. Design and Methods." SAGE Publications, Thousand Oaks.
Zegveld, M. A. (2000), "Competing with dual innovation strategies. A framework to analyse the balance between operational value creation and the develpment of resources. Dissertation", werk-Veld bv, The Hague.

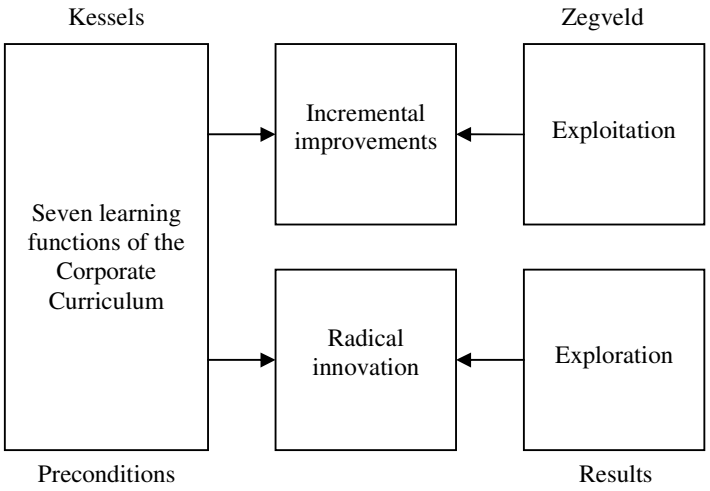

Figure 1: Knowledge Productivity Framework

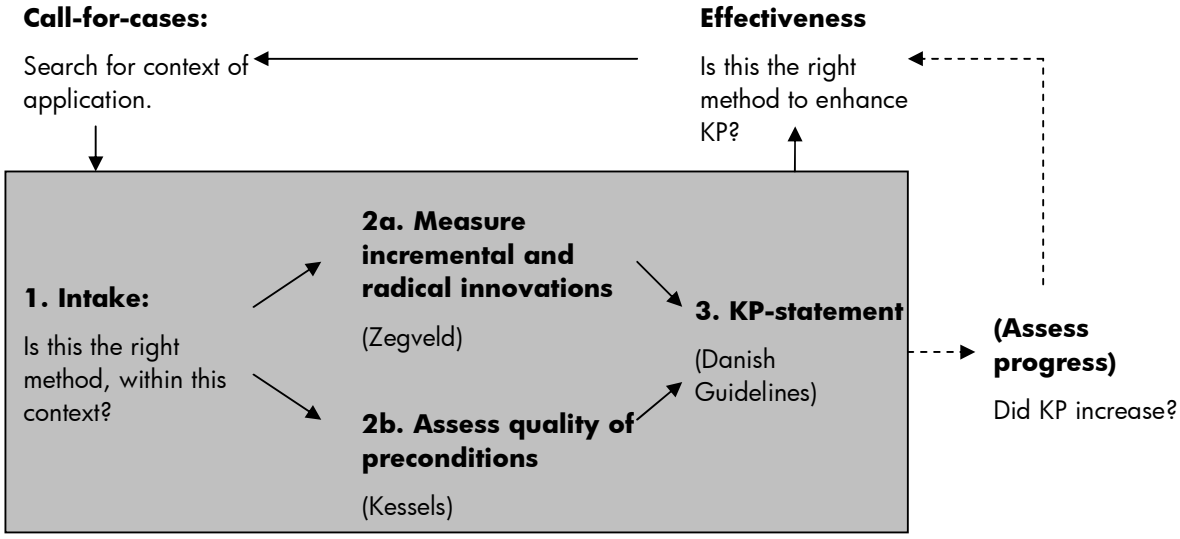

Figure 2: Design of the method within the context of the multiple case study

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
Correcton	Inflation	None

Figure 3: Translating TFP into TRP (Zegveld, 2000)

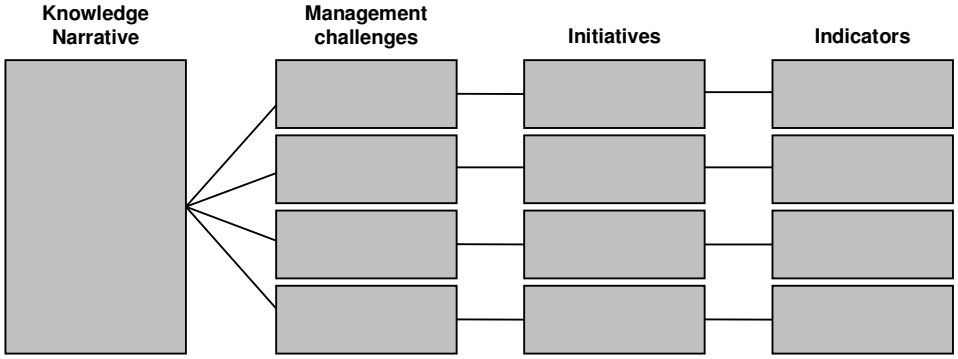

Figure 4: The Intellectual Capital Statement Model, Source: STI (2003), Intellectual Capital Statements – The New Guideline