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## Road Map for Measuring Intellectual Capital

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## **Abstract**

In order for managers to continue to obtain support for knowledge management projects, they need to find quantifiable metrics to present to decision makers within the firm. The challenge facing scholars and organizations today is to measure intellectual capital (intangible assets) that will provide the ability to record and report the value attributed to knowledge.

This paper addresses the issue of establishing measures for intellectual capital, which will provide a more effective way of managing intellectual capital and leveraging knowledge within an organization. The measurement challenges of intellectual capital are discussed and a road map for managing these assets is proposed with the goal of providing a less complex way of evaluating intellectual capital. An example is also presented to illustrate how the model can be applied.

### **Key Words:**

Intellectual Capital, Intangible Assets, Knowledge Management, Competitive Advantage, Scorecard Methods, Road Map

## **Introduction**

In today's global and competitive business environment, companies find it increasingly difficult to distinguish themselves from their competitors. Seemingly, competitive advantage can only be achieved through being able to produce a certain product or service by either enhancing quality or lowering cost more than other competitors. A firm can achieve this through the use of numerous methods such as more efficient management techniques and investing in tangible and intangible resources (Stewart, 1997). However, investing only in tangible resources will merely create a temporary competitive advantage, which diminishes over time. Rather, investing in intellectual capital (intangible resources) is more likely to provide a sustainable competitive advantage (Bontis, 2001; Sullivan, 2000) because intellectual capital grows with use and is not easy to imitate. Intellectual capital includes factors that create value, which generally do not appear on a traditional balance sheet, but are crucial to an organization's long-term success (Edvinsson & Malone, 1997). For instance, it may refer to non-physical or immaterial assets of a company such as patents, copyrights, employees' know how, brand value and corporate image.

Although intellectual capital represents a competitive advantage, companies do not fully understand their nature and value (Barsky & Marchant, 2000; Collis, 1996; Dzinkowski, 2000). For example, intellectual capital is knowledge, which creates new processes and efficiencies that originate from the know-how and experience of the work force. Since knowledge management leverages knowledge in organizations, it has become an important area of focus for successful organizations operating in today's business environment. Yet, many companies are reluctant to undertake knowledge management initiatives because of the difficulty in establishing a sound business case (Yelden & Albers, 2004). Being able to show quantifiable results from knowledge management projects (based on return on investment) is critical in gathering support and showing the benefits of knowledge management in the firm (Liebowitz & Suen, 2000). The relationship between organizational knowledge and intellectual capital is discussed further in Bontis (2002), Schindler & Jaitner (2003) and Sveiby (2002).

For managers to justify a knowledge management project, he or she would have to establish quantifiable metrics to present to decision makers within the firm. The scope of this paper

addresses the issue of establishing measurements for intangible assets. “Intangible assets have always played a role, to some degree or another, in corporate valuations, but the proportion of such intangibles in today’s market caps has reached unprecedented levels” (McElroy, 2003). The challenge facing scholars and organizations is to explain and measure the difference between a company’s book value and market value (Barsky & Marchant, 2000; Schindler & Jaitner, 2003).

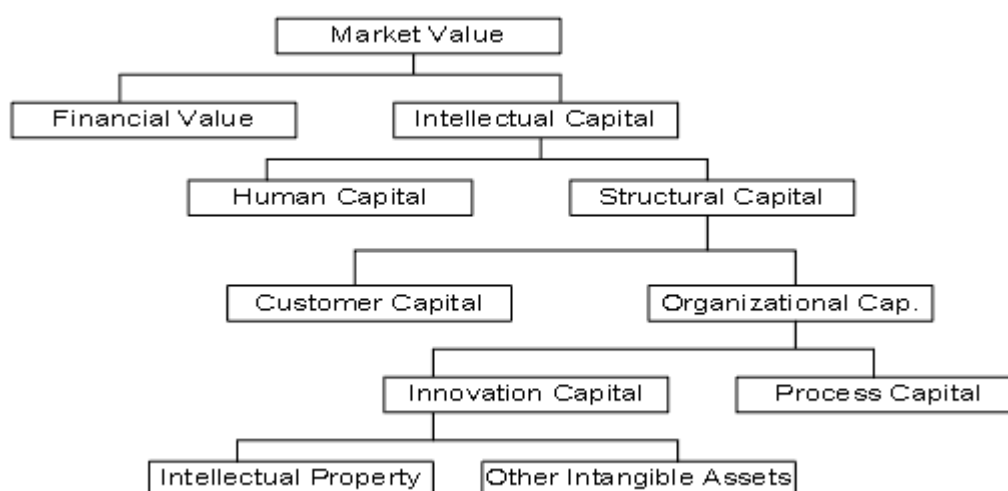
Creating value from knowledge assets is a key factor for creating a sustainable competitive advantage for the firm. Teece (1998) discussed the concept of “increasing returns,” which states that the more a firm uses a resource, the more it will increase in value. However, this is true for intangible assets but not for tangible assets. The benefits of mapping and tracking intangibles becomes clear when one compares firms that disclose their measurement of intangibles versus firms that choose to measure only tangibles (Truch, 2002). The aim of this paper is two-fold. First, it provides a systematic way of evaluating a company’s intellectual capital through the use of an intellectual capital road map. Second, the road map methodology is proposed to simplify the complexity and to provide flexibility for a company to measure, evaluate and manage intellectual capital.

### *Current Intellectual Capital Models*

To understand the issue of how to measure intellectual capital, one needs to examine current models. Many individuals, from the academic and the business communities, have attempted to identify models that try to measure intellectual capital to some extent with varying degrees of success. A few commonly used models are presented in this paper to illustrate the current methodologies used for measuring and evaluating intellectual capital.

One of the first models for measuring intellectual capital (IC) was developed by Skandia AFS as illustrated in Figure 1. Skandia’s IC model is composed of human and structural capital. The human capital refers to the knowledge held by the employees, which they take home with them when they leave for the day, while the structural capital is the embodiment, empowerment, and supportive infrastructure of human capital. Structural capital is further divided into customer capital and organizational capital. Further discussion of intellectual capital measurements at Skandia can be found in Edvinsson (1997) and Ross & Ross (1997).

**Figure 1:** IC Model for Skandia AFS (Source: Edvinsson & Malone, 1997)



McElroy extends this theory further by adding social capital to the model, which refers to the relationships between employees in the firm as well as the relationships amongst firms (McElroy, 2002). Tools for social capital measurement are discussed in Lee (2005).

Four measurement categories have been identified for measuring intangible assets (Sveiby, 1997a). They are an extension of the classifications suggested by Luthy (1998) and Williams (2000). The four measurement categories are:

1. Direct Intellectual Capital Methods
2. Market Capitalization Methods
3. Return on Assets Methods
4. Scorecard Methods

The direct intellectual capital methods estimate the value of intangible assets by identifying the individual components and evaluating them. The second approach is to use market capitalization methods, which aim at calculating differences between a company's market value and the stockholder equity (intangible assets). The third approach is return on assets methods which focus on average earnings from intangible assets. The pretax earnings are divided by the average intangible assets. The result is compared to the industry average, and the difference is multiplied by the company's average tangible assets to get average annual earnings of intangibles. Scorecard methods seek to identify the various components of intangible assets. Once identified, the indicators or indices can be presented in scorecards or as graphs. The return on assets methods and market capitalization methods are useful for the purpose of estimating monetary valuations of intangible assets built on established accounting rules, which are easy to understand but may not be applicable to every organization. In contrast, the direct intellectual capital methods and scorecard methods are more comprehensive, but are more complex to understand due to the indicators, which are contextual and need to be customized depending on the individual organization (Sveiby, 1997a).

An example of direct intellectual capital method is the "value explorer" (Andriessen & Tiessen, 2000). The accounting method of value explorer has been proposed by KPMG to calculate and assign a value to five types of intangibles: (1) assets and endowments, (2) skills and tacit knowledge (3) collective values and norms, (4) technology and explicit knowledge, and (5) primary and management processes. Andriessen and Tiessen (2000) measured intangibles by examining the core competencies, assessing the strength, and measuring the value. A tool kit was developed to provide several checklists for measuring core competencies.

An example of a useful market capitalization method is Tobin's Q ratio (Stewart, 1997). The Q ratio is calculated as the market value of a firm's assets divided by the replacement value of the firm's assets. An example of a return on assets methods are the market value added method and economic value added method (Smith & Parr, 1999). The market value added method represents the firm's spread between the cash that a firm's investors have put into the business since the start up of the company and the present value of the cash (market value). The economic value added is intended to offer improvements to the market value added calculation. The economic value added method is calculated by adjusting the firm's disclosed profit with charges related to intangibles.

One of the most popular and widely used scorecard methods is the balanced scorecard constructed by Kaplan and Norton (1992). Kaplan and Norton argue that the company's performance can be measured by examining indicators that cover four perspectives; financial, customer, business process, and learning and growth. It is important to keep in mind that the company's strategic objective is the foundations for these indicators.

Another scorecard method that has been widely implemented is called the intangible asset monitor (Sveiby, 1997b). The intangible asset monitor is based on three families of intangible assets: external structure (brands, customer and supplier relations); internal structure (the organization); and individual competence (education, experience). This method identifies three measurement indicators: growth and renewal (i.e. change), efficiency, and stability for each of the intangible assets. A great advantage of the intangible asset monitor is that it can be incorporated into the management information system and is fairly short and concise.

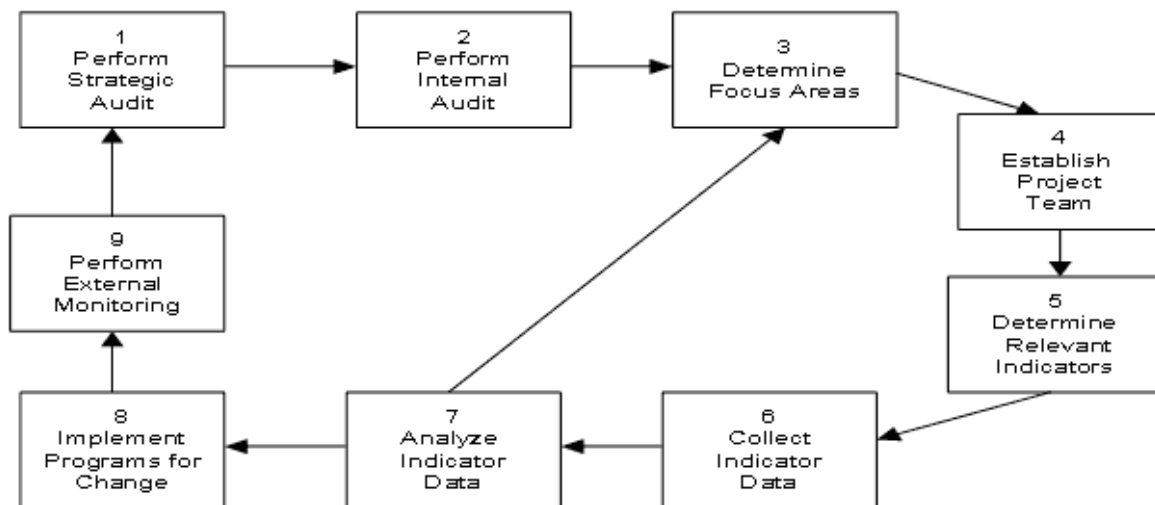
One method that attempts to consolidate all the different individual indicators into a single index is the intellectual capital index (Ross, Ross, Dragonetti & Edvinsson, 1997). This index correlates the changes of intellectual capital with changes in the market. A summary index provides an improvement to having a long list of individual indicators and requires companies to understand the priorities and relationships that exist between the different measures.

There have been a number of studies that have evaluated the various models to measure intangible assets (Bontis, Dragonetti, Jacobsen & Ross, 1999; Bontis, 2001). More recent studies that discuss the various models include Andriessen (2004), Donweiler & Yakhou (2005) and Shalkh (2004). All the authors recognize that intellectual capital measures are necessary and indicate that current methods are not adequate, and in many cases are too complex and costly to implement.

### ***Intellectual Capital Road Map***

Currently, work is in progress around the world to find a simple and flexible model that suits most organizations. But the problem facing the measurements of intellectual capital remains unresolved. For example, the Skandia Navigator model has demonstrated its flexibility but continues to be very complex to deal with. The intellectual capital (IC) road map consisting of nine steps, as shown in Figure 2, is thus used to address the issues of flexibility and complexity of current methods.

1. perform strategic audit,
2. perform internal audit,
3. determine focus areas,
4. establish project team,
5. determine relevant indicators,
6. collect indicator data,
7. analyze indicator data,
8. implement programs for change, and
9. perform external monitoring.

**Figure 2:** Intellectual Capital Road Map

The objectives of the road map is to provide a measurement approach to intellectual capital, elevate awareness of its value and grow the assets as more employees get involved.

The first task of the road map is to conduct a strategic audit, which determines the fundamental question of where the firm is today and where it is going in the future. It identifies the strengths, weaknesses, opportunities, and threats of the organization and determines the strategic direction.

Once a general consensus is reached regarding the firm's direction and goal, an internal audit is performed to determine current capabilities and what new capabilities are needed to support the strategy. These capabilities will include both tangible as well as intangible resources. It will identify gaps in intellectual capital, with the gap being defined as the difference between current capabilities and what is required in the future to support the strategy.

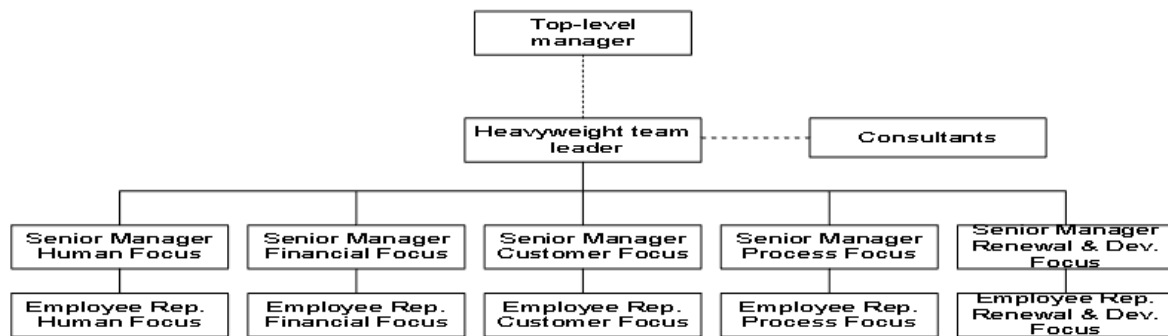
The next step is to determine the focus areas. Any measurement method could be used as a starting point to determine the focus areas, e.g. the Navigator model, developed by Skandia (Edvinsson & Malone, 1997), balanced scorecard, or other methods discussed previously. It is recommended that no more than six focus areas are used to reduce the complexity of the method. It then becomes necessary to determine the relative importance of respective focus areas. Factors that will determine the relative importance are numerous such as the industry it operates within, niche market, strategy, culture and values. Since organizations differ in a variety of ways, one would have to optimize the focus areas by including only those areas important to the firm.

The next step is to establish a project team, as shown in Figure 3, which could be organized along the focus areas appropriate for a given company and industry. Team members could be constructed in three layers, with the first being a top-level manager serving as a liaison between the group and other senior level managers. The top-level manager will be the project champion. The second level comprises senior managers from respective focus areas, e.g. financial, human, customer, process, and renewal/development. The senior level managers' role is to oversee the work performed by the employees in each respective focus area, and to elevate the importance of the measurements to complement their line management role. From the second layer, one senior manager is picked to be a "heavyweight project leader" (Clark & Wheelwright, 1992). The third layer comprises elected representatives for the respective focus area. This is important to rally grass root support



within the organization, as well as building a more direct link with employees. Consultants could also be involved to facilitate the project and to provide external perspectives.

**Figure 3: Project Team**



The next step is to define all the relevant key indicators deemed to be most important for each focus area. Key indicators should not be confused with ratios since they measure a change over time. The goal is to reduce the number of indicators used by the model to arrive at a more manageable size, e.g. the Skandia Intellectual Capital report uses 91 new and 73 traditional key indicators (Bontis, 2001). This means that the company would adopt key indicators that reflect the importance level of the various focus areas mentioned above, i.e. if the customer focus area is deemed to be of lower importance than finance, one would expect to find more finance indicators than customer key indicators. The reduced number of indicators would decrease the complexity and be more cost effective. This process is ultimately a subjective task where the firm has to monitor the appropriateness of the mix of indicators and adjust it when need arises. It is important that the right indicators are selected to provide measures of the particular intellectual assets that are significant to the industry and company.

After the appropriate mix of key indicators has been developed, the next step is to design processes to collect data and analyze the key indicators. Ideally, when a firm believes to have reached its desired mix of key indicators and found the appropriate weight of each focus area, it could develop an automated system that could manage the gathering of data and the calculation of key indicators. Within an automated system the company would have to determine what level of key indicator change would be acceptable and construct a flagging system. The system would then flag any indicator that reaches a predetermined level for inspection. Finally, the firm needs to determine how much relevant data is currently available, and what type of new data is needed to be able to calculate all the key indicators for the model.

The next step is to analyze the data it collects to set up a process for feedback to respective focus areas for attention. The feedback process is critical to enhance the model for future use, which implies that the model will only continue to improve as the company moves up the learning curve. The analysis of the data will reveal how big of a gap the firm is facing and provide a basis for change.

Finally, one will move into the last phase of the project which is implementing the changes needed to fill the gaps in intellectual capital, which will move the company closer to creating a sustainable competitive advantage. For example, a company could initiate or enhance a knowledge management activity in the organization. One cannot emphasize enough the importance of the implementation stage and how critical it will be for the overall success of the project. Even the best recommendations and plan can ultimately fail due to poor implementation.

Once the firm has successfully managed to implement the project it will have to monitor the external environment for changes that are significant enough to require a new cycle of the nine steps in the road map. This would normally be accomplished as the company assesses its strategy against external factors on a regular basis.

### ***Application of the Intellectual Capital Road Map***

We will now turn to examples that will illustrate how the road map could be used to measure intellectual capital. The challenge, to apply the road map, is to reduce the number of focus areas and indicators. Focus areas and indicators need to be company specific and designed to help the company align its intellectual capital with its strategy. To manage and extract value from intellectual capital, a company must understand the context in which they operate and be able to define its own values (Sullivan, 1998). Understanding context and values can be used to streamline the number of focus areas and indicators. The context refers to the business environment in which the firm operates. For example, some firms operate within short product life cycles while others operate in a more stable environment. Also, firms need to understand the values or shared beliefs that guide the day-to-day decisions and actions of employees. Values and context underlie how company intangibles are defined, measured, and valued.

Let us turn to an example to help illustrate how the intellectual capital road map of Figure 2 could be applied (remember that the variables are assumed and vary depending on industry, company strategy, culture and values). Company X is a bio-tech firm that has decided to specialize in developing drugs and/or components that will be handed off during phase one or two of the FDA approval process. The firm will search for a few stable partners that will take over during phase three, or in some certain cases enter during phase two. The firm is not a publicly traded company and as result, it is forced to handle its relationships with venture capital firms with care.

The first step in the process is for Company X to perform a strategic audit. As part of their strategic audit they determine what is important for them to successfully develop strong and lasting partnerships. This will give Company X the ability to deliver on two fronts: successfully handing off drug development that will be taken into phase three, and being able to deliver decent returns to its venture capital investors.

As part of their internal audit, Company X realizes that they will continue to predominantly use its in-house R&D unit to discover and develop new drugs, but will also use boundary spanners to scan the external environment for firms or components that will be of strategic importance. Company X has determined that both its in-house R&D and its boundary spanning will have to be strengthened to reach the goal set in the strategic audit. Company X would identify particular knowledge gaps in various research areas.

The next step, for Company X, would be to determine the focus areas and their relative importance. They would have to make sure that the relative importance of each focus area aligns with the overall company strategy from step one. They have decided to use the focus areas from the Skandia Navigator Model of human, financial, customer, process, and renewal/development. Besides being context specific, it is important to weigh the various focus areas. For example, in a bio-tech firm one would expect the renewal/development focus area to outweigh other focus areas due to its heavy emphasis on research and development. Their customers are usually large pharmaceutical companies that are critical for their survival, but are not as important as R&D and finance, which are vital to long-term success. For these reasons Company X put 25% weight for renewal and development and financial focus, 20% weight for human focus, and 15% weight for customer and process focus.



Company X would construct a three layers project team as discussed in the section “Intellectual Capital Road Map”.

Company X will turn to identifying and assigning key indicators that will support their effort to align its intellectual capital with the company strategy. They have decided to identify 30 indicators for initial use with a reservation for adding or subtracting more if the team determines that there is a need for it. The number of indicators would be proportional to the percentage weight given to each focus area. The renewal and development focus could track indicators such as patents pending, average age of patents, and R&D investments. The financial focus could track indicators such as total asset/employee, revenues resulting from new business operations, and profits resulting from new business operations. The human focus indicators may comprise employee turnover, average years of service with company, and number of full-time/permanent employees. The process focus may consist of indicators such as administrative expense/total revenues, IT expense/administrative expense, and IT performance/employee. Finally, the customers focus area constitutes indicators such as number of customers, annual sales/customer, and satisfied customer index. Additional indicators that may be considered are found in Edvinsson & Malone (1997) and Sveiby (1997a).

The firm could decide to track more or less key indicators or simply choose different indicators. The choice will largely depend on what the firm has to work with, i.e. what type of data they already have and what will demand new processes in order to compute the indicator. To optimize the number of indicators, the company would emphasize the areas that correspond to the gaps in intellectual capital. The organization should track changes in intellectual capital assets over time. The goal would be to define and measure intellectual capital (knowledge assets) that will have the most impact on business objectives, which in turn, are linked to the firm’s competencies. As the company continues to track indicators and move up the learning curve, they will be able to decide on the minimum number of indicators to obtain a reasonable measure of their intellectual capital.

The next step for Company X is to design the process to collect indicator data. The project team has to evaluate:

1. What data do we need to calculate the key indicators?
2. What old data do we have available at this time?
3. What new data do we have to produce to be able to calculate the key indicators?

Once they have the data collected they will then analyze the data which will fine tune the intellectual capital gaps first identified in the internal audit. Company X should feed this data back to the respective focus areas for attention.

The project team would develop recommendations and programs for change to correct discrepancies and shortfalls in intellectual capital. The project team would make sure that the implementation process is executed properly since many projects fail due to poor controls. Finally, Company X would monitor its external environment for changes that will be significant enough to induce another cycle of the intellectual capital road map.

This application illustrates how the road map provides a systematic process to customize the intellectual capital measurements to the particular industry and company. Customizing the measurements reduces the cost and complexity by reducing the number of measurements. The benefits of the proposed intellectual capital road map compared to current intellectual capital models are given below:

### Proposed Intellectual Capital Road Map

*Measurements support the firm's strategy*  
*Measurements in areas of knowledge gaps*  
*Minimum focus areas*  
*Cross functional project team used to determine project areas*  
*Only the relevant indicators are measured*  
*An automatic system recommended to determine indicator changes*  
*Frequency of measurement process determined by external monitoring*  
*More flexible*  
*In general less complex*  
*In general less costly*

### Current Intellectual Capital Models

*Measurements not always support the firm's strategy*  
*Measurements are more generic*  
*Large number of focus areas*  
*Little guidance on type of project teams*  
*Large numbers of indicators are measured*  
*No standard method used to optimize indicators*  
*No set guidelines on frequency of measurements process*  
*Overall less flexible but depends on method used*  
*In general more complex*  
*In general more costly*

## ***Concluding Remarks***

The models that are currently used have contributed to the development of new techniques in measuring intangible assets, but are either too complex or inflexible. Ultimately, the success of any model, with respect to the measurement and management of intellectual capital, depends on how flexible, simple, and cost effective it is. These factors are the major characteristics that a model has to embody if it is to contribute to the measurement and management of intangible assets.

The model presented in this paper satisfies the need to be flexible by giving the company the choice to design a model that assigns various levels of importance to respective focus areas. The same method is used to weigh the respective key indicators that have carefully been selected by the company to make up an appropriate mix of key indicators that will be tracked over time. Furthermore, it is important to mention that a process of trial and error will lead companies toward the appropriate mix and decrease the level of complexity and inflexibility, which are critical for the success of a model.

Finally, we want to emphasize the importance of more research and practical adaptation of this model that is necessary to further enhance our understanding of how to manage intellectual capital and create a sustainable competitive advantage.

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Bobi Dimitrijevic has completed his MBA (Technology and Innovation Management) program at Pacific Lutheran University. He has four years of experience in the Swedish finance industry where he worked for companies such as SkandiaBanken AB (fully owned subsidiary of Skandia) and Delphi Economics AB.