Τ.Ε.Ι ΚΑΒΑΛΑΣ

ΣΧΟΛΗ ΔΙΟΙΚΗΣΗΣ ΚΑΙ ΟΙΚΟΝΟΜΙΑΣ

ΤΜΗΜΑ ΔΙΟΙΚΗΣΗΣ ΕΠΙΧΕΙΡΗΣΕΩΝ

ΘΕΜΑ: INTELLECTUAL CAPITAL MANAGEMENTS MEASURES AND TOOLS.

Ζαλούμη Αντωνία

ΕΠΟΙΗΣ ΚΑΘΗΓΗΤΗΣ: ΜΑΛΥΤΙΝΟΣ ΔΗΜΗΤΡΙΟΣ

ΙΑΝΟΥΑΡΙΟΣ 2008

Εκπονηθείσα πτυχιακή εργασία απαραίτητη για την κτήση του βασικού πτυχίου
INTRODUCTION

A company’s intellectual capital (sometimes called intangible assets or knowledge assets) consists of various immaterial sources of value. Examples of intellectual capital include employee competencies, organisation’s image, customer relationships and immaterial properties. Intellectual capital is a key determinant of organisational performance. This report examines intellectual capital from different points of view.

Intellectual capital is a growing research area. New journals have been established recently to address the topic (e.g. Journal of Intellectual Capital in 2000 and International Journal of Learning and Intellectual Capital in 2004). There are also several international conferences that are dedicated to the topic. The annual amount of publications on the topic has multiplied during the last decade. Intellectual capital as a research area is a multidisciplinary one. Examples of topics related to the research area include organisational and employee competencies, innovations, stakeholder relationships, knowledge and information as resources, employee welfare and motivation, immaterial properties and the valuation, measurement and reporting of intellectual capital related factors. This makes intellectual capital an interesting but also a challenging research topic. Knowledge, and more generally intellectual capital, has been acknowledged to be one of the most important sources of competitive advantage in today’s business environment. This is understandable, since for decades now, companies are witnessing an increasing trend towards devaluation of the traditional resources, physical assets and manual labour: “Capitalism is undergoing an epochal transformation from a mass-production system where the principal source of value was physical labour to a new era of innovation-mediated production where the principal component of value creation, productivity and economic growth is knowledge and intellectual capabilities.” (Florida and Kenney, 1993).

The value of a company is increasingly built on intellectual assets, knowledge
and other non-physical property. Thus, it is important to know how companies can benefit from their knowledge, and how could it be embodied in their processes and products to create value more knowledge and competencies into commercial value by embodying them into products or services.

Also in Finland, the research on intellectual capital seems to have become quite active during the recent years. A few doctoral dissertations have already been finished on the topic and some research projects have been, and currently are being, carried out.

This report aims to provide a glimpse of what is going on, and perhaps what will happen in the future, in the knowledge and intellectual capital research area.

As a result from the conducted literature review, it can be stated that based on this study, the consensus on the definition of intellectual capital is still under work, since there are numerous aspects to consider, but there seems to be a clear understanding between different researchers that the importance of intellectual capital and knowledge embodiment to a company’s value creation is great, and there are many links between these. Several ways of defining value to different stakeholders and models of value creation processes have been introduced, but specific literature concentrating on value creation and knowledge embodiment in innovation process is scarce.

When considering a company’s innovation activities, the critical nature of innovation to value creation has to be recognized, and possibilities to integrate knowledge into processes and products have to be considered already from the early phases of new product or service development. There are many ways of integrating knowledge in the processes and products of a company to create value to stakeholders. Examples range from offering pure knowledge products to
using customer knowledge of their needs to improve product development results. The importance that intellectual capital has in the offering of the company or in the total market value of the company is dependent on the context and type of industry.

Embodying knowledge means also changes in an organization's every-day innovation practices, since a different type of knowledge from various sources needs to be included in the innovation process. The utilization of company internal information as well as external network knowledge has to be planned as part of the innovation process.

Future research questions in this area include questions like how to implement practices in innovation activities that would improve the possibilities of embodying different types of knowledge in all stages of the development work, and what kind of practices are most suitable for different types of companies.

To enable creating a more precise systemic view on the subject in the future, it is necessary in further studies to concentrate on operational zing the concepts and to choose which of the several-presented definitions of each concept to use. This also produces a more focused area of inquiry which will help in defining the links between the issues. The systemic framework will increase holistic understanding of knowledge-based value creation in innovation process and will help in identifying the crucial elements and most effective points of intervention to improve value creation and to gain greater benefits from innovation activities.

One of the limitations of this study is the scope of the literature used. It cannot include all the relevant sources and therefore presents a limited view of the subject, concentrating only on some important definitions and aspects in combining knowledge, value creation and innovation that were brought forward by different authors.

Despite the limitations, the paper gives a draft picture of the connections
between knowledge embodiment, value creation and innovation. Different definitions have been presented as well as several views on the connections of the concepts that provide a general overview of the area. This is valuable from a theoretical point of view because these three broad areas have not been combined in very many previous studies, although the links between either two of them have been studied in some extent. The paper also brings some insights to practice in organizations, by drawing attention to the close interrelatedness of knowledge embodiment and value creation with innovation.

I want to thank my professor Mr. Madutinos Dimitrios for all his time, patience and effort and also thank my parents for all there help and support throughout my school years.
# Table of contents

**Introduction** .................................................................................................................. 1

**CHAPTER 1:**

A brief history on understanding and defining intellectual capital

1.1. A brief history on understanding and defining intellectual capital ...................... 9

**CHAPTER 2:**

Intellectual capital

2.1. Intellectual capital ........................................................................................................ 14
2.2. An IC Model of the Knowledge Firm .......................................................................... 21
2.2.1. Value Creation .......................................................................................................... 22
2.2.2. Examples of intellectual capital Management ......................................................... 23
2.3. Tools available to Measure and Manage Intangible Resources .............................. 27
2.3.1. Economic Value Added (EVA™) ............................................................................... 29
2.3.2. Critical Review on EVA ............................................................................................ 32
2.4. The Case of ApiON ...................................................................................................... 34
2.4.1. The IC Perspective Provides a Basis for Developing an Understanding of the Nature of Resources in Action ................................................................. 35
2.4.2. Realizing Shareholder Value .................................................................................... 38
2.5. The Dow Chemical Company .................................................................................... 39
2.5.1. Setting the Context...........................................40
2.5.2. The Vision......................................................42
2.6. Developing Intellectual Capital at Skandia..........................43
2.6.1. Mission and Definition........................................44
2.7. Phases in the Development of Intellectual Capital..................47
2.8. The Process Developing Intellectual Capital.........................48
2.9. Measuring your Company’s Intellectual Performance................49
2.10. Exploring Intellectual Capital.....................................51
2.11. The Pursuit to Measure Intellectual Capital.........................53
2.11.1. Intellectual Performance......................................55

CHAPTER 3:
Intellectual Capital (IC) and Management Models

3.1. Intellectual Capital (IC)........................................61
3.1.1. Operationalisation.............................................61
3.2 Economic Value Added............................................67
3.2.1. Comparing EVA and IC: where does value come from?........68
3.3. Dow’s Model.....................................................70
3.3.1. Starting with Patents............................................70
3.3.2. The Intellectual Asset Management Model........................72
3.3.3. Intellectual Asset Management Teams..........................74
3.3.4. Intellectual Asset Managers....................................75
3.3.5. The Intellectual Asset Management Tech Center..................75
3.3.6. Benchmarking..................................................79
3.3.7. Visualizing Intellectual Capital..................................79
3.4 For ApiON The IC Perspective Provides a Holistic view of the firm...80
3.4.1. The IC Perspective Provides a Common Language around Intangibles, Facilitating the Understanding of Their Contribution to Value Creation Within and between Firms as well as to Shareholders and Other Stakeholders ................. 81
3.4.2. The IC Perspective Focuses on Value not on Cost .......................... 82
3.4.3. The IC Perspective is Practical rather than Conceptual .................. 82
3.4.4. APIONS IC Process ........................................................................ 82
3.4.4.1. Operationalize Value Creation .................................................. 82
3.4.4.2. Outline Strategic Intent .............................................................. 83
3.4.4.3. Articulate Value Creation Path and Visualize Navigator ............. 83
3.4.5. Articulating the Value Creation Path and Visualizing the Navigator ... 84
3.4.6. Insights from the Process .............................................................. 87
3.5. Skandia’s Method ............................................................................. 90
3.5.1. Hidden Values ................................... ........................................... 90
3.5.2. A New Language .......................................................................... 91
3.5.3. A Balanced Annual Report ........................................................... 93
3.5.4. Navigation and the Skandia Navigator ........................................ 94
3.5.5. Future Accounting Methods ......................................................... 96
3.5.6. ICM – Intellectual Capital Management ....................................... 97
4.1. How do you find the needle in a haystack? ...................................... 102
4.2. Swedish biomedical research has exceptional advantages Center for Molecular Medicine ..................................................... 103
4.3. Biomedical research improves the public health and welfare .......... 103
4.4. Aiming for the next milestone .......................................................... 105
4.5. Their vision ..................................................................................... 105
4.6. Their organization ................................... ........................................... 107
4.7. Impact of the research ................................................................. 108
4.8. Natural inhibitor of atherosclerosis ................................................. 108
4.9. New candidate gene behind eating disorders ................................... 110
4.10. A new gene identified behind the second most common endocrine
4.12. The CMM Intellectual Capital Report model ....................................... 115
4.13. Their knowledge goals ............................................................................ 115
4.15. Coaching for success .............................................................................. 116
4.16. Their capital ............................................................................................. 117
4.16.1. Human capital .................................................................................... 117
4.16.2. Relational capital .............................................................................. 117
4.16.3. Structural capital ............................................................................... 117
4.17. Their key processes ................................................................................. 118
4.17.1. Research ............................................................................................ 118
4.18. Knowledge transfer ................................................................................. 118
4.19. Their results ............................................................................................ 119
4.19.1. Output ............................................................................................... 119
4.19.2. Outcome ............................................................................................ 119
4.19.3. Impact .................................................................................................. 120
4.20. CMM treatments under development 2003 ............................................. 120
4.21. Their outlook for the future ................................................................. 121

References:
References that where used ................................................................. 126
CHAPTER 1

A BRIEF HISTORY ON UNDERSTANDING AND DEFINING INTELLECTUAL CAPITAL
CHAPTER 1

A BRIEF HISTORY ON UNDERSTANDING AND DEFINING INTELLECTUAL CAPITAL

1.1. A brief history on understanding and defining intellectual capital

Although there has been an explosive interest in an intellectual capital and a thirst for information on how it might be managed, there has been little written to describe or define the concept. This paper provides background and definition to the notion of intellectual capital and describes where and how it fits into the 'knowledge company'. It is intended to provide an overview of intellectual capital, where it fits into the 'knowledge firm' what the component elements of it are, and what might be done to manage them. This paper defines intellectual capital as well as its relationships to other elements of a knowledge company. The component elements of intellectual capital are identified, defined and discussed.

Finally there is a review of the actual practice of several major knowledge companies and how they manage their intellectual capital.

Intellectual capital is a topic of increasing interest to firms that derive their profits from innovation and knowledge -intensive services. In many cases, these 'knowledge firms' that the market place values them at a price far higher than their balance sheets warrant. But surprisingly few managers in knowledge firms can define intellectual capital, what it is, where it resides in their firm, and how they manage it to produce the profits that so excite the market.

Definitions of intellectual capital are just now beginning to emerge as the
interest in the topic spreads Tom Stewart, author of Fortune magazine’s series of articles on the subject says, [it] is something you can’t touch but which makes you rich. Larry Prusak, Erust & Young’s spokesman on intellectual capital, defines it as intellectual material that has been formalized captured, and leveraged (to produce a higher valued asset). Mobil’s Ted Lumley sees it as knowledge used to increase economic order in the business process. Dow Chemical’s Gordon Pettrash defines intellectual capital as knowledge with potential for value. And Hughes Space and Communications Company’s Arian Ward believes that intellectual capital is fundamentally the sum of the company’s ‘islands as knowledge’ and that the challenge is to link and coordinate knowledge workers for the benefit of the firm.

These definitions seem to agree that intellectual capital is a stock of focused, organized information (knowledge) that the organization can use for some productive purpose. But the existence of a stock of knowledge (intellectual capital) is not enough to account for the high value the market place puts on many knowledge companies. Indeed, it is the ability of companies to leverage their intellectual capital that is perhaps a greater key to profitability. Skandia of Sweden recognized this early, where Leif Edvinsson, Director of Intellectual Capital, initially described intellectual capital as the sum of human capital and structural capital, including customer capital.

Intellectual capital management is an evolving field of activity. In the beginning of its evolution two very different perspectives emerged as a significant focus areas for management. The first was a focus on value-creation. Organizations with value-creation in mind tended to focus their management energies on the human capital of the firm: how it is organized, how it is directed, how knowledge is created and how it provides value to the firm. The second perspective on intellectual capital management involved companies interested in value-extraction. Companies with value extraction (or profits) as their focus direct their energies to the intellectual assets of the firm: intellectual properties and
commercializable intangible assets.

A discussion of intellectual capital is best understood if one has a clear understanding of 'knowledge' in the business context. Business knowledge generally is of two kinds: that which is codified and that which is tacit. This distinction is very important strategically. Knowledge that is codified can be written down, transferred, and shared. Codified business knowledge is definable and can be protected by the legal system, whether as trade, secrets, patents, copyrights, or semiconductor masks. If not protected by intellectual property law, codified information is often easy to imitate. In contrast, tacit knowledge, or know-how is by nature difficult to describe. It can be demonstrated but rarely codified. Tacit knowledge gets transferred through demonstration and out-the-job training. Process knowledge, in manufacturing firms in particular, is often tacit. Relationship knowledge, often found in service firms, is also usually tacit. As with many things, the tacit knowledge position can be both an advantage and a disadvantage. Because it is difficult to transfer, tacit know-how is inherently protected. Once transferred, however, there are few means for the original owner to re-assert ownership.

Three other dimensions of knowledge are worth mentioning. The first is whether it is visualized in use or not. Some knowledge can be commercialized without being observed by other. Process knowledge is often of that kind. Product knowledge is different; to sell it, you have to reveal it to others. A second dimension of note is the complexity or simplicity of the knowledge. And third we must note whether knowledge can stand alone, or whether it has value only when embedded in some kind of integrated system. Whether knowledge is autonomous affects the way you manage its commercialization.

There is a relationship between the degree of codification of knowledge and the amount of value it can be said to command. For example there is a difference
between ‘knowing about’ something, ‘knowledge’ and ‘know why’. ‘Knowing about’ involves having an awareness of a subject or pieces of information about it. Knowing about something is perhaps the first that can be leveraged. ‘Knowledge’, in contrast, implies a specific or delineated set of knowing. It tends to have a central focus or theme, and for this reason it is represented by the definition or codification that takes place just before an idea or innovation can be committed to pen and paper. ‘Know-why’ understands insightfully. ‘Know-why’ understands insightfully. ‘Know-why’ provides access to the factors, which underlay value creation for the firm.

Once described and discussed, on paper or on a blackboard, an idea becomes tangible. Its potential value is increased because it becomes available to others for improvement, refinement, and use. In fact, there is a relationship between the degree of codification of an idea and its relative value. Indeed, the more that discussion of a piece of knowledge leads to a description of its application, the more value the piece of knowledge is able to create. The value of knowledge is largely realized through applications of the knowledge.
CHAPTER 2

Intellectual capital
CHAPTER 2
INTELLECTUAL CAPITAL

2.1. Intellectual capital

John Kenneth Galbraith first published the term ‘intellectual capital’. His concept of the term incorporated a degree of ‘intellectual action’ rather than ‘intellect as pure intellect’. The implication of this view is that intellectual capital is likely to be a dynamic rather than a static form of capital.

We prefer to define intellectual capital as knowledge that can be converted into value. This definition is very broad, encompassing inventions, ideas, general knowledge, designs, computer programs, data processes, and publications. It is not limited to technological innovations, or to just those forms of intellectual property identified by the law (e.g. patents, trademarks, trade secrets). For the manager, intellectual capital (IC) has to major components: human resources and structural capital (including intellectual assets). The distinction between these two kinds of IC is of particular importance to owners of knowledge companies. Unlike human resources, which are not interchangeable and cannot be owned by shareholders, intellectual assets are and can be. For this reason, it is clearly to the advantage of the knowledge firm to transform the innovations produced by its human resource into intellectual assets to which the firm can assert rights of ownership. One major task of IC managers is to transform human resource assets into intellectual assets. To facilitate this transformation, it is important to understand the differences between human and intellectual assets. Figure 1 shows how parts of a firm’s IC are made up of know-how (tacit knowledge) and Intellectual assets (codified knowledge).

<table>
<thead>
<tr>
<th>Human Resources</th>
<th>Intellectual Assets</th>
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<tbody>
<tr>
<td><strong>Definition</strong></td>
<td>Specific knowledge to which ownership can be asserted</td>
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<td>knowledge and know-how that can</td>
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<td>be</td>
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<td>Converted to Value</td>
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**Examples**  
Experience  
General Know-how  
Skills  
Creativity  

Technologies  
Inventions  
Processes  
Data  
Publications  
Computer Programs  

**Repository**  
People and organizational routines & procedures  

Tangible Form  
(e.g. documents, CD ROM, etc.)

**Protection Methods**  
Umbrella agreements between employer and employee  
Contracts

Patents  
Copyrights  
Trade secret laws  
Semiconductor masks

**Figure 1**  
Two Components of intellectual Capital

1. Human Resources

The human resources of the firm may be defined as the collective capabilities of employees to solve customer problems. The firm-wide human resource is the know-how and institutional memory about topics of importance to the company. This resource includes the collective experience, skills, and general know-how of all of the firm's employees. It is a resource because it can generate value for the company, yet it would be difficult for the company to deliver this value without the employees themselves. For example a law firm might count its staff of lawyers as its primary human resource. The lawyers appear in court and advise clients on
legal matters. It is difficult to see how a law firm could provide such legal services to its clients without the carrier of skills, the lawyer.

Other companies use their human resources to create value, but not necessarily directly. A software company may use its programmers to create a new software program. The program once codified, becomes an intellectual asset that is then reproduced, manufactured and sold to customers. In this case, the human capital does not create value directly, as the lawyer does; he or she does it indirectly by creating an intellectual asset that is subsequently manufactured and sold.

Gaining access to the power of a firm's human resource often means knowing what piece of information or knowledge is relevant, which employee has it, and the speed with which the knowledge can be shared. Access to relevant knowledge becomes more problematic as firms grow and become complex. When companies are small it is easy for everyone to know what knowledge is relevant to a situation and how to gain access to the knowledge possessed by the human capital. As companies grow and the size of the human resource pool increases, such knowledge is less widely shared and becomes more compartmentalized. In the days before reengineering dramatically downsized the middle management ranks, middle managers were often the most knowledgeable people in the firm about what was happening, what was relevant, and who had the relevant information or skill. Now middle managers are largely absent and firms are struggling to figure out who knows what. Technologies such as e-mail and the Internet facilitate the rapid exchange of knowledge, but they do not help identify the relevant knowledge and who has it.

One solution has been to create a set of 'yellow pages' the directs the user to the people in the firm who know about particular topics of interest. The Swiss pharmaceutical company, Hoffman La Roche, has developed a set of 'yellow pages' that they call Rudi, named after an employee who, while not important the
firm's hierarchy, was nevertheless the person people went to, to learn about how things really worked.

In an ideal world the corporation would evolve to possess some form of 'collective intelligence' a term coined by George Por, in which all members of all organization were aware of and had access to, all of the relevant knowledge. In small groups this often occurs naturally. As groups increase in size, diversity, and number of location, increasingly sophisticated information technology is often used to store and organize the firms, 'collective intelligence'.

2. Intellectual Assets

Intellectual Assets the second component of IC, are the codified, tangible, or physical descriptions of specific knowledge to which the company can assert ownership rights and that they can readily trade in disembodied form. Any piece of knowledge that becomes defined, usually by writing it down or inputting it into a computer, qualifies as an intellectual asset and can be protected. Intellectual assets are the source of innovations that the firm commercializes.

 Intellectual assets can often be grouped into three areas:

Those focusing on commercialization, those focusing on infrastructure and those focusing, on customers and customer relations.

Most of the firm's intellectual assets will be used internally and not be 'legally protected'. Intellectual assets to be used outside of the firm (as well as intellectual assets of particularly great value to the firms are likely to be legally protected. Intellectual assets receiving legal protection become intellectual property. Intellectual property law, the body of law that deals with the protection of intellectual assets recognizes five forms of legal protection in the United States: patents, copyrights, trade secrets, trademarks and semiconductor masks. For each form of protection, the nature and amount of protection available varies,
as does the degree to which that protection applies to an innovation.

3. Structural Capital

Human resources by themselves are of little value. Picture, for a moment, a group of skilled people, huddled together on a hillside, thinking great business thoughts. But without the supporting resources of a firm they have no ability to do anything with their ideas. They have no paper with which to write things down; there is no production staff or manufacturing facility; there is no telephone to call potential customers. In short, the human capital lacks the firm’s supporting infrastructure, called structural capital.

Structural capital is the infrastructure that firms develop to commercialize their human capital. It includes both direct and indirect support, and for each there are both physical and intangible elements. Direct support, which is the support that ‘touches’ the human resource directly, includes physical support such as computers, desks, and telephones; and as well as intangible support such as information systems, computer software, work procedures, marketing plans and company know-how. Indirect support (which is the support that touches the people who touch the human resource) includes physical elements such as buildings, lights, electricity, and plumbing, and indirect elements such as strategic plans, payroll systems, costing structures, and supplier relationships. Indeed, structural capital provides the environment that encourages the human resource to create and leverage its knowledge. The structural capital is the part of the firm that remains when the human resource goes home (e.g., IT, desks, systems, customer data bases, organizational structures).

In knowledge companies, structural capital should be designed to maximize intellectual output. The physical surroundings of such firms should promote creative and productive thought. Their rooms should be designed for collaborative work, with white boards and easels easily at hand, with computers
and enabling tools easily accessible, and with design rooms as well as conference rooms in abundance. In addition to 'hard' supporting assets, structural capital also consists of 'soft' assets: files of lessons learned, information on best industry practices, and business intelligence about customers' needs in new products and services.

4. Physical structural

This capital takes on different forms depending upon the firm and industry. For example, in a prestigious law firm, it may involve walnut-paneled offices, a library, and an extensive, computer-assisted research system. In a think tank, it might include clean well-lit workrooms with throw rugs and comfortable chairs and lots of wall space to write on. It might include an operating budget that allows for attendance at creative conferences and sabbaticals for intellectual introspection and renewal. Structural capital allows the human to be all that it can be.

5. Intangible structural capital

This in many ways is even more important to the firm than its physical counterpart. The intangible elements include the firm's culture, history and even that portion of the intellectual assets that relate to the management of the firm. Whereas the firms human capital is normally thought of as the source of knowledge that becomes commercialized, other elements of intellectual capital determine the direction the company will take and its vision for the future; these include the firms mission, its values, and its business objectives.

6. Complementary Business Assets

Complementary business assets are structural capital assets of the firm used
to create value in the commercialization process. Typically, for knowledge companies, the business assets of the firm complement the innovations developed by the firm's human capital. These complementary business assets typically include processing facilities, distribution networks, prospect lists, supplier networks, service forces, and external organization capabilities. Complementary assets may be thought of as the string of assets through which the technology must be processed in order to reach the customer. Obvious complementary assets are processing capabilities, storage capabilities, relationship networks, and sales outlets. Complementary assets could also be other complementary technologies, prospect lists, trademarks, or market relationships. No matter how exciting an intellectual asset itself may be, it will have little commercial value unless paired with the appropriate complementary assets.

There are two kinds of complementary assets. The first are business assets that are widely available (generic complementary assets). They can be bought or contracted for on the open market and may be used in commercializing a wide range of technology applications. The second kind, which offer more leverage, are called 'specific' complementary assets. Suppose an inventor devised a unique product with large market appeal. If this product could be made using manufacturing equipment that is available in the marketplace, then its manufacture would involve the use of generic assets. If, however, the product required some manufacturing process or technique that was unique to the technology or the product's design, so that generic manufacturing equipment was not capable of producing it, then that specific manufacturing capability would be a specific complementary asset. A specific complementary business asset can be used strategically; it can be used as a barrier to competition; it can be licensed out as a source of income; it can be sold; it can be used to attract joint venture partners. Most important, it can be used to protect a technology from competitors and when legal protection is either not desired or not available.
Specific complementary assets, then, are a source of value in addition to the value created by the innovation. The use of a business asset in the commercialization process adds value to the innovation on its way to the marketplace. It is this additional value that the owner of the complementary asset can capture and retain for himself. The owner of the manufacturing system can capture the value realized by the manufacturing process as profit. The value of distribution can be captured as profit by the owner of the distribution system, and so on. Where the business assets are unique to the innovation, their owners can charge a greater premium for the value they add to the innovation. Thus complementary business assets are also a source of hidden value; in fact, they provide a greater value to the firm than their book value as tangible assets.

Specific complementary assets are usually created in conjunction with the commercialization of a specific application of an intellectual asset. They are therefore unique, and they are often themselves protectable. In effect, controlling the specific complementary assets is equivalent to controlling the underlying intellectual asset and the ultimate commercial value of an intellectual asset. This has the advantage of protecting a technology without having to reveal the technology itself. Patenting does not provide this advantage.

2.2. An IC Model of the Knowledge Firm

With this definition of complementary assets, it is now possible to more fully describe the knowledge firm in terms that allow one to contemplate all of the sources of value developed by its intellectual and structural capital. The intellectual capital of the firm has four major elements in its make-up: human capital, structural capital, complementary business assets, and intellectual property. A knowledge company's human capital is enabled by the firm's structural capital, which includes both tangible and intangible assets. Indeed, that portion of the firm's intellectual assets pertaining to business and administrative infrastructure may be viewed as an intangible element of the structural capital.
The firm's structural capital includes as part of its tangible assets the business assets that complement the innovations produced by the IC. These complementary business assets not only process, refine and bring innovations to market, they also add value and bring profits to the firm themselves.

2.2.1. Value Creation

Knowledge companies have been defined earlier to be those using their knowledge as a source of competitive advantage; and intellectual capital for those firms is 'knowledge that can be converted into value'. How do knowledge firms create value from their intellectual capital?

There are two fundamental sources of value inherent in the knowledge firm model. The first is the innovations themselves. Commercializable innovations are generated by the firm's human resource, converted into intellectual assets, and legally protected. These innovations become the fuel that drives the firm's business engine. Firms can have too many innovations just as they can have too few. For firms having too many innovations, their management must develop methods for screening out the less desirable innovations and identifying those that will generate the most value for the firm. Conversely, firms with too few innovations must develop processes that will stimulate innovation (particularly in certain technologies or innovation areas of importance to the firm).

The second source of value for knowledge companies resides in the conversion by firm's structural business assets. These assets (e.g., processing, distribution, sales) add value to the innovation as it is converted from an intangible into a product or service for which customers will pay. In terms of extracting value from business assets, knowledge firms are no different than others; they are able to achieve revenue from the value added by each structural business asset during the process of converting an innovation from an intangible
into a salable item.

The mechanisms for payment, or conversion of value into cash, are several fold: sale, tax-deductible donation, licensing, joint venture, strategic alliance, and complete commercialization.

Companies successfully managing their intellectual capital consistently accomplish several things. First, they develop the internal policies, procedures and decision processes to develop and maintain an acceptable flow rate of commercializable innovations. This includes not only the incentive systems to focus energies on technologies or innovations. Of business interest, but also the processes to evaluate and screen the innovations in order to identify those that offer the most potential value to the firm.

2.2.2. Examples of intellectual capital Management

Nine or ten years ago it would have been unlikely to find many companies systematically managing their intellectual capital. There were some becoming sophisticated about how they managed and encouraged learning within their human capital. There were others that had developed sophisticated methods for managing their portfolio of patents; and virtually no companies had developed skills for managing their unprotected intellectual assets.

Today the story is quite different. There are now a number of large companies that have made significant investments in developing the capability to manage their intellectual capital (ICM). Some of these have even formally named executives as directors or vice presidents of intellectual capital management. Until recently, each company developed its ICM capability in a vacuum; largely unaware of the efforts of others. In 1996, a group of such companies, sponsored by Dow Chemical, Skandia and the ICM Group, have been meeting informally to
discuss what ICM means at each of their firms and to share information on
techniques, approaches and processes.

One result of these informal information-sharing meetings has been to create
the models of intellectual capital we described earlier. In addition, it is clear that
each firm, see different aspects of intellectual capital as important to their firm.
With this in mind, we can describe how knowledge companies approach the
problem of managing their intellectual capital.

Some knowledge companies, usually those with a value-creation perspective,
focus their intellectual capital management activities on enhancing the ability of
their human resource to increase either or both their rate of knowledge creation
and the fit of their new knowledge to the firm’s needs. These firms are dealing
with new or different forms of organizational structure, new or different methods
for incentivizing employees, new or different managerial styles as well as new or
different ways for employees to work with the firm.

Other companies, also those with a value-creation perspective, are not
satisfied with the rate at which they are able to convert knowledge into
intellectual assets. For these companies, the bridge between tacitness and
definition is one that must be better managed. They are investing the time of their
intellectual capital management team in learning how to identify the business
focus areas interested in new innovations and then working with the firm’s human
capital to learn how to provide the necessary environments and incentives to
produce a stream of desired innovations on a routine basis.

Still other companies who actively manage their intellectual capital find
themselves focusing on the unprotected intellectual assets. These companies
are often those with a dual perspective (both value creation and value
extraction). Often these are companies in industries with relatively long product
life cycles. These companies focus energies on identifying previously unidentified
intellectual assets, evaluating their commercial potential, valuing them and screening them into the portfolio. Here the focus is on identifying attractive intellectual assets.

Yet companies, usually those with a value-extraction perspective, focus their intellectual capital management activities on the portfolio of patents. For these companies it is crucial to create a portfolio of patents that has not only direct commercialization uses but also one that provides them with patents useful in business negotiations or in cross licensing. These companies tightly manage the quality of the properties placed into the portfolio. For these companies a quality patent is one that is itself directly commercializable, that directly protects a commercializable patent or that is valuable to a business competitor. Companies with this ICM focus develop screens and patenting decision processes that both control the quality of patents entering the portfolio and cull the portfolio routinely and delete patents no longer deemed to be needed for the firm to achieve its business strategy.

Finally, some companies take an even broader view of their ICM activities. These are companies whose business strategy requires a longer-term focus on intellectual capital. Companies with this broad focus also tend to have the dual perspective of both value creation and value extraction. They view their ICM activity as involving all three areas: tightly managing the quality of patents entering the portfolio, delving into under-explored unprotected intellectual assets to find new potentially commercializable innovations, and improving the processes involved with transitioning innovations from ideas into defined and codified assets.

- **Human Resource** - Human capital is the organization's human element. It includes owners, employees, contractors, suppliers, and all related humans who collectively bring to the firm their skills, know-how, and
individual abilities. It represents the individual capabilities of the firm to solve problems. Human capital is one of the major elements of an organization's intellectual capital.

- **Intangible Assets**: an accounting term defined as: on-physical benefits that contribute to future cash flows. (The benefit has already been obtained or is owned by an entity, which controls the access of others to it.)

- **Intellectual Assets**: Intellectual assets are the codified, tangible or physical descriptions of specific knowledge to which the organization may assert ownership rights. Intellectual assets are one of the major elements of an organization's intellectual capital.

- **Intellectual Capital**: Knowledge that can be converted to value.

- **Intellectual property**: a legal term describing the intellectual assets for which legal protection has been obtained.

- **Structural Capital**: All that is left when the human resources go home, i.e. organizational capability. Structural Capital includes both tangible and intangible elements. Intangible elements are such things as the firm's information technology, customer data bases, business and industrial procedures, strategic plans, etc. Tangible elements of the firm's structural capital include financial assets, facilities, and the range of assets that are valued on the company's balance sheet.
2.3. Tools available to Measure and Manage Intangible Resources

The task of leadership is to create the environment for managing knowledge. It requires less emphasis on what we own and more emphasis on what we know. It’s not about managing hired hands, it’s about setting context and energizing hired minds. Our challenge is to manage the stage, so to speak, for the human spirit to thrive and create in the emerging knowledge society. (Mr. Paul Allaire, Chairman and CEO Xerox Corporation Keynote Adress, November 7, 1997. Conference on Knowledge in International Corporations, Rome, Italy).

A New Set of Rules

Welcome to the information age, where products and companies live and die on information and the most successful companies are the ones who use their intangible assets better and faster. Knowledge and information are nowadays the drivers of company life, much more so than land capital or labor. What does it mean for managers? The increased importance of knowledge does not simply add an additional variable to the production process of goods: it changes substantially the rules of the game. The capacity to manage knowledge-based intellect is the critical skill of this era (Quinn, 1992). The wealth-creating capacity of the enterprise will be based on the knowledge and capabilities of its people (Savage, 1990). Firms that are thriving in the new strategic environment see themselves as learning organizations pursuing the objective of continuous improvement in their knowledge assets (Senge, 1990).

But there is more. Recent contributions have suggested that knowledge and information are actually subject to increasing returns, as opposed to the decreasing returns typical of the traditional resources. If this is true, then, knowledge and information become even more attractive to companies than before. Having a good base of knowledge means that a company can in future years start leveraging that base to create even more knowledge thus increasing its advantage on the competitors (Arthur, 1996).
What is even more striking is that the market has long recognized the value of knowledge and other invisible factors in the value-creating process. It's thus very common for companies to be valued more than their net assets would justify, precisely because of these invisible components. What has changed recently is the size of this 'hidden value'. In 1986 Merck had the biggest gap: its net assets covered just 12.3 per cent of its market value; in 1996, Coca Cola's assets were only 4 per cent of its value, whereas the same figure for Microsoft was 6 per cent. At the same time, some companies are trading below book value, which might be suggestive of the existence of 'intellectual liabilities' (Harvey and Lysch, 1999).

Companies however were the first to realize that something was changing. In the last decade, the job title of Chief Knowledge officer (CKO) has been showing up on annual reports and in job advertisements with ever-increasing frequency. Present and future success in competition will be based less on the strategic allocation of physical and financial resources and more on the strategic management of knowledge (Bontis, 1996), and these path-finding individuals have been given the unenviable task of channeling their organization's knowledge into corporate initiatives that become the essential source of competitive advantage. Unfortunately, knowledge is invisible and intangible, and thus it is not captured very well by any of the traditional measures, accounting or otherwise, that corporations master in their everyday operations. This means that managers run the risk of 'forgetting' that knowledge and the other intangible assets are there, or underestimating their value and contribution, and thus take decisions, which in the long-term might prove harmful precisely because they damage the 'intangible asset stock' of the company. What is even worse, the attention of the company will be focused on improving the efficiency of its physical assets only, because that is what gets measured, appraised and evaluated by senior managers (Hauser and Katz, 1998).
Knowledge managers may thus feel that they have been asked the impossible: how can they use accounting tools, developed 500 years ago to help merchants in the feudal era, to make the key success factors of the information age visible? Once the need for new tools is recognized, how do you choose among the many alternatives suggested by different sources? How do they stop jumping on the bandwagon.

Of the latest faddish instrument that promises success and competitive dominance?

I believe that answers to these three questions may come only from a deep understanding of all the most important tools available, of their premises and assumptions, their strengths and weaknesses.

To use a metaphor, this part of my paper would like to be the instruction sheet of the managerial toolbox for measuring and managing knowledge.

2.3.1. Economic Value Added (EVA™)

Traditional financial measures of performance, like Return on Assets (ROA) and Return on Equity (ROE) have long been criticized for their inadequacy in guiding strategic decisions. In particular, they do not consider the cost of capital incurred to fund the projects that generate these returns, and thus are severely lacking as instruments to guide managers in their quest for value-creating values. They are also highly aggregated which means that they often confound the impact of different strategic factors, such as product differentiation leading to higher price recovery and productivity improvement providing a cost advantage (Stewart, 1994). In addition, they often fail to shed light on underlying causes of high or low performance. For instance firm pursuing a cost leadership strategy may improve its productivity and lower its prices. The impact of these two managerial actions may be offsetting and no change may be registered in the
ratio to reflect these actions (Baiker et al. 1996).

Economic Value Added, (hereafter referred to as EVA, a registered trademark) was introduced by Stern Stewart and Co., a New York based consulting firm, in the late 1980's as a tool to assist corporations to pursue their prime financial directive by aiding in maximizing the wealth of their shareholders (Stewart 1994). In the broadest terms, EVA is a comprehensive financial management measurement system that can be used to tie together capital budgeting financial planning, goal setting, performance measurement, shareholder communication and incentive compensation. The objective of EVA is to develop a performance measure that properly accounts for all ways in which corporate value could be added or lost. Building accountability into a measurement system that can be used to tie together capital budgeting financial planning, goal setting, performance measurement, shareholder communication and incentive compensation. The objective of EVA is to develop a performance measure that properly accounts for all ways in which corporate value could be added or lost. Building accountability into a measurement system, EVA encourages managers to take each and every decision following the overarching principle of maximizing shareholder value. Because of this, Stern Steward and Co purport EVA to be the only measure of performance the properly accounts for all the complex trade-offs involved in creating value.

The concept is certainly not an outright revolution. Alfred Sloan, the General Motors patriarch, knew EVA- though not by that name- as early as the 1920s. In fact, accountants have long known a closely related acronym: RI, or residual income. Residual income is the value remaining after company's stockholders and all the other providers of capital have been compensated. The difference is that EVA has been taken a lot more seriously, and developed a lot more, by practitioners, consultants and researchers alike.

EVA provides a common language and benchmark for managers to discuss
value-creation: projects become easily comparable, and managers can respond to the pressure for performance accountability through the use of an appropriate metrics (Young, 1998). More than that, EVA is blessed with widespread acceptance in the financial community, and thus can increase the legitimacy of a company in the eyes of the financial markets, as a valuable measure of corporate value-creation or destruction over a given period (Cs First Boston, 1996).

According to the EVA supporters, maximizing, the shareholders wealth is not the same as maximizing the company's total market value. Simply investing as much capital in it as possible can maximize a company's total value. Only maximizing the difference between the firm's total value and the total capital that the investors have committed to it on the other hand maximizes shareholders' wealth. This difference is called market value added (MVA). The spread represents the difference between the cash that the firm's investors have put into the business since the start up of the company and the present value of the cash that they could get out of it by selling their shares. Maximizing this spread, corporate managers maximize the wealth of its shareholders relative to other uses of their capital.

It can therefore be argued that on an aggregate level a company's MVA communicates the market's present verdict on the net present value (NPV) of all its current and contemplated capital investment projects. MVA is thus a significant summary assessment of corporate performance – showing how successful a company has been in allocating, managing and redeploying scarce resources to maximize the NPV of the enterprise and hence the wealth of the shareholders.

The disadvantage with MVA is that gains and losses accruing from years-old activities are aggregated on a one-to-one basis with last year's results and today's hope or despair as expressed in the share price (Management Accounting, 1997). As a consequence, a company with a very successful
history will keep on showing positive and high MVA even if current projects and future prospects are bleak, risky and unrewarding.

The solution to this is to concentrate only on the changes in MVA, that is the contribution from new projects to the spread between market value and total capital. EVA aims to do just that, emphasizing the importance of maximizing incremental earnings above capital costs. In order to have positive EVA, in organization's rate of return on capital must exceed its required rate of return. The importance of maximizing incremental earnings above capital costs seems intuitively simple.

EVA is the difference between net sales and the sum of operating expenses, taxes and capital charges.

Net sales - operating expenses - taxes - capital changes = EVA.

2.3.2. Critical Review on EVA

Even though EVA does not explicitly relate to the management of intangible resources, the implicit argument here is that the effective management of knowledge assets will increase EVA. All the same, this origin implies that no specific measures are developed for the assessment of the potential contribution of investments in intangibles. Indeed, some strategy researchers support the idea of using EVA measures as a surrogate measure for the stock of intellectual capital and that EVA can be viewed as a measure for return on intellectual capital (Marchant and Barsky, 1997). The implication is that these investments should still be judged according to the standard criteria for assessing any long-term project: net present value, cost benefit analysis, etc. The complication, which we hinted at in the introduction, comes from the ephemeral nature of intangible resources: how do you estimate the value of a training program? Or of the creation of a best practice database?
EVA pretends to do just that, through the innumerable adjustments to the value and the cost of capital that have been suggested. In defining the EVA measures, Stern Stewart and Co. has identified 164 different areas of performance adjustments that are supposed to address shortcomings in conventional accounting practice, and thus solve problems like the accounting of intangibles and long-term investments with a high degree of uncertainty. Among these problematic areas we find: depreciation, capitalization and amortization of R&D, market building, outlays, restructuring charges, acquisition premiums and other 'strategic' investments with deferred pay off patterns.

Even ignoring the possible 'accounting massage' that such a number of adjustments can allow unscrupulous managers to make, it is clear though that companies, when implementing EVA, face a trade-off between accuracy and complexity. As the number of adjustments increases, the precision of the EVA calculations may improve, but the system becomes more complicated and vulnerable to challenges by company managers, not to mention unwieldy and useless. To solve the trade-off, most companies that adopt EVA limit the number of adjustments they use to less than five. Some companies choose not to make adjustments at all, on the grounds that it will make the system too complicated.

Another limitation is that the calculation of EVA uses book values of (net) assets. These will in many instances be based on historic cost, which might give little indication of current market or replacement value. The argument for using historic cost is however that the market values would have to be updated on a regular basis, and that the volatility of the values, and possible estimation subjectivity, would impose large costs on a measurement system, and reduce the objectivity of the measures.

Although there is evidence to date showing that EVA and stock prices are correlated (Lehn and Makhiija, 1996), can it be claimed that EVA is better at explaining stock price than alternative measures of performance? The evidence
seems to suggest otherwise, as studies reveal no additional explanatory power over accounting profit in explaining stock price and only a relatively low correlation between variations in EVA and variations in stock prices (Dodd and Chen, 1997).

As a final comment, it is important to note that EVA assumes a definite governance perspective: the starting point of EVA analysis is that companies should be run in the interest of shareholders exclusively. The corporate governance debate however is not so clear-cut. Some organizations might thus resent this characterization of their institutional goal, either because of their particular circumstances (for example, State-owned companies), on ideological grounds or simply because they believe that other perspectives on governance are more fruitful for their long-term development. It remains to be seen whether the EVA can be adapted to respond to these other governance viewpoints.

2.4. The Case of APION

Having surveyed the literature on value creation, categorizing it under financial and economic, strategic, managerial action, and resource-based perspectives, the paper notes that a major criticism that can be leveled at all these perspectives is that they are weak in identifying specific actions and in mobilizing organizational resources to increase shareholder value. Even resource-based theory (RBT) focuses on the development and protection of valuable resources rather than on providing a theory of 'resources in action'. The IC perspective has emerged alongside RBT as a complementary viewpoint but has a distinctive practitioner bent emphasizing resource accumulation and deployment in the value creation process.

If there is one question that has dominated the deliberations of most senior
management teams over the decades it is *how do we enhance shareholder value?* Answering this question must surely be the Holy Grail of management practice; and there is no shortage of views about how this objective can be achieved. Indeed, when the stock market values a company at a valuation in excess of its shareholders’ funds, which is usually the case, it is taking a view on the wealth-creating potential of the organization’s resources, particularly those not valued or indeed identified in the balance sheet. Many high tech companies have little by way of assets: buildings are rented, equipment and computers are leased. These companies depend entirely on their intangible resources, particularly the skills and knowledge of employees. While assessing the value of such companies is fraught with difficulty, mobilizing these intangible resources to create shareholder value presents a management challenge that has not been adequately addressed in the research literature.

In the industrial era, the production function was relatively straightforward. The key input was financial capital, the economic behavior of productive resources well understood (the dominance of decreasing returns), and the boundaries of the organization were clear. Today’s knowledge intensive companies struggle with a much more complex environment.

2.4.1. The IC Perspective Provides a Basis for Developing an *Understanding of the Nature of Resources in Action*

Intellectual, or intangible, resources have different characteristics than physical and monetary resources beyond tangibility. This affects their impact on the value creation process differently depending on the resource and the context.
Any model aiming at depicting how different resources with different characteristics impact the value creation process, must be able to incorporate these characteristics. Unfortunately, there is currently only limited research in this area, consequently these different characteristics and their effects are not fully understood. However, given our current understanding, there are few key features of elementary importance that must be recognized in any dynamic model.

Many IC resources are *non-rivalrous* in an economic sense, meaning that many users in different locations at the same time can use them simultaneously. This applies to, for example, a process, an information database or a system – i.e. most elements of organizational capital. The non-rivalrous concept is also relevant for any knowledge (HC) that has been formalized and transformed into information, for example in the form of a manual (OC). This information can be used by an unlimited number of people, for a variety of applications, regardless of location, particularly if stored in digital form, an objective of many corporate Intranets. A machine on the other hand, can only produce a limited output per unit of time and only in a single location at any one time.

One of the fundamental economic laws upon which accounting relies is the law of decreasing returns. When a machine is used, the capabilities of that machine are consumed, thus the accounting rule of depreciation. This is not true of intellectual capital. When knowledge is used, for example through formalizing it as a process or through knowledge exchange with another party, it does not decrease in value. On the contrary, when articulated and challenged new knowledge is developed and thus its value may very well increase. Indeed, it has been suggested that some of the intellectual resources are instead characterized by *increasing returns* (value generated increases per incremental unit of investment). In reality most intangible resources apply to a combination of decreasing and increasing returns throughout their lifetime. For example the resource customer relationships (RC) often benefit initially from an increasingly
growing customer base as the individual customer benefits from the improved service and learning effects this provides the supplier (increasing returns). However, after a certain level the network may become too large to handle with the systems and processes in place and each customer experiences a negative impact on the service provided as a consequence (decreasing returns). The challenge lies in determining when the changes of the curve will occur, i.e. when the increasing returns turn to decreasing returns (Arthur, 1990, 1996).

As intellectual resources are often internally generated, interrelated and interdependent their value is context specific (Collis, 1994). The value of a brand, for example, is heavily related to the particularities of the industry in which they are marketed. This predicament has become apparent in the many discussions and experiments around brand extension that have captured the interest of many firms in recent years. Research has also shown that financial markets appreciate these effects. In a study of over 1000 firms by Brynjolfsson and Yang (1997), an increase of one dollar in the quantity of computer capital (tangible asset base) installed by a firm was found to be associated with an increase of up to ten dollars in the financial markets' valuation of the firm. The researchers' model suggests that intangible assets can provide an explanation for this high market valuation because they complement information technology just as software complements hardware. To realize the potential benefits of computerization additional investments in human, organizational and relationship capital (IC) may be needed (for example in the form of training and new processes to support the new IT system). The conclusion of the study is that the contribution of computers to a firm's market value is increased only when they are combined with certain intangible assets especially created to support the investment in hardware.

Furthermore, unlike balance sheet items, the value of the constituent parts of IC is not additive. Because these resources are co-dependent in creating value, and because the resulting returns may well be increasing rather than decreasing,
it becomes meaningless to attempt to assess the value of the constituent parts of IC by adding them together. Although parts of the structural capital can be traded, for example certain brands, it is only through combination and utilization that most intellectual resources render any value to an organization.

The IC perspective is able to incorporate these characteristics in the holistic framework used to study the resources in action and their contribution to the firm’s value creation through the concept of transformations. As already noted, there is no correlation between the presence of resources and the ability to create value. Value is created (or destroyed) when one resource is transformed into another. For example, monetary value can be created through selling a process (organizational resources transformed into monetary resource) or new organizational capital can be created through formalizing knowledge into a process (human resources transformed into organizational resources). The impact of the transformations on value created can be assessed and visualized with a ‘Navigator’, a model revealing all the value creating resources (tangible and intangible), their transformations and the relative importance of the resources and transformations for value creation. The Navigator will be further explained and illustrated later in the paper.

2.4.2. Realizing Shareholder Value

Through identifying what turned out to be the right knowledge and skills, acquiring and harnessing them through its structural capital, APiON achieved its goal of first-to-market in the convergent space. They were the first company in the world to-market with a WAP gateway product in February 1999 – ahead of the market leading giants Ericsson, Nokia, Motorola, and Unwired Planet (subsequently renamed Phone.com). In September 1999 Finish telecommunications operator Sonera used their software in the world’s first commercial WAP service.
Being first-to-market with their product allowed APiON to establish a lead in the European market place. Phone.com were first movers in US and Japan and had dominant market share in these regions with their technology. There was thus little overlap between the markets covered by the two companies and APiON was therefore an attractive candidate for the much larger Phone.com who approached APiON with a $263 million bid in October 1999.

The shareholders were faced with the choice of accepting the offer from Phone.com or investing additional funds so that APiON could pursue the market opportunity itself and follow the initial strategy to IPO 2-3 years later. The shareholders understood that the question of timing was extremely important; in 2-3 years' time the WAP market would have matured and be more competitive and thus less attractive from an investment perspective. The board accepted the bid.

2.5. The Dow Chemical Company

The Dow Chemical Company in 1996 and for the four past years had been developing a vision, functional systems, and tools, for the 'value management' of its Intellectual Assets (IA). During this effort, it has developed some competencies in the area of 'measuring and valuing' IA, and in developing systems that support the leveraging of IA for maximum value. In this paper, Dow shares its experiences gained and reveals some of the lessons learned from this highly successful endeavor.

The journey begun about 10 years ago, with the first step taken by a group of forward thinking and creative individuals within The Dow Chemical Company. Within Dow, this effort is viewed as very successful. The businesses that now comprise the company have and continue to benefit from the efforts of a small group of people who have applied creativity, knowledge, experience, and teamwork to reengineering systems and processes that contribute to the creation
of value. The people who signed on to this journey have taken some career risks by jumping into a vehicle that was newly created, not totally complete, and only had a general direction to travel with no clear maps. This journey has been, and still is, through a territory of cultural change. It has been dangerous, difficult, exciting and rewarding. The people involved have been rewarded from both the internal satisfaction of making real positive change and in their own career development and compensation.

What I would like to accomplish with this part of my paper is to provide some insights as to how The Dow Chemical Company created a vision for the management of its intellectual assets and how it has successfully traveled down the path to getting there.

Why would Dow want to share this information? They believe that in the future business environment, successful companies will be required to engage in more partnering and alliances, do this globally, and do it within legal boundaries. This is not to say that head to head competition will be minimized, in fact, it will most likely intensify. Dow is preparing itself for this future. They have recently reorganized themselves around global business units and established strong business leadership reporting lines. They have, and are, continuing to establish best practices. In order to do this effectively, they are benchmarking leaders in all industries. They also believe that the better our competition understands their own intellectual assets and the process to manage them, the healthier the competition will be in the future. This could result in less litigation and misunderstanding.

2.5.1. Setting the Context

Dow started in the United States in 1987 producing a few basic chemicals. It is now a large global company producing over 2000 chemical related products. The company is presently organized into 15 major business units along with
other 40 joint ventures. Its 1995 sales were over 20 billion dollars with about half of the revenues coming from European, Latin America and Pacific area sales. Dow spends approximately one billion dollars a year in research and development and employs about 4,000 R&D people. Its present patent portfolio consists of about 25,000 patents globally. The company will spend over 30 million dollars a year on maintaining and supporting this patent portfolio. This includes patent abstention, litigation, writing agreements, etc. Historically, Dow has been managed through a matrix type organization. The matrix consists of a functional, business, and geographical components. Throughout the history of the company different functions have taken on a leadership role. A quick profile of Dow and its culture would be best described as a technology driven (we can do it better for less); a global player (think global, act on a national basis); and conservative (in true Midwest tradition).

"Corporate intellectual properties will be more valuable than their physical assets in the 21st century" Joel Barker, Futurist, Infinity Limited

If I had to choose one idea that acted as a catalyst, probably more than any other, it this quote from Joel Barker. This quote has floated around Dow for many years, resonating, but never catalyzing action. The leveraged buyouts that took place in the 1980s is an indicator that what Joel Barker talked about had real credibility. This was further advanced by John Tobin Yale University. Tobin addressed the differential between a corporation's book value and it's market value and called this difference 'service value'. Much of this service value, I believe, incorporates intellectual capital and intellectual assets, both of which I will define later on. These ideas along with Dow's own experiences have contributed to building a framework for the future that will greatly value intellectual assets. There are some companies that where highly profitable only a few years ago and barely surviving today. There are companies that were not around ten years ago that have leapfrogged the industry leaders. The ability of a
company to manage and leverage intellectual assets has certainly played an important role in this repositioning of industry leaders. Dow must focus on the management of its intellectual assets and its intellectual capital not only to survive, but to prosper. This is not to say that Dow or any other corporation has not managed its intellectual assets, in fact, I believe there is a direct correlation between how well the intellectual assets of a corporation have been managed to its financial success. The opportunity is in being able to visualize, better measure, and manage them.

2.5.2. The Vision

For the past three years the Intellectual Asset Management function has had the responsibility to integrate Dow's intellectual assets into the business strategic thinking of the corporation, to maximize the business value of Dow's Intellectual Assets and develop a management process that will help to maximize the creation of new valuable intellectual assets. Intellectual Assets are defined, in Dow, as knowledge or legal instruments (patents, trademarks, copyrights, and trade secrets) that have value or the potential for value. Intellectual assets are part of a larger body of intellectual property, which does not necessarily have value. Dow also recognizes both of these to be part of an even broader defined body of knowledge called 'intellectual capital'. I subscribe to the definition of intellectual capital being presently developed in collaborative that include Leif Edvinsson Skandia; Hubert Saint Onge Canadian Imperial Bank of Commerce (CIBC); Patrick Sullivan from Intellectual Capital Management (ICM); myself and others. I am working on the company's acceptance of these terms. This definition simply stated this:

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\text{Intellectual Capital = Human Capital + Organizational Capital + Customer Capital}
\]
Where human capital is that knowledge that each individual has and generates; organizational capital is that knowledge that has been captured/institutionalized within the structure, processes, and culture of an organization; customer capital is the perception of value obtained by a customer from doing business with a supplier of goods and/or services. Hubert Saint Onge and Leif Edvinsson have both done an outstanding job of articulating these definitions and their relationships to each other. At a recent forum, a particularly interesting relationship diagram was developed with Hubert Saint Onge facilitating. It shows the interdependency of each of these elements and how 'value' is created when knowledge flows between them.

2.6. Developing Intellectual Capital at Skandia

WHEN YOU BUY A COMPANY, what do you buy? The fixed assets? Or do you look for some more sustainable assets? What do you measure? The number of customers? The number of nodes in the network of the virtual corporation? What do you value? The number of working hours? The number of good ideas?

The reason why Skandia started to focus on intellectual capital was, among other things, a need for a new logic regarding the development of knowledge intensive services. This is based on the very simple metaphor of a tree with fruit as well as roots. For the long-term sustainability of an organization it is much more important to focus on nurturing the roots than harvesting the fruit. The long-term idea might even be to get a new balance with a leadership focus on how the tree is flourishing. A focus on intellectual Capital provides an effective instrument to manage and develop the company. It will also serve as a useful indicator when benchmarking the company against other companies. It will stimulate renewal and development. It is also a better tool for evaluating the soft analysis. Intellectual capital becomes at least as important as financial capital in providing
truly sustainable earnings.

The search in Skandia for this new logic started more than a decade ago when both the CEO, Mr Bjorn Wolrath, and the Deputy CEO, Mr Jan R Carendi, began to realize the need for a more holistic and balanced perspective of how to develop and nurture service organizations and encourage growth. This is also very much in line with the new insights on quantum management leadership i.e. a more holistic and balanced view.

But, going back to Why, this also needs a broader perspective. The new knowledge era requires a knowledge economy. That is very evident when you look at the major investment streams. In the industrial society, investment used to go into plant, equipment and capital tools. Today, a major proportion of the investment goes into knowledge upgrading or competence development leading to human capital. Another major investment stream goes into the development of information technologies leading to value added networks, global area networks, etc. This is something that is invisible on the corporate balance sheet. One paradox, which is emerging, is that investing in the areas of human capital and IT leads to a short-term deterioration of profits, which in turn reduces the value of the balance sheet, thereby reducing the book value of the organization. To put it briefly, the paradox is that the more is invested in knowledge upgrading and IT, the less is the value of the organization!

A society where a major proportion of the investment stream goes into these intangibles needs another mapping system. To quote Bill Davidow: “there is a need to move to a new level in accounting, one that measures a company’s momentum...” In Skandia we call this “the need for a future accounting”.

2.6.1. Mission and Definition

Within Skandia AFS, intellectual capital was initially defined as “the
possession of knowledge, applied experience, organizational technology, customer relationships, and professional skills that provides Skandia AFS with a competitive edge in the market. The value of intellectual capital was determined by the extent to which these intangible assets would be turned into financial returns for Skandia AFS as a whole.

According to the CEO of Skandia AFS, the aspiration was to have an accelerated, steep learning curve that would rapidly integrate corporate knowledge into tangible assets and enable AFS to apply it with maximum competitive effect, thereby turning AFS into both a learning and a teaching organization. This was refined later on into the concept of an intelligent organization. The key point in this is that the lead time between learning and teaching should be as short as possible. This ratio might nowadays be measured as organizational float.

The **intellectual capital mission** at Skandia AFS was defined as follows:

1. To identify and to enhance the visibility and measurability of intangible and soft assets.
2. To capture and support packaging and accessibility by knowledge transparency and knowledge technologies.
3. To cultivate and channel intellectual capital through professional development, training and IT networking.
4. To capitalize and leverage by adding value through faster recycling of knowledge and increased commercialized transfer of skills and applied experience.

In 1992, Skandia AFS started stocktaking of these hidden values. This led to a very long list of items that were valuable, but not disclosed in traditional accounting systems. The list consisted of items such as trade marks, concessions, customer databases, fund management systems, IT systems, core competencies, key persons, partners and alliances, as well as about 50 more
items. The list was too long and unwieldy. It was therefore reduced, based on the major decisive characteristics. This led to the simplified definition of intellectual capital as follows:

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\text{Human capital} + \text{Structural capital} = \text{Intellectual capital}
\]

This definition emerged out of the insights gained when AFS was starting new units around the world. These new units represented mainly human capital, while in those units, which had already been in operation in the market for some time, had something else as well as human capital. Those dimensions beyond human capital were left behind when the staff went home. They were, for example, the customer database, the concessions, the IT systems, etc. So what was learned from this was that out of human capital grows some kind of structural capital. Metaphorically speaking, this could even be compared with a tree trunk which shows a number of year rings. For every year, the organization adds something beyond the staff. More and more structure is emerging.

So a key role of leadership is the transformation of human capital into structural capital. Furthermore, the human capital cannot be owned, it can only be rented. The structural capital can, from a shareholder's point of view, be owned and traded. Therefore, human capital is much more volatile, and structural capital can be used as leverage for financing corporate growth. Consequently, the banks and venture capitalists, amongst others, are more interested in structural capital. Unfortunately, neither the human capital nor the structural capital is visible in the traditional accounting system Skandia AFS initiated efforts to change this...

To be able to disclose these structural capital assets, it was necessary to develop a reporting system. Some of the areas on which information was now required were, for example, customer relations, distribution channels, structural
development, human resources IT and innovation. All this was assimilated into a report, and the idea was to try to get all the information on one page. The ambition was to have a simple overview of financial as well as non-financial data. Such a one-page report was presented to the board of Skandia AFS in 1993. The reception was enthusiastic and encouraging.

The completion of this very first blueprint report was a part-time effort by the Director of Intellectual Capital and Deputy Controller, Mr Ake Freij. To be able to develop this type of reporting further it was evident that a supplementary function had to be created. This led to the recruitment of the first IC Controller, Mrs Elisabeth Gemzell-Mikkelsen, in 1993.

2.7. Phases in the Development of Intellectual Capital

The following major phases can be regarded as a pattern for the development of intellectual capital:

- Missionary
- Measurement
- Leadership
- Technology
- Capitalizing
- Futurizing

The first phase around missionary work focuses on the insights and logic behind intellectual capital. It covers, among others, the area of the metaphor of the tree, as well as the need for a supplementary mapping system.

The second phase around measurement focuses on the development of the data, as well as the language. At Skandia this included development of the IC
Controller functions and alignment with the accounting system.

The third phase focuses on the leadership acting upon the new insights from the data. This is also called the navigation dimension to highlight the need for navigation into the future and to nurture renewal and development rather than just management of the past.

Technology focuses on the development of technology tools for the packaging of knowledge as well as communication technologies for rapid knowledge sharing. What could be seen in Skandia were also the evolutionary steps from Admin Technology (AT) with mainframes, to IT with PGs, to Communication Technologies (CT) with Intranets to Entertainment Technologies (ET) with customer amusement technologies, e.g. CD-ROMS.

The capitalizing phase focuses on packaged organizational technology for recycling, as well as intellectual properties.

The futurizing phase focuses on the continuous renewal and development and the nurturing of the innovation capital. This is illustrated, among other things, by the establishment of the first of Skandia’s Future Centers.

2.8. The Process Developing Intellectual Capital

Intellectual capital has many dimensions. These might be summarized as the appreciation of those collective human and structural assets, which have knowledge as a component. It involves off-balance sheet values. It measures the unmeasurable. It is a search for relationships among people, ideas and knowledge. Intellectual capital is therefore a relationship issue not a thing not an objective. It is a renewable, as well as renewing resource, that must be cultivated in a context. The management of intellectual capital is a process that can be facilitated, but which is not easily controlled. It is a network of connections. It
works through collective effort. It results from match-making and the exchange of ideas among people. Complex intellectual capital might have a simple elegance and could be represented and visualized in the graphical patterns. The Internet provided clues about how intellectual capital may be developed in the future. There may be a new art of knowledge leadership in managing the tension between internal and external worlds, between words and numbers, between differences and similarities, and between the development of intellectual capital cultivation and cost rationalization. A new organizational balance might emerge with a focus on 'maximizing value relationships'. This will involve value creation, value extraction and value exchange. A web of new dimensions will emerge based on: rethinking leadership, reinterpreting the role of finance, the new logic of value creation and value extraction, a new view of work, information that can be accessed globally, a new focus on core skills based on innovation; the transparency of organizational boundaries, and a new interpretation of society's rules, i.e. the nourishment of life based on what is valuable.

2.9. Measuring your Company's Intellectual Performance

Management theory has gradually accepted that 'hidden' assets (knowledge of employees, but also customer and supplier relations, brand loyalty, market position and knowledge) increasingly play a major role for the survival of companies. "[Intellectual capital] is becoming corporate America's most valuable asset and can be its sharpest competitive weapon. The challenge is to find what you have and use it" wrote Thomas Stewart in Fortune. These 'assets' are hidden because they do not show up on the balance sheet of companies. At the same time, as business journals and magazines demonstrate almost daily, many senior executives realize that successful companies will be those who do the best job of capturing, nurturing and leveraging what employees know.
This should not be surprising since in many instances the hidden assets have overtaken financial holdings, real estate, inventories and other tangible assets in reflecting the most valuable part of many companies. Just look at the difference between a company symbolizing the industrial era, General Motors, and one symbolizing the information era, Microsoft. The market value in March 1997 of GM, which has considerable traditional assets, is approximately $49 billion. Microsoft, which has few such assets apart from its headquarters buildings in Seattle, has a market value of some $119 billion! The ratio between a company's market value and the cost of replacing its assets (Tobin's q) is getting larger in most industries, not only in service industries, but in all businesses where companies integrate smart technologies, software, electronics and total solutions into their existing products.

The crux is that it is individuals, not the company, who own and control the chief source of competitive advantage – the knowledge of organizational members. Nevertheless, as Peter Drucker has said, in the knowledge era the company needs to serve and nurture the 'knowledge worker'. But at the same time knowledge workers need the value creating processes and infrastructure of the organization, as well as conversations with other knowledge workers to unleash and leverage their knowledge.

This is why concepts like hidden assets, intangible resources, or most recently 'intellectual capital', often say more about the future earning capabilities of a company that any of the conventional performance measures we currently use. If the top fifty programmers suddenly left Microsoft, the share price of the company would likely drop dramatically. The absurdity is that while a company may just have gone into 'intellectual bankruptcy', the short-term profits may very well rise since costs have been lowered! Thus, it should not be surprising that the Securities and Exchange Commission in the USA have recently indicated they would like to see an intellectual capital supplement to companies' annual reports.
So, how can companies better visualize and even measure the growth and/or decline of intellectual capital, the 'intellectual performance' of the company? This is the managerial issue we address in this paper. To this end we have studied how companies could set up their own systems for visualizing and measuring intellectual capital.

I am going to present the findings of the study in the form of examples of intellectual capital process models of some firms. Finally, I draw ten conclusions regarding the managerial issues.

2.10. Exploring Intellectual Capital

Until the 1980s mainstream management theory focused on companies' environment as the basis for understanding competitive advantage. In line with neo-classical economics, resources were assumed to be homogeneously distributed within industries, and in addition easily accessible by competing firms. Thus, the role of management was to figure out smart ways to combine products and markets given the bargaining power of suppliers and customers, entry barriers, and potential substitute technologies and/or products. The strong message of the economist-driven 'industrial organization' line of thinking was to worship the environment rather than the inside of the firm.

In the 1980s, what was later called the 'resource-based' perspective of the firm challenged this view. Elaborating some elements that had already been brought forth by Edit Penrose in the 1950s, followers of this school of thought suggested that competitive advantage did not arise only via various product-market combinations in a given industry. On the contrary, it was mostly due to differences in organizational resources of different kinds. Because resources
cannot always be transferred or imitated, we must look inside the firm to find the real sources for sustainable differences in the resources. In other words, worship the inside of the firm, not just the environment.

Pushing these ideas further ahead J. Barney developed four criteria for assessing what kinds of resources would provide sustainable competitive advantages:

1. Value creation for the customer
2. Rarity compared to the competition
3. Limitability
4. Substitutability.

The only resource that seems to pass this acid test is 'knowledge'—regardless of whether you call it invisible assets, absorptive capacity, core competencies, strategic assets, core capabilities, intangible resources, organizational memory, or other concepts carrying similar meaning.

The introduction of these ideas coincided with a seminal work in the management area, namely Itami and Roehl, Mobilizing Invisible Assets, Harvard University Press, Cambridge, MA (1987). Although not defined by the authors, invisible assets are considered as the most important resource in the production processes of firms. These assets, the authors claim, are based on information. They can include anything from brand loyalty (the result of information from the company to the environment), to technological or technical skills (with information flowing from the environment to the company), to internal goodwill (presumably helped by free flow of information inside the company).

Likewise, the well-known and widely applied concept of core competencies is another example of a source of sustainable competitive advantages from this perspective. To identify core competencies and distinguish them from 'non-core' competencies should be suitable for application in many different markets; they
should create a significant contribution to customer value; and, in line with Barney, competitors should have problems imitating the core competencies of a company.

The next logical step for scholars trying better to understand the nature of knowledge was to categorize it. Although many categories have been suggested, like embodied knowledge, encoded knowledge, embrained knowledge, procedural knowledge, the most frequently used distinction is tacit versus explicit knowledge. This distinction, suggested by Polanyi, and later exploited by many authors in the strategic management realm, most recently Nonaka and Takeuchi, is indeed a fundamental one. It seems to us that we have reached the limits of present understanding of knowledge – at least in the management realm – by revisiting one of the basic issues the Greek philosophers struggled with, namely the distinction between mind and body.

To sum up, strategic management research seems to have shifted its focus from looking outside at the industry structure to uncover the 'true' basis for sustainable competitive advantage to a realization that heterogeneously distributed resources provide more fertile soil for such advantages. The acid test of limitability led to the realization that knowledge; often in the guise of 'core competencies' should be the real nexus of attention in companies.

2.11. The Pursuit to Measure Intellectual Capital

Usually, what is measured in companies is also what is managed. But as Albert Einstein pointed out, what can be measured is not always important, and what is important cannot always be measured! Although the stock market is showing us that intellectual capital is far more important than money and other traditional assets – a fact that is consistent with the resource-based perspective – only a few companies are making a serious effort to capture, measure and better manage it.
Nonetheless, Eccles for example described the trend towards qualitative performance measurements, including innovation, personal, and customer satisfaction, instead of mere financial evaluation. Building on this work Kaplan and Norton introduced the ‘Balanced Scorecard’ technique to help managers combine performance measurements from different perspectives (i.e. knowledge development perspective, infrastructure perspective, customer perspective, and financial perspective) on a daily basis. Along these lines scholars have tried to measure competencies, technological knowledge, the meaning of employee-knowledge and other ‘intangible resources’.

Building on the Balanced Scorecard approach, Skandia, one of Sweden’s leading insurance companies operating internationally, is one of the pioneering companies in developing and implementing a systematic way of visualizing and measuring intellectual capital. It has come to view intellectual capital as both what is in the heads of employees (‘human capital’) and what is left in the organization when people go home in the evening (‘structural capital’). The latter, in turn, is sub-divided into three areas, called Customer Focus, Process Focus and Renewal and Development Focus. Although in somewhat different forms, the initiative of Skandia has been followed by other companies, including Dow-Chemicals, CIBC, Hewlett-Packard and Canon.

In this paper I subscribe to the basic views of the resource-based perspective of the firm. In turn, this allows me to build on the work by scholars like Eccles, Kaplan, Norton, as well as Skandia and other companies. To sum up, the conceptual framework through which I address the managerial issues of this study is that:

- Intellectual capital is the sum of the ‘hidden’ assets of the company not fully captured on the balance sheet, and thus includes both what is in the heads of organizational members, and what is left in the company when they leave.
- Intellectual capital is the most important source for sustainable competitive advantages in companies.
- An important managerial responsibility is to manage the intellectual capital of the company better.
- The growth and decline of intellectual capital can be called 'intellectual performance' and can be visualized and measured.
- A systematic approach to visualize and measure intellectual capital is increasingly valuable to companies regardless of the industrial, size, age, ownership and geographical dimensions.

2.11.1. Intellectual Performance

Intellectual performance, that is growth/decline of the intellectual capital of the company, is increasingly interpreted as an early warning signal of subsequent financial performance. Simply because they say more about future earning capabilities, we are convinced measures of intellectual capital will increasingly be at the forefront in discussing the health and value of companies, inside and outside the organization.

This is the balance sheet approach. Based on the results of this study the adoption alongside the balance sheet approach of a “Profit and Loss” approach is suggested and could help companies to monitor the flows among different types of intellectual capital and between intellectual and financial capital.

There seem to be three requirements for developing an Intellectual Capital System.

1. The company/unit must be mature enough to have gone beyond the stage of discussing business performance solely in financial terms.
2. The company/unit must have a clearly defined business idea or direction. Companies, which satisfied this condition, could relate intellectual capital
issues to their activity more readily than others.

3. There must be a clear operational commitment to moving ahead which top management visibly supports. This was evident in comments made by the interviewees during the interviews.

The I.C. system should capture only the intellectual capital growth or decline that affects the long-term earning capability of the business. Therefore, efforts to identify and measure intellectual capital must be rooted in the business. Therefore, efforts to identify and measure intellectual capital must be rooted in the business vision, mission or strategy to the company/unit since intellectual capital is a consequence of strategy.

The companies’ studies convince us that the intellectual performance system must also be rooted in the language of the company or unit. Important concepts used in conversations and texts around the vision, mission, strategy, and success factors must be identified, like ‘leading’, ‘product knowledge’, ‘the company’, ‘high product quality’, ‘high profitability’ and ‘customer integration’, and the meaning of these concepts must be uncovered. The authors tried to rephrase the concepts completely, using standard theoretical terms, but in these cases the managers did not recognize their own statements, and the statements themselves sometimes lost their meaning. Intellectual capital knowledge, then, is self-referential.

To be measured, intellectual capital obviously needs to be categorized. The objective is to create the new language that will be used in the company to discuss and evaluate intellectual performance. To create an indicator with operative, practical use it is essential that the indicator in question be precise and robust. To achieve these goals, the scope of the measurement has to be limited to a manageable level, and here is where distinction becomes useful.

The vehicle for measuring intellectual performance is a set of indicators used
for each intellectual capital category. It is these indicators that permit
measurement, not the categories. Contrary to the method of categorizing,
developing and refining measurements seems to be more of a bottom-up
process simply because these measurements must make sense to the people
who do the measuring and be understood by those who are to be measured. The
discussions involved in developing indicators often increase the awareness of
what is really important in the daily life of people in a company.

The balance sheet approach to intellectual capital is inherently a ‘snapshot in
time’ of the intellectual capital situation and does not provide information on the
transformation from one intellectual capital category into another.

There seem to be three ways to derive indicators:

- Develop indicators grounded in the drivers of the vision and/or direction
  expressed;
- Develop indicators grounded in the intellectual capital categories
  selected; and
- Develop indicators grounded in inter-capital flows.

There are many examples of the first type of indicators, which are company-
specific, since this study was based on these only. However, the second type of
indicators surfaced as important in some interviews. An example is ‘Percentage
of turnover attributable to products or services introduced during the last three
years’ as an indicator of Renewal and Development Capital and ‘Customer
satisfaction index’ as an indicator for Customer Capital. These indicators clearly
belong to a group of generic indicators linked to specific intellectual capital
categories. They are company-independent, but their use and their ranking
depend on the actual direction the company is taking. The third type of indicators
are used to measure the transformation of one intellectual capital category into
another: as such, they are totally independent from their context, while their
interpretation is once again strategy and context specific. An example of the third
type is ‘Percentage of available man-hours spent on developing and maintaining
an IT-based experience library’ as an indicator for a flow from Human Capital to
Structural Capital and ‘Cost savings due to use of an IT-based experience library
in training new employees’ as an indicator for a flow from Structural Capital to
Human Capital.

There are many analytical difficulties in handling indicators. Examples of
these difficulties are:

- Selecting the right indicators among the almost limitless number of
  potential ones.
- Ranking the importance of indicators for a specific category.
- Ensuring high precision for indicators.
- Establishing reliability of numerical values of indicators.
- Tracing all sources of error or noise in the logic used to identify
  indicators, which may otherwise lead to erroneous or irrelevant
  indicators.
- Tracking the high multicollinearity among many of the indicators,
  meaning that they are not reciprocally independent. This can be
  exemplified with the relationship between indicators ‘market share’ and
  ‘customer satisfaction’ where a change in one will have an effect on the
  other increased customer satisfaction generates higher market share
  and increased market share generates lower customer satisfaction. This
  makes it difficult to insulate any form of critical path or cause-effect
  relationship.

Any intellectual capital model must be scaleable; it should make sense for
large as well as small companies, and for organizations, parts of organizations as
well as individuals. This scalability is a prerequisite for comparison between
entities in the same framework. If the model is scaleable it means that it could be
consolidated along the distinction tree of intellectual capital, leading to an overall
intellectual capital index, analogous to the ROA of a DuPont model. Moreover, if
two intellectual capital models within the same framework are consolidated to one level above the highest intellectual capital category for which indicators are used, then the consolidated models may be compared. This approach may help companies to go beyond the initial benefit of a unique intellectual performance system, that of only benchmarking against oneself over time.

To be viable, an intellectual capital system needs to be aligned with existing managerial processes. When this happens, the system, in itself, becomes a valuable part of the intellectual capital of the company.
CHAPTER 3

Intellectual capital
CHAPTER 3

Intellectual Capital (IC)

3.1. Intellectual Capital (IC)

Intellectual Capital (IC) has enjoyed a very rapid diffusion in the last five years. Even though the term has been widely used in the literature before, the current wave of interest has been sparked by a few companies (mainly Skandia, Dow Chemicals and the Canadian Imperial Bank of Commerce) who started using it as a blanket denomination of all intangible resources. These companies realized that the existing frame works could not address the issues they were facing, and tried to develop something new. Thus, IC is very much a practitioner-created concept, and only more recently did scholarly contributions appear to analyze its use and potential.

3.1.1. Operationalisation

Under the name of Intellectual capital, we can classify all intangible resources (Bontis, 1996; Edvisson and Malone, 1997; Roos, and Roos, 1997; Bontis, 1998). Thus for this tradition, intellectual capital is quite simply the collection of intangible resources and their flows. The problem is the definition of intangible resources: for the purposes of this paper, suffice it to say that we will call resources any factor that contributes to the value generating processes of the company and is, more or less directly, under the control of the company itself. Thus the goodwill of the local community is an intangible resource (because the company can influence it) and therefore a part of intellectual capital. The tax system, instead, is not, unless the company is so big that it can influence the tax system of the country it operates in, but this case would, hopefully, be an exception. It is clear that the definition is very vague, and purposely so. IC is
something absolutely peculiar to each and every company: what the company can and cannot influence depends on many factors, which make one company include in IC something that another company would not. In other words, IC is context specific.

The value of a company then comes from its physical and monetary assets (which we will call financial capital), and from its collection of intangible resources (its IC, as we explained above). Once we try to get in the IC concept, however, the idiosyncratic situation of each company should take precedence, and guide the selection of specific categories. In general, I believe that this identification process should be guided by a purely managerial logic: if two intangible resources require different managerial actions, then they should belong to two different categories.

Very briefly, human capital is the collection of intangible resources that are embedded in the members of the organization. These resources can be of three main types: competencies (including skills and know-how), attitude (motivation, leadership qualities of the top management) and intellectual agility (the ability of organizational members to be 'quick on their intellectual feet': innovation and entrepreneurship, the ability to adapt and cross-fertilize, etc.).

Structural capital instead is everything that remains in the company after 5 o'clock, according to a definition by Leif Edvinsson, Vice president and Corporate Director of Intellectual Capital for Skandia. The essence of structural capital is the knowledge embedded within the routines of an organization. Its scope lies internal to the firm but external to the human capital nodes. It comprises all the intangible resources which are the property of the company: thus in most cases their is market, albeit a limited one, for structural capital, where the company can buy or sell intangible resources, and the dynamics of this market are quite similar to the ones governing the market for more traditional resources (though there are obvious complications due to the
problem of evaluating these intangible resources correctly). The market for human resources instead, while existing, presents totally different characteristics, given that what is 'bought' and 'sold' are human people, and thus nobody can claim ownership of them. Structural capital can be divided into relationships (with any type of external actors: suppliers, customers, allies, local communities, government, shareholders, etc.) Organization (including structure, culture, routines and processes) and renewal and development (all the projects for the future: R&D, new plants, new products, BPR, etc.).

Identifying the different types of intellectual capital can be linked to the identification of stocks of intangible resources: this however is not enough. It is essential to measure, and thus manages, also the flows of intellectual capital, that is the changes in the stocks of intangible resources (Roos and Roos, 1997). Dierickx and Cool (1989) make a fundamental distinction between stocks and flows of knowledge by using the bathtub metaphor:

*At any point in time, the level of water in the tub indicates the stock of water; it is the cumulative result of flows of water into the tub (through the tap) and out of it (through the leak). In the example of R&D the amount of water in the tub represents the stock know-how at a particular moment in time, whereas the current R&D spending is represented by the water flowing in through the tap: the fact that know-how depreciates over time is represented by the flow of water leaking through the hole in the tub (Dierickx and Cool, 1989)*

In a way, the identification of stocks creates a series of still photos of the company's intangible resources, whereas the flows provide the animation. Adding a flow perspective to the stock perspective is akin to adding a profit loss statement to a balance sheet in accounting. The two perspectives combined (or the two reporting tools, in the case of accounting) provide much more information than any single alone. At the same time, intellectual capital flow reporting presents some additional challenges in term of complexity. Unlike accounting and cash flows, in fact, intellectual capital flows do not necessarily add up to
zero: in other words, intellectual capital management is not necessarily a zero-sum game (Roos and Roos, 1997). We are all familiar with stories of investments in IT, brand building and training that did not pay off, and turned out to be pure money drains. In these cases, the money invested in these activities did not convert into value for the company. Equally renowned, fortunately enough are other cases where small ad campaigns, marginal improvements in quality or processes and short training courses paid back their cost manifold, turning into great assets for the company in question. Incidentally, it might be worth noting that the very nature of intangible resources might contribute to this non-zero-sum effect. In fact, research has shown that knowledge and information are governed by increasing returns, as opposed to the decreasing returns which characterizes the traditional resources (land, labor and capital) (Arthur, 1996)

How should the indicators of IC be chosen? The choice should be guided by the long-term strategy of the company, its vision or mission. Once the company has clear ideas on its identity and its long-term goal, it should use these goals to identify two sets of variables: one is the 'value-creating path', that is the categories, or focus areas, of IC that really drive value-creation; the other is the set of key success factors (KSF) and indicators that are appropriate as performance measurements. The information from the two separate steps should be joined, and an IC system created. (Figure 2)
The creation of intellectual capital measurement system is fundamentally a top-down process. The initial start of idea, as well as the initial framework (that is the top part of figure 3), must come from the topmost layers of the organization. All the same, top management can only supply the language and the framework. The filling of the framework, the real juicy part (the bottom part of figure 3) can only be created at a local level, by the people that know the reality of the business because they are immersed in it every day, 250 days a year. The added familiarity with the business operations is an absolute requirement. Key success factors are quite general, and in most cases refer to most companies. We are not diminishing the importance of the KSF identification step, but KSFs are necessarily general, and thus applicable to more then one company, if not to entire segments or industries. The choice of indicators instead reflects the
characteristics of the company more closely: in other words, it is more specific (Hauser and Katz, 1998). Finally, indicators should be put together and organized according to the particular outlook of the company on intangible resources.

The joint examination of intellectual capital stocks and flows still leave some issues unsolved. It is still impossible to judge the overall IC situation of companies: if, for example, its culture has improved (judged by whatever criteria top management chose as appropriate), but its process efficiency has deteriorated, what is the final effect on structural capital? Has it gone up, down or remained stable? An answer can only be reached through the consolidation of the different IC indicators into a single, summary measure. Intellectual Capital Services, Ltd, has introduced the concept of consolidation of IC indicators under the name of IC-Index approach. The consolidation implies the identification of weights for all the indicators, to ensure that the most important factors be adequately represented in the consolidated IC index. It also requires a re-examination and transformation of the indicators, to make them dimensionless and more robust. Once however this index is obtained it can be used to monitor the evolution of the company’s IC situation very easily and effectively.

Unfortunately, the fact that different companies will use different indicators to create their IC index makes comparisons of the absolute value meaningless, in most cases: to be more precise, the more two companies use different indicators, and the more they operate in different contexts (thus the more their weights differ), the less their IC indices will be comparable. Still, it is possible to compare companies through the relative changes in the index. Changes in this measure would reflect changes in the underlying components, which in turn would be a sign of changes at the deeper level of the drivers of future earning potential. Thus a company that improved its IC index by 50 per cent is invariably doing better than another that improved the same measure ‘only’ by 25 per cent. The nature of IC and its increasing returns also eliminate any concern about the starting
point of the two companies. In fact, companies with higher starting IC levels would probably increase their IC performance more easily, contrary to common logic.

3.2 Economic Value Added

EVA is a technology of managing that attempts to underscore value creation and growth through focusing on the deployment of financial capital. Minimally EVA is a performance evaluation system, which emphasizes 'net operating profit after taxes less a charge for the capital employed to produce those profits' or in other words: "EVA is the 'residual income' left over from operating profits after the cost of capital has been subtracted". It makes the cost of capital explicit, and it attempts to make certain changes to the balance sheet to make the capital base more in harmony with a cash flow perspective on capital consumption. EVA is said to be 'superior to accounting profits as measures of the value creation because it recognizes the cost of capital and, hence, the riskiness of the firm's operations' (Lehn and Makhija, 1996). It directs attention to the possible different risk profiles of the elements of the assets in the balance sheet and allows different cost of capital to be used for each, just as it allows different risk profiles of investors using CAMP models to support this. EVA is thus a performance measure, which highlights the value, added beyond the cost of capital of the firm's periodic income, and the present value of the firm's future EVA represent the firm's Market Value Added (market value less the cash provided by investors and leaders). EVA is thus a performance measure, which provides a decision criterion (value beyond and above cost of capital) and it ties in neatly with the firm's Market Value Added and thus with value to shareholders, or Shareholder Value.
3.2.1. Comparing EVA and IC: where does value come from?

EVA and IC suggest very different drivers of growth and value. They are both intellectual technologies oriented towards the future, but they capture the future in two different ways: EVA tries to calculate it; IC tries to hope for it and visualize it. EVA is directly concerned with cash flows; IC is directly concerned with competence enhancement.

Firstly, EVA is a bottom-line indicator, which focuses on total factor productivity. Here, cash flows are integrated and aligned with a cost of capital derived from the capital market. There is a little attention to or acceptance of loosely coupled sets of information which are contained in accounts of the type preferred in IC whose sets of measurement are hardly an exhaustive list and carry no pretence of being a full reflection of the IC increments which accrue to the firm from period to period. EVA claims access to (near) complete information used by the omniscient manager simulated as a stockowner. IC, in contrast, new as new knowledge aligns itself with other assets in a spiral of development that cannot be predicted. Such logic of discovery is concerned with knowledge-destruction and re-application to new and more appropriate ends. Here, if there were an implicit model of a simulated owner somewhere, it would not be the one preoccupied with financial returns (alone) but more likely one resembling Schumpeter's entrepreneur who improves the business because the products and services will make more sense. The simulated owner is here the entrepreneur, while for EVA it is the portfolio manager with no specific interest in the business. IT is entrepreneurial capitalism vs. financial capitalism (Spybey, 1984).

From the perspective of IC, EVA is a very sorry representation of the future. From an IC perspective, if it possible to calculate in a net present value of the effects of organizational action over the long run, then the strategies proposed cannot be very interesting, they must be conservative, and most likely they will
miss the point about how post-modern markets function. Therefore, according to proponents of IC, EVA may generate results, but very uninteresting ones that cannot be of strategic value to the firm.

EVA is concerned to create a bottom line; IC cannot see a bottom line but rather a set of interrelated sets of talk structured by loosely associated sets of figures, digits and visualizations. EVA sees growth as a reflection of current products and technologies and cost of capital; IC sees growth as the outcome of skillfully managing the relationship between tangible and intangible assets. For EVA, strategic recommendations are produced directly from the net present value calculations; for IC strategy has to be rooted in hopes for a better future emphasizing the need to increase white collar productivity and creativity. EVA sees capital as a stock which has to be depreciated properly and associated with risk-adjusted interest rates to calculate performance and net present values; IC sees capital as a process where the augmentation of intangible capital may increase the productivity of the network of complementary capital.

There are many differences between the two accounts of growth and value creation. They are simply diametrically opposed in terms of the role of calculation. For EVA, calculations cut through organizational mess and rearrange it in such a way that all good and all bad are related in a final proposition as a digit. This may involve a complete reorganization of the firm. IC, in contrast is constantly on the move, and the calculations are always tangential to the important issue: How is competence identified, achieved and developed? How it is packaged and mobilized to increase white collar productivity? How it is made an object for intervention? How it is appropriated?

Against this perspective, the challenge to EVA from IC is simply whether it really is possible to make a firm progress towards an uncertain future with a technology of managing which primarily is a logic of justification; an ex post means to evaluate the actions already taken. Where is, IC would probably insist,
the future really?

3.3. Dow’s Model

This model is simple and exciting. It encompasses all of the basic concepts that ultimately capture and create value. I am sure you will be seeing it, as it further evolves, in many other discussions about knowledge management and Intellectual Capital Management.

3.3.1. Starting with Patents

So much for context and definition, though they are both necessary and critical to any discussion that deals with experiences and models. Where do they start? They started by recognizing that, within Dow, evolving new processes and opportunities is a much more sustainable approach to changing corporate culture and developing new business opportunities than a revolutionary one, recently better described as the ‘program of the month’. It was understood that how and where this new effort was started would be critical to its succeeding. Therefore, it was decided to start in an area that was familiar to many within the corporation, had a high probability of success, would be an obvious value contributor, and could be implemented quickly. Within Dow, patents met these criteria.

Starting with patents by no way means that we did not recognize the significant opportunities with other intellectual assets within Dow. Know-how is probably the largest and most valuable intellectual asset in Dow. If we could be successful in managing our patent portfolio, we felt strongly that we could follow that success with the management of our know-how, our copyrights, our trademarks, and trade secrets. First surveying the way the existing processes were done – current process started the process changes. This was done in a very detailed way for the intellectual asset management process. Getting the
right people in a room together, which included all stakeholders in the patenting process, and literally mapping, out all of the activities from cradle to grave and all the roles and relationships between stakeholders was completed. Having successfully completed this critical step, and revisiting the corporate vision, development of a 'should process' was started. The development of these tools was no easy task. Critical to their success was having the right level of management that understood, in detail, the processes they were responsible for and could make commitments to support this process. This careful mapping of the 'is' and 'should' processes has proven to be the cornerstone to their success in implementing many of the reengineered processes and tools that were developed. The process provided buy-in from all the key players. And it had enough complexity about it that higher management felt secure that all the right thinking went into it. It also limited those who would try not to challenge it to truly interested parties. To include the details of these maps in this forum is not possible. What is possible is to include the abbreviated model that they developed from the 'should process'. This model has become the focus for all of their dialogues inside and outside the company. (Figure 3)
3.3.2. The Intellectual Asset Management Model

The best place to start is with the **portfolio phase** of the existing intellectual assets. In Dow they started, as previously indicated, with the existing patent portfolio. The model, in fact, will work for any of the intellectual assets in their company. This assembling of the patent portfolio was not easy. They had to identify all of the properties, determine if they were still active and find an internal business or cost center that would take ownership and pay the costs appropriate.
with pursuing or maintaining the property. A lesson learned in this phase of aligning properties to a business was that identifying the business that benefited from the value of the property or that sponsored it made the process much simpler. Sounds like an obvious and easy task until you try it at a complex company like Dow where there were over 29,000 patents that were not well organized for many years. With the portfolio in hand for every business segment within the company they proceeded to the next classification phase. In this step they determined the ‘use’ of the property. Each business classified all of their properties into three major categories; the business is ‘using’, the business will ‘use’, and the business will ‘not use’. Each of these classifications had additional detailed designations, i.e. license, abandon. The strategy phase in divided into two parts; (1) integrating the portfolio into the business strategy in order to fully leverage the properties for maximum value and; (2) identify the intellectual property gaps in the portfolio required to more effectively implement the business strategy. The valuation phase and the competitive assessment phase are necessary to accomplish with the strategy phase. Dow has developed a comprehensive intellectual (intangible) property valuation process for internal use in support of licensing, opportunity prioritization, and tax purposes. It is called the ‘Tech Factor Method’ and was developed in close association with A.D. Little consultants. In short, it combines a number of industry-acceptable methodologies in such a way as to allow an abbreviated, low cost, and self-facilitated estimation of the monetary value contribution from an intangible asset in terms of a percentage of the total net present value of the business enterprise in which it resides. This methodology has been documented and is available upon request (limited availability). Obviously, no strategy is complete unless it is done in the context of a competitive environment. Competitive technology assessment tools are readily available but the most valuable one to Dow in assessing patents is the ‘patent tree’. This tool has been used within the company for over 15 years. It is a valuable that allows one to visually organize one’s own patents along with any or all competitor patents and evaluate such things as dominance, breadth of coverage, blocking, and opportunity openings. It has the flexibility to be
organized in ways that can reveal the direction in which competitors are headed and which inventors are active in what areas. Most of this information is available publicly. The Dow patent tree tool makes it easy to assemble, visualize, analyze, and explain. We are presently expanding this tool to include all intellectual assets, including know-how. This tool is evolving into a 'knowledge tree'. With the intellectual assets integrated into the business strategic thinking, it allows them to be leveraged for maximum value and with the strategic gaps identified; the next investment phase can proceed. This is simply the procurement of technology that will contribute to attaining the business objectives stated in the strategy. This procurement leads us to understand the external resources and the body of work that is available outside of the company. This survey acts as the first step to understanding what we would have to overcome if we were to develop this technology in-house. After this survey is completed, it must be determined whether to joint venture, license, and purchase, do cooperative research with external sources, or develop the technology in-house. If we are successful in obtaining the needed technology and where appropriate securing a patent, the intellectual asset is incorporated into the portfolio and the process starts again.

3.3.3. Intellectual Asset Management Teams

There are over 75 multi-functional teams closely aligned with the businesses that are responsible for the management of the intellectual asset process and portfolio. These teams are composed of front-line managers from the various functions within the businesses. They meet about two to three times per year to review the portfolio and make recommendations to the business management regarding intellectual assets (initially this has only encompassed patents). The teams have operated in Dow for many years. Historically, they were little more than a forum for R&D and Patent people to set priorities for which patents to file first and where to file them. Today, they are helping to integrate intellectual asset issues into the business strategy and implementing processes that will optimize the costs and gain maximum leverage.
3.3.4. Intellectual Asset Managers

The Intellectual Asset Management Teams (IAMTs) have been led by Intellectual Asset Managers for the past four years. These managers report into both the Intellectual Asset Management (IAM) function and into business R&D management. As part of the function they have been the backbone for reengineering the many processes that were needed to make the IAM model work. For the past four years the focus of their job has been to identify best practices and reengineer or create the tools needed to do the IAM managers job. Today the focus of their job is to take these tools from within their businesses and through the IAMT’s to advocate for and implement the model and tools needed to make the vision of business ownership come true. It is realized by the company that this vision will take time to accomplish. To achieve the vision the culture of the company will have to change. And as I had indicated before, the sustainable changes take place through an evolutionary process. The intellectual asset managers will be the focal points for this to happen. They will accomplish this by working within each of their individual businesses and through the intellectual asset network that has been created – the Intellectual Asset Management Tech Center.

3.3.5. The Intellectual Asset Management Tech Center

This is the organizational structure that was designed to support the IAMT’s and the IAMs. It refers to a similar organizational structure found within the manufacturing community at Dow. Its primary function is to directly manage those activities best managed from a central point and support the management of those activities best managed from a decentralized point.

The Tech Center responsibilities include:
- maintaining the communications network (home page, staff meetings, workshops)
- sharing of best practices
- continuous improvement of processes
- database support
- administrative support
- leadership
- career development of IAMs
- training and training manual
- measurements
- IAMT support

The Intellectual Asset Managers through their Intellectual Asset Management Teams are responsible for the following (internally referred to as the IAMT minimum standards):

- develop and maintain an intellectual asset plan aligned with the business strategy
- review the intellectual asset portfolio at least once a year
- identify key intellectual assets
- classify intellectual assets by utilization
- manage portfolio costs
- where appropriate do a competitive technology and portfolio assessment
- create and staff intellectual asset management teams and facilitate IAMT meetings
- leadership and advocacy for the IAM vision and process implementation
- make recommendation for licensing, abandonment, donation, and utilization of IAs

The process and tools that need to be developed or reengineered were many. From the development of a competency in and methodology for valuing
intangible property to improving and simplifying the way we approve the release of technology for licensing. In all, over 60 processes, methods, and tools were developed or reengineered. I will review a few of the more interesting tools that they developed in addition to the valuation and patent tree tools I described previously. I must emphasize the importance of having capable, dedicated and focused people responsible for the completion of each of these goals. Having a person unfamiliar with the subject and only being able to work on IAM goals for 10 per cent or 15 per cent of their time would have seen this entire effort die a slow death. The window of opportunity to focus resources was there and open for a limited time, they knew it and planned our projects accordingly. They also planned the completion of projects so as to allow us to use new tools that would make an immediate positive impact. This helped them maintain support for those projects that had importance but could not be accelerated. One of these initial projects was the auditing and classification of all of Dow's patents. This effort enabled the company to reduce its patent tax maintenance costs by $40 million over the life of the portfolio (about ten years). This was the function's first contribution and gained widespread recognition acting as a springboard for the many other process changes that would follow.

Another project recently completed was the identification of key patents in all of Dow's businesses. This effort proved to be more valuable than they had first envisioned. Not only did the company develop a database of all its key patents, it caused, for the first time in many businesses, an awareness of what the patents' contribution to the overall business really were and were not. It proved to be a vehicle in many businesses for debate and ultimately consensus building between the businesses, manufacturing, patent, IAM, and the R&D function. The businesses now have a solid understanding of their patents and can incorporate this understanding into their business strategies. They where are seeing the results! One result was the company's new licensing income target for the year 2000 of $125 million. This was a significant increase from the $25 million that they received in 1994. This could only be achieved when the business
management understood what its intellectual property position was and has developed plans to leverage it. In the past, they did not pursue licensing because they were not confident in knowing what impact it might have on their existing business. The only things that were licensed were those technologies that they were clearly not going to pursue.

The resulting reduction in Dow's patent portfolio (over 30%) challenged them to try to find a way to salvage some value from those properties that we decided to drop. They abandoned many patents that probably should not have been patented in the first place. Some of these might be better classified as vanity patents. The traditional way for technical people to advance and get promoted was to get a lot of patents and publish many papers. The emphasis was as much on 'quantity' as 'quality'. This is changing quickly within Dow. Trying to out-license these properties proved to be unsuccessful. They did not justify the time and effort needed to market and support licensing opportunities. Utilizing brokers also proved to be unsuccessful. They did develop an alternative leveraging approach that so far has proven to be successful: 'donations'. Simply put, they have given technology to universities and non-profit institutions worth millions of dollars over the past few years. This has supported the overall corporate donation efforts and thus benefited the company. I might add this is not as simple as it sounds. There are many bureaucratic hurdles that must be cleared and liability concerns on both the donor and donee's parts. If done correctly, there could be resulting tax benefits for the companies that make the donation in the United States.

Patents are where they started but all of the tools and examples that where reviewed can be and will be used for trademarks, trade secrets, know-how, and copyrights. The company is presently building upon the success it has had in managing the patent portfolio and is now focusing on probably the largest and most valuable body of intellectual assets – 'know-how'.
3.3.6. Benchmarking

Benchmarking has been and continues to play an important role in helping the company to both guide its future direction and determine best practices. Benchmarking has proved to be very helpful in reengineering the processes that went into the intellectual asset management effort. It provided needed perspective and confirmation of the need. It allowed the company to develop targets that not only would allow it to be a leader in the chemical industry but also a leader in any industry. Dow has benchmarked with the leaders in many industry segments for both intellectual asset management and intellectual capital management (this includes knowledge management). We have found the companies in the computer hardware and software industries to be generally using processes and strategies that we feel are best practices. We have also found significant insights from companies in the insurance, banking, and consulting services. Within Dow, setting the competitive standard is an ongoing responsibility of each business and its functions. This leads me to the final discussion of 'what is next', and allows me to give a glimpse of what is around the corner in Dow's ongoing journey to becoming a 'knowledge value management company'.

3.3.7. Visualizing Intellectual Capital

Teaching the corporation what this term means and about its components and how understanding them and their relationships to each other could significantly and in a very powerful and positive way, tap into employees, customers, suppliers, competitors, and any sources of knowledge in a way never attained before, to maximize the leverage of existing knowledge and create new valuable knowledge and intellectual assets. Skandia has produced a document that does this. This document, with some encouragement from Leif Edvinsson, and a very powerful message that comes from the concept has encouraged a small group of
people to champion the effort at Dow. A prototype has been completed and three members of the company’s executive management have sponsored the development of a more thorough prototype that would be utilized to gain company-wide support. The objectives are:

- To enable all stakeholders to visualize and better understand the capabilities of the employees, the organization, and all the intellectual capital within Dow to achieve the corporate vision and objectives for the future.
- To start a dialogue within Dow on the subject of intellectual capital and how to improve the management and measurement of it.
- To use the process of developing and maintaining a document that addresses intellectual capital, human capital, its importance to the future of the company, and management’s understanding of it, to reconnect the corporation back to the employees.

3.4 For Apion The IC Perspective Provides a Holistic View of the Firm

A principal objective of the IC perspective is to create a framework that allows for describing all resources at the firms disposal and how they interact to create value. As shown in Figure 4, these resources include physical and financial resources as well as intellectual resources. Although the IC perspective grew out of the need for visualizing and understanding the intangible aspects of the organization, the objective is not to exclusively focus on these resources. Rather it aspires to provide a more balanced picture of the firm, taking into account the intangible value drivers as well as the traditional financial ones.
3.4.1. The IC Perspective Provides a Common Language around Intangibles, Facilitating the Understanding of Their Contribution to Value Creation Within and between Firms as well as to Shareholders and Other Stakeholders

The IC perspective is already becoming widely understood and applied, both in academia and within the business community. Although there are still many different definitions and versions of this perspective and what it consists of, a consensus has begun to take form regarding concepts, tools and frameworks.
3.4.2. The IC Perspective Focuses on Value not on Cost

The IC perspective takes the potential for value creation of a resource or a transformation as point of departure, regardless of its origin, thus complementing the accounting framework. While the latter provides an excellent basis for studying the costs relating to historic and future transactions, the former allows you to look at sources of value and their path to finally becoming realized in financial terms, regardless of the origin of those sources.

3.4.3. The IC Perspective is Practical rather than Conceptual

The IC perspective and its supporting concepts, tools and frameworks have been developed in an iterative process between the practitioner and academic communities, drawing heavily upon a practice oriented research approach. This has allowed the IC perspective to be highly practical and actionable from a managerial perspective as will be illustrated with the case about APiON.

3.4.4. APiONS IC Process

The IC perspective utilizes concepts, tools and frameworks to help organizations harness its IC. As it focuses solely on value, it provides managers with a complement to the accounting-based tools and techniques with their emphasis on cost. The IC process operationalizes the perspective, and is designed around the features outlined in the previous section in order to help the company create a holistic picture of how value is created within the firm.

3.4.4.1. Operationalize Value Creation

This first step entails defining who the stakeholders are and what value they want the organization to create for them. For a government department, for example, this can be a very complicated process as there is a large set of
stakeholders involved that all have different, and often conflicting, objectives and needs – most of them non-financial. Because the definition of what value to be created is where the rest of the process is focused upon, this is a crucial step for this type of organization. At the other extreme we find APiON, where the value dimensions of the stakeholders are very clear. The directive from the shareholders – the primary stakeholder – was to develop and implement a strategy that would allow APiON to maximize the value they would get from an IPO in 4-5 years time.

3.4.4.2. Outline Strategic Intent

The strategic intent represents the strategic position the firm aspires to, relative to the competitors. This is normally expressed in terms of perceived value by customers and delivered cost. The objective of this step is to ensure that the organization has a clear direction which to strive towards, one which is understood by all participants in the IC process. As the Navigator will define what is required by the organization to achieve the strategic intent, there has to be a coherent view of where the organization is going or the Navigator will be ambiguous and not provide any insights or direction for management (other than the fact that the strategy and how to achieve it is unclear).

3.4.4.3. Articulate Value Creation Path and Visualize Navigator

A value creation path, within the context of the IC Process, is the description of the management team’s understanding of how the organization creates value – what resources they use, how they are deployed (i.e., transformed into another resource), the relative importance of these resources and transformations, and how they are related to each other in the creation of value. The Navigator is the visual representation of the value creation path and includes all value creating
resources – human, organizational and relationship resources as well as the physical and monetary resources that are traditionally included in the balance sheet – thus providing a holistic picture of the organization’s value creation process.

Successful, experienced managers have an unarticulated, implicit model in their mind of how success is achieved in their business (Mason and Mitroff, 1991). This mental model directs their actions and decisions, particularly in a situation when there is not enough time to go through a rational analytical process – they act based on experience. However, different managers have different experiences, knowledge and competencies and consequently act according to different mental models. In addition – and especially when working in an emerging industry and with a rapidly growing company such as APION – there is rarely a common definition and understanding of the terminology relating to the intellectual resources and their components. The primary aim of the IC process is to uncover these implicit mental models and to arrive at a common model of how the firm ought to work to achieve the strategic intent (i.e. what resources to grow and how to deploy them).

3.4.5. Articulating the Value Creation Path and Visualizing the Navigator

During a series of workshops the management team worked through the implications of their strategic intent in terms of prioritizing their investments and business activities. Armed with a new language containing words such as ‘recourses’, ‘transformations’, ‘human capital’, and ‘structural capital’ they set about exploring what the optimal value creation path should look like for APION, given its strategic intent.

In particular, the senior management team worked on answering the following three questions:
1. What Resources do we Need to Create Value According to the Strategic Intent?

The first task is to identify all the necessary resource inputs to the value creation process. Thus in response to this question all resources – intellectual as well as physical and monetary – necessary to create shareholder value are identified, agreed upon and visualized in the form of a context specific distinction tree. Given the knowledge-based strategy of the company, the focus was on identifying the different components of IC – both existing and non-existing but necessary. Because of the intangible and thus inherently ambiguous nature of those resources this is not as obvious as it may seem. The APiON team spent much time addressing this question to ensure they all had the same understanding of value creating resources.

2. How Should We Best Deploy These Resources to Create Value According to the Strategic Intent?

In addressing this question, workshop sessions sought clarity in defining how the identified resources could most effectively be deployed. Or, using the language of the IC perspective, the participants defined the value creating transformations of the previously defined resources. This involved posing themselves questions like:

- In order to achieve the strategic intent, in what resources should we invest our money?
- How do we ensure that knowledge is created in an efficient manner?
- What is most effective in terms of value creation? For example, should the company use its engineers' knowledge to sell man-hours? Or use this knowledge and competence to develop new solutions? Or use engineers
to train new colleagues?

- What do these transformations mean in operational terms?

3. How Relatively Important are the Identified Resources and Transformations for Achieving the Strategic Intent?

Through assigning weights to the resources and transformations the team was forced to think in terms of trade-offs, to identify what resources and transformations are really important for achieving the strategic intent and how they relate to each other in the process of creating value for the shareholders.

It was relatively easy to accept that all suggested resources were good to have and that it would be helpful to deploy them in all sorts of ways. This question is, however, more challenging – prioritizing between the resources and transformations. If you cannot focus on everything, what resources should be let go? What resources are most crucial to the value creation process? At this stage the different points of view within the team became more apparent and the most valuable insights came out of these discussions.

This visualization process generates large amounts of information about hidden assets deemed important by the participants. To avoid a paralyzing information overload and be able to act upon the new insights, the trade-offs necessary for maximum shareholder value creation have to be determined to keep the strategic focus clear.

Articulating the value creation path is an iterative process where consensus within the group is achieved through discussion and argumentation. They finally agreed answers to these three questions are summarized and visualized in the APION Navigator (see figure 5)
3.4.6. Insights from the Process

One of the key benefits of going through the IC process for the company was the common language that developed around intellectual capital and the shared understanding of the key drivers of value and the value creation process within the management team. This allowed for more effective communication surrounding the strategy and its implementation, within the team as well as to the rest of the organization.

The discussions during the workshops also led to several ‘aha-experiences’ within the team. But there were two insights in particular that were so powerful that they came to modify the focus and implementation of the strategy.
The first was the crucial importance of structural capital. As Murphy noted ‘When [we began this IC process] we said that people are our most important resource. But as we went through the analyses process we saw something quite different that caused us to think quite differently about what to do in order to create shareholder value’.

The fundamental philosophy of building knowledge and competence as aggressively as possible did not change – it was still seen as the key to achieving the strategic intent. But rather than focusing on building the knowledge of the different individuals (human capital), the company changed the focus to putting mechanisms in place to extract the experience and tacit knowledge of the employees and turn it into structural capital. In this way they can leverage the knowledge of the individuals: people can learn form others’ experiences, they can pick up a project where somebody else has left it, and new employees can get up to speed more rapidly. It also reduces the risk of people leaving and taking their valuable knowledge with them.

The understanding of the role that structural capital could play in the APION value creation process also helped the company identify other structural capital value drivers they had not previously considered. For example, the APION brand, which had largely been ignored, but which the company now realized required focus.

The second influential insight for the team was the understanding of transformations between resources and the realization that they are the key to value creation.

It is not primarily the stocks of knowledge residing among the individuals in the organization that would achieve superior shareholder value growth for APION, but how they as an organization were able to transform that knowledge
into a process, a product, good reputation, a brand or something else that creates the value – a value that will directly or subsequently be translated into financial returns for the shareholders. This insight led them to shift the focus from the mere building of the resource base, i.e. knowledge surrounding networking infrastructure technologies, to a focus on the deployment of resources.

The ‘API ON Way’ represents the unique culture that existed at API ON, which the company continually fostered, that shaped the behaviors of people. This is akin to the notion of ‘Ba’ as defined by Nonaka et al. (2000) as it represented the shared context for knowledge creation and application that existed with the company. (see Figure 6)

![Diagram](image)

Figure 6 Harnessing the Intellectual Capital at API ON
3.5. Skandia’s Method

3.5.1. Hidden Values

A stock market analyst in Sweden observes that the stars on the stock exchange attract more with their knowledge than with their substance. By looking at the market value versus the book value, it is evident that a major proportion of growth companies, such as Intel, Microsoft, Netscape, are valued way beyond book value. Most of the companies going through mergers and acquisitions in the US during the period 1981 – 1993 were valued at between 2-9 times their book value.

This gap could be described as the intellectual capital. Another word for it is Tobin’s Q, i.e. the ratio of market value to book value.

This leads to another paradox. Today there is a well-defined and well-developed system for the measuring of the book value. However, for the gap there are only qualified analyses, i.e. a kind of ad hoc measurement. Another contribution from the SEC Symposium is that such a disclosure should perhaps be presented in some sort of supplement to the financial report in order to increase insight into a corporation’s work about prospective renewal and development work. The idea is not to distort the financial information, but rather to supplement it. The SEC Commissioner, Steven Wallman, even envisages that in the future such supplements could constitute the major part of any report about a corporation’s future earnings potential, and the financial aspect would represent the supplementary information. The Skandia approach could be seen as a benchmark.

A new balance is also emerging. On the asset side is the financial capital, on the debt side the non-financial capital, or intellectual capital. Therefore it is
possible to develop a tentative new balance sheet. The intellectual capital is a
debt item, which is regarded in the same way as equity. It is based on the
principle that IC is borrowed from stakeholders such as customers, employees
etc. The counterbalance, from an accounting viewpoint, is goodwill. The major
message is, however, that it constitutes hidden values. But another paradox is
that, form an accounting point of view, goodwill is a trash item. As an intangible
item, goodwill should be deducted as quickly as possible, thereby actually
reducing the value of the balance sheet. From a knowledge value viewpoint
however, it could be considered to reflect the intellectual value that grows over
time.

It follows that intellectual capital is:

- supplementary information to financial information;
- non-financial capital;
- a debt item, not an asset item.

This kind of thinking led Skandia management to recognize that there is a
need to bring these hidden values to the surface. This was especially evident in
the rapidly growing entrepreneurial unit: Skandia AFS. So an intellectual capital
function was formed there in 1991. The goal of the IC function is to grow and
develop intellectual capital as a visible, lasting value, complementary to the
traditional balance sheet. The IC function provides a link between other
development functions like Business Development, Human Resource
Development and Information Technology Development. The operations of
the IC function include initiating new measurement tools and ratios, implementing
innovative programs and projects for rapid learning and knowledge transparency
and nurturing profitable knowledge sharing.

3.5.2. A New Language

Given all these paradoxes and common sense concepts and reporting needs,
a new language was required to support the changed approach to reporting what was happening and what should be nurtured. In an article in Fortune, Tom Stewart put it like this: "Intellectual Capital is something that you cannot touch, but still makes you rich". This approach has now been developed into a Skandia value scheme. (see Figure 6)

![Skandia Value Theme Diagram]

Figure 6 The Skandia value theme

It has become evident that there are a number of building blocks adding to the non-financial value of a corporation, or the gap between book value and market value. The term intellectual capital has its origin in intellectual property; the packaged and legally protected knowledge components in a company.

This is of fundamental importance for global trade. The new world trade
organization, **WTO**, is organized into three bodies: trade in goods, trade in services and trade in intellectual properties. The foresight and complexity of the emerging global trade is very much highlighted around issues related to intellectual properties such as patents, software, copyrights, etc. Therefore the need for a language for value extraction and value creation becomes acute. The findings from Skandia suggest that such a language will have to be supported by numbers. To give an illustration: to report that a customer database is large is not very tangible. To say that the customer database is growing by about 40% over a 12-month period is tangible. Furthermore, numbers are to a large extent a global language that appeals also to financial analysis and shareholders.

3.5.3. A Balanced Annual Report

The concept behind this was the need to have financial as well as non-financial reporting. At the same time the balanced score card approach by **Kaplan & Norton** emerged.

The first balanced annual report was presented in 1994. However, this was an internal document and was not published outside Skandia AFS. During 1995, Skandia as a whole decided to share this information and applied a systematic approach to the whole of Skandia in an appropriate document. The first document was published in May 1995, under the heading – **Visualizing Intellectual Capital**. This was a supplement to the Skandia Annual Report 1994. As a supplement to the annual report it highlighted the fact that it was not integrated into the traditional balance sheet. Furthermore, it gave expression to the separate documentary approach, which was in progress.

This first public report was followed by a supplement to the 1995 Interim Report, 6 months later. The title of that publication was **Renewal and Development in Skandia**. During the Spring of 1996, the supplement to the 1995 Annual Report was published under the heading **Value Creating**
Processes. During the early Autumn 1996, the supplement to the 1996 Interim Report called *Power of Innovation* was published.

3.5.4. Navigation and the Skandia Navigator

The metaphor of navigation constitutes a search for another language of dynamic reporting beyond management. It aims to highlight the continuous process of adding to the long-term sustainability of the organization and nurturing the roots for sustainable value generation.

With the reporting format, mentioned earlier, of a one-page report of non-financial items emerged the Skandia Navigator (see Figure 8).

![Figure 8 The Skandia Navigator](image)

This very simple metaphor emerges out of the need for a new balance between financial and non-financial issues. It is also a balance between
information on past financial performance, information about today, including human resources and processes, and about tomorrow's renewal and development. It also takes into account the external operating environment. Summarizing all these dimensions into one reporting format leads to the Skandia Navigator. There are six different focus areas. The expanded leadership responsibility is immediately clear.

This model could also be viewed as a house. The financial focus is the roof. The customer focus and process focus are the walls. The human focus is the soul of the house. The renewal and development focus is the platform. With such a metaphor, renewal and development becomes the critical bottom line for sustainability.

The Skandia Navigator also had similarities with the balanced score card approach developed by Kaplan and Norton. However, the layout of the Skandia Navigator amplifies the renewal and development dynamics, as well as the operating environment. These different focus areas all add up to the intellectual capital value of the organization.

Within each such focus area it was possible to develop what Skandia calls indicators. The definition of these indicators is general rather than being defined as precise ratios. However, they are numerical. The indicators where developed from a strategic traditional approach. It starts with the business concept, core mission and ambition. These strategies lead to critical success factors. The critical success factors are translated into data, which are further developed into indicators. Such indicators can act as target indicators, as well as follow-up indicators. They are summarized into the Navigator.

This summary gives the balanced overview between financial and non-financial dimensions. Experience shows that there where restrictions on how many indicators can be handled. It would appear that an ideal number of
indicators are about 3-4 per focus area. For the time being, therefore, there where no plans to aggregate the data from individual units into a corporate Navigator. In Skandia, the present reporting development uses the Navigator more and more, both as a planning tool and as a follow-up tool. As their experience grows, it might be possible later on to consolidate some indicators on a corporate level.

One of the major aspirations underlying the Navigator was to develop an accounting language for the sustainability of the organization. This language was, furthermore, a global language as it is numerical. It also lead to a stronger leadership focus on the non-financial dimensions.

Recently, Skandia has also used the Navigator for individual performance appraisal, as well as rewards assessment. This makes it possible to have a balanced reward system emerging with a focus on financial as well as non-financial dimensions.

3.5.5. Future Accounting Methods

Given the information contained in the Navigator, the leadership would then have a broader perspective on the value potential of the organization. As Tom Johnson says, "Intellectual capital looks far beyond the more ineffable assets, such as the ability of a company to learn and adapt". The focus was on renewal and development as well as on its interaction with the operating environment and the internal environment. It was a kind of 'edge accounting', which might concentrate on value extraction, but perhaps more so on value creation. Therefore it could be said that human capital was no longer the major asset in comparison with structural capital. However, it was the most dynamic value. This led some Skandia executives to question the role of the controller. What will be the label on the business cards of the controllers of tomorrow? Some of the answers might be Value Finder, Navigator, Pathfinder, etc. Recently in Skandia
the controllers and the internal auditors are working together to search for source on innovation. This further highlights the need to feed the roots of the organization, which will ensure its future.

3.5.6. ICM – Intellectual Capital Management

From what was said above, it is evident that ICM is more than just knowledge management. *ICM was leveraging human capital and structural capital together.* It is multiplying the interaction between human capital and structural capital. Intellectual capital value emerges out of these connections and relationships as described in Figure 9.

![Diagram: Intellectual Capital Management](image)

*Figure 9 The Intellectual capital management*
The challenge was to manage the process of developing intellectual capital from the creation of values to gathering, capturing and knowledge sharing to leveraging and capitalizing of the values. The goal of knowledge management was to improve the company’s value creation capability through the more effective use of knowledge. The goal of intellectual capital was to improve the company’s value generating capabilities through identifying, capturing, leveraging and recycling intellectual capital. *This includes both value creation and value extraction.*

One of the critical components of this was the ‘organizational capital’. This can be defined as the use of structural competence and knowledge for recycling, leveraging and sustainability. The value-creating process should produce organizational capital, which adds value. The Navigator focuses on value creation, while organizational capital was more focused on value extraction.

IC management provides an organization with many benefits:

- a steeper learning curve;
- a shortened lead time to application;
- savings in costs and investments, or the recycling, of structural capital and organizational capital;
- higher value added because of improved interactions;
- new value creation through new connections and new combinations.
CHAPTER 4

Examples of Intellectual Capital Reports
Intellectual Capital
Report 2003

CMM Center for Molecular Medicine
4.1. How do you find the needle in a haystack?

To find a needle in a haystack one can spend endless time searching through the hay or burn the hay and pick out the needle from the ashes. But, what if one wants to find the location of the needle in the hay? This metaphor illustrates our endeavors at the Center for Molecular Medicine (CMM) at the Karolinska University Hospital in Stockholm, Sweden. Molecular Medicine represents a new approach to pathologic changes in a cell. Techniques are now available that allow identification of genetic disposition factors among the several million variants of the human genome, or the myriads of gene products produced from these genes. The trick is to find the, probably, very few factors that usually dispose for disease or, more rarely, are protective.

The mission of CMM is to increase bnderstanding in the common chronic diseases and to improve the possibilities for treatment. The close association with the Karolinska University Hospital, a major academic hospital in Sweden
offering specialized treatment in areas of research at CMM, sharpens the possibility to offer better methods for diagnosis and therapy.

The different research groups gain momentum through interaction in a network, where they share technologies and competencies — relational and structural capital. Besides the rational use of structural capital, daily encounters between the different groups and group members may create new openings. Historically, most major breakthroughs in medical research have occurred more by chance than by plan. A test result that is found to be useless for one study can have great impact in other areas. Thus, CMM is a forum where experimental and clinical research can meet and synergize.

CMM is now going through a monitoring and evaluation program, which will be described in this Intellectual Capital Report. Various quantitative and qualitative indicators measure the accomplishment for year 2003. We envision that the current set of indicators will be modified, expanded, and compared in the years to follow.

Hopefully, development trends will be revealed after just two or three years. All substantial and significant research has an international arena, scientific progress knowing no national barriers. Benchmarking partners to CMM will be sought in other European countries as implementing a benchmarking system to establish universal standards will permit comparison between similar institutions. CMM as a knowledge generator extends.
4.2. Swedish biomedical research has exceptional advantages Center for Molecular Medicine

Sweden is an attractive country to conduct medical research in. Not only does the Nobel Prize ceremony take place here, but Sweden is also world-leading in the number of Nobel Prizes per inhabitant. In addition, Sweden is the top performer on the Euro-creativity index, outperforming not only all of the other European countries, but the United States as well.

These and other circumstances facilitate excellent research in this country. For example, the accessibility of the public medical service for everyone on equal terms aids the identification and follows up of new patients. The Swedish patient registers are therefore probably the most detailed and comprehensive in the world. This unique data material enables discoveries that might not be found in other countries.

Furthermore, a very high proportion of clinicians are trained in research in Sweden; every third clinician holds a PhD degree. This fact facilitates clinical research and the transfer of knowledge from the bedside to the lab bench, and back. Another advantage are the cost levels. For example, in the US the expenses to conduct research are three to four times higher than in Sweden. Altogether, these factors benefit CMM in the work to understand and find the molecular factors behind the common chronic diseases.

4.3. Biomedical research improves the public health and welfare

The total societal costs for illness in Sweden are estimated at least 400 billion SEK, putting an enormous burden on the state budget. Many of the common chronic diseases studied at CMM are among the most costly diseases. Therefore, the importance of research on the common chronic diseases
stretches beyond the doctors and patients, and reaches into the economy and welfare system at large.

4.4. Aiming for the next milestone

This time in history is important in biomedical research. The recent discoveries in genetics – above all the mapping of the entire human genome – facilitate further research on the molecular mechanisms behind the common chronic diseases. Today, many therapies affect diseases in ways that are partly or completely unknown and with numerous unwanted side effects. Research in molecular medicine can discover the exact knowledge of the disease mechanisms. Thereby a second generation of therapies could be developed – therapies that target the diseases much more accurately than today.

4.5. Their vision

CMM is founded on the vision that researchers in different medical research fields can benefit from each other in an interdisciplinary environment. Another central theme of this vision is that an important dimension is added to medical research when research is conducted in close collaboration with the clinics and their patients.

Following this vision, CMM integrates four of the departments at Karolinska Institute: Department of molecular medicine, Department of medicine, Department of clinical neuroscience, and Department of woman and child health. Another nearby resource is the Karolinska University Hospital, on which campus CMM is located. This structure is unique in Sweden and paves the way for knowledge exchange and synergy effects, guaranteed through the interaction and networking among the clinicians and researchers studying common chronic diseases.
CMM
For research on the common chronic diseases

A common building; a natural arena for networking
By creating a multidisciplinary arena, CMM helps building a network of approximately 300 scientists for free flow of ideas and information across clinical disciplines.

A common concept: patients, clinics and laboratories
At CMM, well-trained skills merges – clinical expertise from the Karolinska University Hospital combined with research skills at the Karolinska Institute – to study a clinically well-characterized patient material.

A common technology platform
To enable front line research, CMM provides core facilities with state-of-the-art technology for molecular and cellular biology research.

The common chronic diseases pose a major problem, for the individual as well as society. By definition, these diseases are also problematic for the researcher. Apart from many other diseases, these are complex due to their multi-factorial genesis stemming from both environmental and hereditary causes. But they also have common denominators. Therefore, to speed up research progress, CMM forms a common intellectual and technical platform, allowing a free flow of ideas and information across clinical disciplines. The platform rests on three pillars: a common concept, common technologies, and a common building. The common concept is the access to patients, clinics, and laboratories. The extensive patient material in biobanks and the potential of clinical trials are outstanding from an international research point of view. Secondly, regardless of disease orientation, molecular and cellular biology research uses the same technology, saving valuable funds while focusing the investments on state-of-the-art equipment. Finally, housing various clinical research disciplines under the same roof, CMM creates a natural
arena for networking and exchange of knowledge. Altogether, these factors unite our efforts in seeking to improve the treatments for the common chronic diseases.

4.6. Their organization

Director Lars Terenius, who is Professor of Neuroscience at Karolinska Institutet with expertise in mental disorders, including alcohol and drug addiction, heads the center. Apart from his duties at CMM, he, like some other CMM research leaders, is a member of the Nobel Committee and the Nobel Assembly for the Nobel Prize in physiology or medicine.

The CMM building is owned by a Foundation whose Steering Board is utmost responsible for the activities. The mission of the Steering Board is to guide and support the development and implementation of high quality education and research in the field of molecular medicine.

To continuously evaluate the quality of the scientific work at CMM, a Scientific Advisory Board (SAB) has been appointed to scrutinize the research activities every third year. The next SAB meeting will take place in 2004.

Our activities build on the expertise we have in four core profile areas: Genetic diseases, Cardiovascular diseases, Immunology and inflammation, and Diseases of the central nervous system.

Across the disciplines, there are auxiliary facilities, such as the bioinformatics group, the IT group, and core facilities, including advanced biotechnological equipment or resources. There are also funds allocated to support selected cross-functional projects and the patenting of intellectual property derived from research.
4.7. Impact of the research

We have here selected three examples of research projects to give an insight into the current work on common chronic diseases.

4.8. Natural inhibitor of atherosclerosis

Atherosclerosis causes more deaths than any other disease in the Western world, since it leads to myocardial infarction and stroke. In Sweden the disease is responsible for approximately 50% of all deaths. Research on atherosclerosis during the past decades has focused on fatty deposits on the arterial walls as a result of high levels of the bad cholesterol, LDL. However, cholesterol levels do not tell the whole story as increasing evidence suggests that atherosclerosis is also an inflammatory disease. Göran Hansson is Professor and team leader of the Cardiovascular unit at CMM. His research group is among the leading groups in the world in their field. As early as the 1980’s, the group discovered that the T-cells of the immune system play an important role in the development of atherosclerosis. T-cells are one type of white blood cells that activate and regulate the complex mechanisms of the immune system. A large number of signal molecules in turn control the T-cells in order to prevent the system from running amuck. Göran Hansson’s group has now defined a molecule, TGF-β, which acts as a natural inhibitor of atherosclerosis. TGF-β is one of the signal molecules that control the T cells. The research group demonstrated that without this signal molecule, atherosclerosis is five times more pronounced and there is a dramatic increase in inflammation in the arteries (Fig 3). Now, the identification of this inhibitor molecule may pave the way for new therapies.
Fig 3. The aorta is the large artery that carries blood from the heart to the different parts of the body. The formation in the middle is the cardiac valves which regulate the passage of blood from the heart through the aorta. If the cholesterol level is high, small fat deposits (red) develop in the aorta (left). If the immune system is hyper aggressive due to inadequate control of its T-cells, there is a five-fold increase in atherosclerosis, leading to an increased risk of heart attacks and stroke (right).

4.9. New candidate gene behind eating disorders

The Central Nervous System, CNS, consists of the brain and the spinal cord and is perhaps the most complex system in the body, controlling most body
processes. CMM conducts research in a variety of CNS diseases, including eating disorders, obesity, depression, alcoholism, and drug abuse. Part of the Neurogenetics research team at CMM, led by Professor Martin Schalling, is looking for the genes behind anorexia and strive towards understanding the mechanisms that regulate eating behaviour. The center of the brain that regulates most vital physiological functions, including food and water intake, body temperature, blood pressure and respiration is called the hypothalamus. Several studies have implied that this region is involved in the development of eating disorders. After massive efforts of DNA analyses, the research group has identified the candidate gene anx as possibly involved in the hypothalamic regulation of food intake. The group has also showed that a number of appetite-controlling proteins are expressed differently in the hypothalamus without a functional anx gene, suggesting that the gene plays a central role in the regulation of food intake. For example, in anorectic mice lacking a normal anx gene, there was a normal production but a disrupted transport of the appetite-stimulating signal molecule called neuropeptide Y (fig 4). Thus, neuropeptide Y could not reach important target areas in the hypothalamus to stimulate feeding. This finding raises the possibility that the signalling systems in the brain and the newly discovered candidate gene anx represent interesting targets for the development of new eating disorder treatments.
**Fig 4.** Differences in the brain region controlling appetite, i.e. the hypothalamus, have been found comparing normal mice (left) with anorectic mice (right). In normal mice the appetite-stimulating signal molecule called neuropeptide Y (dyed light green) is produced in one area of the hypothalamus and transported to various target areas of the hypothalamus where it stimulates food intake. In anorectic mice however, neuropeptide Y is produced normally but remains in the cells (here at the bottom of the picture). Hence, the transport of neuropeptide Y and the appetite stimulating signal have been disrupted.
Fig 5. The picture shows parathyroid tumor cells (pink) that have spread and are now growing in the lung, successively reducing the space where oxygen is normally absorbed (left).

4.10 A new gene identified behind the second most common endocrine disease

The transfer of cancer features from a tumor cell to all its daughter cells shows that cancer is a genetic disease that can be explained and tackled on the genetic level. For the benefit of patients with cancer, research has started to provide
improved diagnostic and prognostic tools, as well as aided in the design of new treatment strategies. The main goal for the medical genetics unit led by Catharina Larsson is to explain the genetic mechanisms underlying tumor development in hormone producing glands. The most common hormonal disturbance after diabetes is primary hyperparathyroidism. In most cases, the disease is caused by a tumor in the parathyroid glands, which are located in the neck. The tumor forces the glands to overproduce hormones, leading to increased calcium levels in the body. This in turn causes symptoms such as kidney stones, osteoporosis, and cardiovascular disease.

Parathyroid tumors are difficult to diagnose. Without a sufficient diagnostic tool, a malignant tumor, i.e. cancer, can be mistaken for a benign, easily cured tumor. In unfortunate cases, the true diagnosis is established only when the cancer has spread and formed metastases in other parts of the body. Larsson’s group is now investigating better diagnostic procedures. Just recently, Larsson’s research group and collaborators found that inherited mutations, which turn off a gene called HRPT2 confers a very high risk for cancer in the parathyroids. More importantly, an inactivated HRPT2 gene was found to be associated with the most malignant forms of the disease, which can spread the cancer in the body through metastases, thereby significantly reducing the possibilities to save the patient’s life (Fig 5). These results may give rise to future genetic testing to identify patients at risk for tumor development in an early stage, before symptoms are seen. Thus, chances to cure the patients can be greatly improved.


Historically an organization was valued by its tangible assets, such as buildings, equipment and machinery. In our case that would imply that only the brick
building, laboratories and computers would be valued, giving a distorted picture of the true value of the center.

Our main value is generated by the human capital, which is seldom reflected in the financial statements. The aim of this Intellectual Capital Report is to explain how the different research groups together contribute to the progress in exploring the common chronic diseases.

The instrument of Intellectual Capital Reporting was invented by Swedish economists, among others the CMM board member Leif Edvinsson, and has since spread worldwide. CMM aims to use Intellectual Capital Reporting to benchmark against similar distinguished international institutions to evaluate and improve its performance. This will also help increase the visibility of Swedish research abroad and help attract talent to Sweden. Furthermore, the annual analysis and report will help control the knowledge-based value-creation process and help increase transparency for the public.

4.12. The CMM Intellectual Capital Report model

The 2003 Intellectual Capital Report is based on a process model that describes the increase in knowledge over time as a cycle within the organization. The model symbolizes the research process as a funnel, where much information is inserted in the form of human, structural, and relational capital, filtered and eventually transformed into new diagnostics and therapies. The knowledge goals of CMM are derived from science and society, and communicated by interest groups. The key processes describe the work of CMM. The results thereof are shown in three categories; output, outcome and impact, which in turn have different time horizons. In the short term, new results are published, eventually leading to mid-term results such as patents, spin-off companies, new diagnostics or treatments. The long-term results are the socio-economic effects on the Swedish welfare system, society and economy, e.g.
improvements in public health during a ten year period.

4.13. Their knowledge goals

They have defined three overall strategic knowledge goals: networking to improve research, coaching for success, and improving quality of life. The knowledge goals shape the strategic framework for CMM and define the direction of development for the center in the coming three to five years. They strive towards improving public health, directly or indirectly, through spreading information about their research results for the utmost benefit for the patients and the society on the whole.

World-class medical research affects, unlike many other scientific activities, everyday life of people. Consequently, they feel utmost obligated to spread information about our results to doctors and the research community as well as to patients, investors, politicians and the interested public. In making scientific excellence available we contribute to the welfare of the Swedish people. The impact of our research on the patients and society is consequently strongly related to our ability to build bridges between research and people. Therefore professional communication with their stakeholders on all levels is of major importance for their success and them.
4.14. Networking to improve research

They intend to enhance and cultivate their research through academic networks to secure high-quality research. The appropriate positioning of CMM, in both a national and international medical research landscape, is to be in the front line of research on the common chronic diseases. We will mould clinical and experimental research together to obtain the optimal medical research effectiveness. We want to support the establishment of worksharing teams and networks within CMM, Karolinska Institutet and the Karolinska University Hospital, as well as with other universities, research institutes and the industry. Cross-functional programs in consortiums as well as in specific research areas enable exchange of ideas and collaborations. These networks will promote new and unexpected approaches to the common denominators of diseases as diverse as multiple sclerosis, rheumatoid arthritis and atherosclerosis.

4.15. Coaching for success

Their aim was to recruit and retain outstanding young researchers and support their development. Their knowledge and skills was their major asset and was crucial for the future success of their institution. It is only with the best researchers that we are able to find answers to complex questions and to give a solid basis for the prevention, diagnostics and treatment of common chronic diseases that currently can only be treated symptomatically. Their management therefore envisions an important strategic goal in the training of the junior scientific staff and active recruitment of junior investigators. They have developed measures to support and guarantee good practices in the recruitment of research leaders and strive towards developing similar measures to recruit at all levels. For the promotion of a stimulating environment and flow of knowledge the concept of "inner meeting places" was being put into practice. Furthermore, key persons within CMM are identified and actively supported.
4.16. Their capital

4.16.1. Human capital

The common chronic diseases pose a complex problem that needs to be tackled by outstanding research. To this end, CMM has gathered researchers in the very front line of their research areas. An indication of the research quality is the average impact factor of journals accepting articles by the researchers. As a comparison, the articles by the CMM researchers were accepted by journals with an average impact factor of 4.4 compared with 3.6 for all researchers at Karolinska Institute. In total there are 313 staff members of whom 22 are professors, 67 assistant or associate professors, 63 post doctoral employees and 128 doctoral students.

4.16.2. Relational capital

Not only the individual work makes a difference in research; the exchange of knowledge in networks is also a very important asset, secured through the strong connection between Karolinska Institute, the Karolinska University Hospital as well as international relations. Within CMM, the average CMM group collaborates with three other CMM groups. Outside CMM, collaborating groups can be found at Karolinska Institute (73), the Karolinska University Hospital (109), in Sweden (93), or abroad (174). Furthermore, the bond between research and clinical applications is strengthened by the clinical work with patients that 74 of the scientists at CMM conduct.

4.16.3. Structural capital

The average research group affiliates with four of the following scientific fields: clinical medicine, molecular biology and genetics, biochemistry, biophysics, immunology, microbiology, pharmacology, neuroscience, and psychology/psychiatry. Thus, a multidisciplinary mix characterizes the structural
capital of CMM. There is also a clear technological focus; the average research group invested 553 000 SEK on heavy technological equipment in 2003.

4.17. Their key processes

4.17.1. Research

The exploration of the common chronic diseases is based on basic, disease-oriented, and patient-oriented research. Molecular mechanisms are explored through basic research, which aims to lay the foundation for disease-oriented or patient-oriented research. Disease-oriented research is targeted towards the understanding of the pathogenesis or treatment of a disease. Now, the proximity to the Karolinska University Hospital comes to its advantage as patient samples of diseased tissues are easily collected for research. As new knowledge is gained, patient-oriented research commences. Physicians who observe and analyze individual patients evaluate the new therapies or diagnostic procedures. At CMM, all research approaches are used, although the emphasis is on disease-oriented research.

4.18. Knowledge transfer

The knowledge transfer from CMM is three-fold. Firstly, the researcher spends on average 16% of their working time in a clinic, facilitating knowledge transfer from the research lab to the patient. Secondly, there are also frequent contacts with the public. On average, each group leader participated in one public debate, one information meeting with patients and/or patient organizations, and were interviewed three times by a journalist. Finally, transfer of knowledge also flows
from CMM to the industry. Thirty-eight of the former doctoral students were employed by a company in 2003.

4.19. Their results

4.19.1. Output

The short-term result was that 28 of the doctoral students defended their dissertations and received their PhD-degree during 2003. Furthermore, a total of 228 articles were published, or on average, 11 articles per research group. For their achievements, the researchers received a total of 13 prizes and awards.

4.19.2. Outcome

As mid-term results, CMM researchers started 31 different medical treatments or diagnostic programs, and created two spin-off companies during the year (see table CMM treatments under development 2003). Collectively the research leaders owned 23 patents in 2003.
4.19.3. Impact

Measuring how CMM research has an impact on the socio-economy of Sweden is, needless to say, unfeasible for a report spanning only one calendar year. However, considering the short- and mid-term results in 2003, it is plausible to project that, in the long run, research on the common chronic diseases will improve both the welfare system as well as the public health.

4.20. CMM treatments under development 2003

1. Ten different treatments were commenced during 2003 for evaluation of their effect on leukemia.
2. Another ten clinical trials are investigating the result of new treatments on rheumatoid arthritis.
3. Two new treatments for patients with multiple sclerosis are under investigation.
4. A multicentric European study including CMM (IMPROVE) examines the usefulness of repeated ultrasound investigations of the carotid arteries for identifying individuals at risk for cardiovascular diseases.
5. Mutation screening of the gene HRPT2 is being initiated in several clinical centers to enable an early detection or prevention of tumors in the parathyroid.
6. Collaboration with a Danish biotech company was started to develop future medical treatment against a severe form of brain tumor, glioblastoma.
7. A web-based genetic and clinical risk profiling tool is being developed to enable early detection of complication risks and treatment choice for patients with end stage renal disease.
4.21. Their outlook for the future

To strengthen the human, structural, and relational capital, CMM will strategically focus on three key areas in the near future:

• Recruitment of Senior Research Fellows. CMM aims to vitalize the human capital by recruiting internationally competitive senior researchers to set up new groups at CMM.

• Strengthen the core facilities. The structural capital will be updated continually to provide competitive experimental conditions for new discoveries.

• Support cross-disciplinary projects.

At the end of 2003, contracts were signed with collaborating teams to allocate funding to three cross-disciplinary projects. CMM aims to increase the financial support to fuel cross-disciplinary progress.

In order to achieve these goals, CMM will continue to strive at increasing its external, independent financing. This Intellectual Capital Report is one means to do so.
**Major grant donors (mSEK)**

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123
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References


