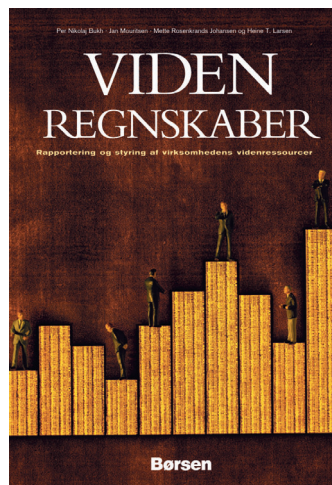


Intellectual Capital Reporting and Knowledge Management in Systematic

Case from the book



Videnregnskaber

Rapportering og styring af
virksomhedens videnressourcer

PER NIKOLAJ BUKH

JAN MOURITSEN

METTE ROSENKRANDS JOHANSEN

HEINE THORSGAARD LARSEN

UDGIVET AF BØRSENS FORLAG

Børsen

Intellectual Capital Reporting and Knowledge Management in Systematic

So far this book has dealt with the development of a company's knowledge strategy, knowledge management and external reporting. However, since intellectual capital reports are a new phenomenon – both as a document and as a management tool – it is also interesting to look at how the reader interprets an intellectual capital report? What is told in the intellectual capital report? What is taking place in this particular company?

The answers to these questions are not simple since no practice of reading and analysing this type of reporting exists. Neither have any standardised methods of calculating and interpreting the results been developed in the same way as annual accounts on the basis of numerical data may be read and interpreted. Nor are there historically anchored institutions, such as accountants, financial analysts and investors, who are experts in reading intellectual capital reports and who can place them in certain contexts.

In this chapter a more detailed example is given of how one can read and interpret an intellectual capital report by means of the knowledge statement, management challenges and the analysis model for the key figures of the intellectual capital report. The Danish company Systematic Software Engineering A/S (Systematic) and its intellectual capital report is used as an example since this company's intellectual capital report covers a wide field both within the types covered by numerical data and the textual presentation. When reading an intellectual capital report, it is insufficient to merely look at the figures; they are not part of a logical context based on the principle of double entry bookkee-

ping and they may not be inferred or counted by mathematical formulas. On the contrary, they are part of a complex context capable of drawing a picture of the company's knowledge statement and management challenges and thus the company's knowledge management strategy. The analysis carried out by a company during the formulation of a knowledge strategy and prior to external publishing can in this way also be used for the reading of an intellectual capital report.

Systematic's intellectual capital report draws a picture of the activities initiated in the company with a view to developing knowledge resources and competences and the role of the figures is to be indicators of whether the initiated activities have been mobilised and whether the desired effects have been achieved. Stated differently, the figures report on the company's set of specific management challenges relating to the knowledge statement. With a view to giving the reader a basis for understanding the analysis and reading the intellectual capital report, a description of the company is given first along with some of the thoughts aired prior to the final publications. Then the form of the intellectual capital statement is described with a special view to Systematic's company model as illustrated in its intellectual capital reports.

Subsequently, an analysis is included for two purposes: Firstly, it illustrates how, by means of the conceptual framework in this book, Systematic's intellectual capital report can be interpreted and analysed. Secondly, at the same time, it is a practical illustration of how the conceptual framework of the analysis is used prior to external publication.

Systematic Software Engineering

Systematic Software Engineering (Systematic) is a Danish software and system house developing and selling technical integration and application solutions, products and support for the Danish armed forces as well as for industry, transport and service companies. The Systematic Group has approx. 200 employees of which approx. 170 are placed in the headquarters in Aarhus and in the office in Copenhagen. In the year 1999/-2000 Systematic's group turnover amounted to Dkr 102,6m and a profit after tax of Dkr 6,481m. Furthermore, the company has established subsidiaries in the UK and the USA handling sales, marketing and support outside Scandinavia and Germany. The company is privately owned and is thus managed on a day-to-day basis by its owners, as the managing director and the vice-director are the shareholders.

The core area is the development of systems handling interoperability (i.e. a structured and unambiguous information interchange

among military units) and command and control systems for the armed forces. Moreover, data, information and communication systems are a common denominator for the main part of Systematic's solutions for the armed forces as well as for the civilian sector.

The company's vision is to be internationally known as a reliable software supplier and system integrator within the core areas and to make customers experience the cooperation with Systematic as positive and constructive.

Systematic sees it as its main task to create enhanced earnings and value-to-the-user through a supply of future-oriented and reliable IT solutions. The company is being run on the basis of the following standard of values:

1. The customer as our partner
2. Respect for the customer
3. Quality over quantity
4. Freedom with responsibility
5. Flat organisation
6. Constant changes
7. Active knowledge sharing
8. Modest level of costs

Systematic has a tradition of being a house with a very open communication to the external environment. This appears e.g. from Systematic's homepage (www.systematic.dk) where the company publishes a large number of White Papers and newsletters about its activities, projects and products.

History

Systematic was established in 1985 with its first contract being a support and maintenance job for the Danish Navy, but it soon won other military contracts, and by the end of the 1980s, Systematic developed its main product IRIS which is a mail system for structured text used in more than 25 countries world-wide, e.g. the British, German, Italian, Australian and Norwegian armed forces as well as the US Air Force. IRIS licences are now sold and supported by the subsidiaries in the UK and the USA whereas the development of IRIS is taking place in the headquarters in Aarhus.

In the beginning of the 1990s, Systematic also had customers from the civilian market and current jobs are e.g. the development of a system for the Danish police in connection with the Schengen agree-

ment, an integration system for the Danish Financial Supervisory Authority as well as an EDI-system for Danish mortgage banks.

In the future, Systematic also wants to increase the number of customers in the civilian sector, e.g. with solutions within EDI, electronic security and system integration.

Furthermore, in recent years the health sector has increasingly been brought into focus and Systematic is currently developing an integration system for the Danish county of Aarhus, for the handling of Electronic Patient Journals (EPJ). Systematic is, moreover, going to handle the development of two user modules for the EPJ-system in Aarhus.

In 1996 the company reached 100 employees and in 1997 Systematic was for the first time nominated as "gazelle" company by the Danish business trade newspaper, *Børsen*, as well as Dun & Bradstreet (D&B rating: AAA). Finally, in the autumn of 2000, Systematic was awarded the price for "Best Intellectual Capital Report".

Organisation

Systematic is a project house meaning that all activities – external as well as internal – are organised as one project and in this way are managed and carried through according to traditional project management tools as well as project management tools developed by the company itself. 2/3 of customer-related tasks are project tasks where typically 3-5 employees are assigned to the project for a minimum of six months. Moreover, the projects are often part of a large consortium cooperating on the supply of a large integrated system.

The last third of the company's customer activities comprises Systematic's own product development and licence sale that beyond IRIS products also comprises EDItrade, Web-Publisher, Hekate, IMT and EWare.

Organisationally, Systematic is divided into three main departments, *Defence*, *Products* and *Industrial Systems* where the different projects are placed. However, the notion of department is not more stringent than the fact that all employees are considered a common pool of knowledge resources for the whole company to be allocated to the necessary projects and activities. Consequently, since the beginning of 2001, the organisation has been changed and the notion of department has been abandoned so that projects are brought more into focus and project managers receive more responsibility. Furthermore, so-called 'Knowledge Networks' have been established where the employees establish knowledge networks on various technical and process-related topics.

Process Improvement

The company focuses on quality in the developed systems as well as in the processes controlling the work. The quality of the products depends on e.g. project management and development processes. During the last four years Systematic has worked intensely according to an American process model called the Capability Maturity Model (CMM). This model was developed for IT-companies and is based on self-assessment. It makes demands on the structuring and documentation of processes e.g. processes in connection with project management, configuration, requirements and reviewing in connection with software development as well as processes in connection with competence development, allocation of resources and personnel. CMM operates with five levels where each level indicates the company's maturity, i.e. the ability to repeat its development projects successfully (defined with regard to time, budget and quality) independently of the involved persons.

In relation to CMM, Systematic's objective is to be certified at level three at an external audit during the year 2001, indicating "the defined level" or "the organisational level"¹. This would place Systematic among the top 10 percent of software companies in the world. At level three, the projects are independent of individual persons, so-called 'heroes', as knowledge and procedures are stored in the organisation qua documentation and structuring of processes.

To reduce the dependency on individual persons – and thus the vulnerability of projects – demands are made on standardisation and documentation of processes for software development and maintenance and that processes are part of a consistent structure for software development and management processes. The standard processes are based on 'best practice' from previous projects that have been generalised to be applicable in the whole organisation. Level three thus makes demands on the collection of experiences from projects as well as the sharing of knowledge across the whole house. On the basis of the standardised processes, it is possible for a new project group to adapt the processes to its own project according to its needs. Innovation and learning from previous experiences are in this way united through standardisation and structuring.

Furthermore, by working according to the CMM model, Systematic implements a method aiming at discovering errors as early as possible in the process meaning that the company can fulfil the objective of delivering the system on time, within budget and at the agreed quality.

Beyond the work with the maturity model, Systematic also works according to other quality models and has recently, as one of the first

companies in Denmark, been ISO9001:2000-certified and has also been approved according to corresponding standards for defence suppliers (AQAP).

Knowledge Management and the Intellectual Capital Report

Systematic sees itself as a knowledge-based company or 'The IT-Knowledge Company'. It is the intangible assets by way of the employees' knowledge, customer loyalty, effective processes, product rights etc. that are considered crucial to the company's future competitiveness and development. Systematic does not consider tangible assets crucial to the development of the company.

In its first intellectual capital report (p. 3) it is stated that:

The foundation of the company is based, first and foremost, on the knowledge and competency of our employees (human capital), but also the knowledge and experience of customers, processes and technologies (structural capital).

The development of the intellectual capital report is considered a natural part of the company's work with knowledge management and already in the beginning of 1997 Systematic took the first initiatives to develop an intellectual capital report. For example in a brochure/annual report from Systematic, the company's vision and intellectual capital are included in the sections describing Systematic together with an extract from the annual accounts. This reflects that Systematic does not consider financial results alone to be capable of drawing a complete picture of the company.

Systematic's management sees the intellectual capital report as an alternative to the traditional annual accounts. This is stressed symbolically at the end of the intellectual capital report, where the reader will find a two-page version of the annual accounts. In this way, the financial statement is presented as a supplement to the intellectual capital statement. Furthermore, compared with the financial statement, the intellectual capital statement is a colourful, expressive and creative form of communication.

As a management concept in the internal knowledge management, the purpose of the intellectual capital report is to:

.... make the company's knowledge resources visible and to shed light on the management's efforts to develop these resources. (VIR)

In this way Systematic wants to give the company's stakeholders a better background for assessing the company's prospects, and the intellectual capital report is clearly not about assessing knowledge resources in monetary terms, but more about its management's efforts to develop the company's softer values. The project on the development of an intellectual capital report was thus in the beginning meant for internal use supporting knowledge management in Systematic. The external document was to be prepared, but was not considered the main purpose of the project and was therefore less important.

However, the process of developing the first intellectual capital report meant that Systematic's motive for preparing the intellectual capital report became more externally directed as the company to a higher degree considered the intellectual capital report as a tool for presenting the company to customers, employees, cooperators and other stakeholders. The company began to target the external document so that informing about the company was no longer the only purpose. It also had the purpose of strengthening the relations with existing employees and customers and, at the same time, addressing potential employees and customers. In the external document more attention was drawn to communicating the company's strategic challenges.

After the publication of the first intellectual capital report in May 1999, Systematic's management began to use the intellectual capital report very actively in connection with presentations of the company. It was often used in connection with meetings with customers and partners, applications for prequalification, in quotations and, finally, in connection with interviews. The management was positively surprised at the ability of the intellectual capital report to present the company in a serious and professional way. Systematic has also experienced a great external interest in the intellectual capital report. An enormous increase in the number of requisitions of the intellectual capital report compared to the previous annual accounts has been seen and Systematic has become a well-known company in research environments, the press and the local authorities such as municipalities and counties. The company thus experienced the creation of new contacts to potential employees, organisations and companies with whom Systematic had not previously had any contact. From the many new inquiries, especially after the publication of the second intellectual capital report, the conclusion may be drawn that a great interest in competence development in the private as well as in the public sector exists.

Systematic thus experienced that the external intellectual capital report all of a sudden was an important part of the company's internal

knowledge management activities. Even though internal activities are still important, the company realised that the external document reported about the development in the implementation of these activities and therefore offered an insight into the company's practices for development of internal resources. This insight was considered important from internal and external stakeholders' point of view as it contributed with a further understanding of the company and thus offered a basis for the stakeholders' decisions about their desired relation to the company.

Therefore, with the second intellectual capital report, the external motive became even more prominent after Systematic experienced what effect the publication of the intellectual capital report had. Systematic's management points out that, when the intellectual capital report has these effects, it is not just simple communication, but a tool for developing the company's current base of knowledge resources and thus a contribution to the company's future.

The connection between and the integration of the company's intellectual capital report and knowledge management is a separate point in both of Systematic's intellectual capital reports.

Especially '*Knowledge management*' is included as a separate theme in the second intellectual capital report. For Systematic, it has become increasingly difficult to distinguish between what constitutes knowledge management and what is a measurement of knowledge and it can thus be concluded that these two phenomena are deeply integrated.

The contents of Systematic's Intellectual Capital Reports

Systematic has never found it necessary to publish annual accounts beyond the compulsory ones to be submitted to the Danish Commerce and Companies Agency. This is due to the fact that the company has a closed ownership and the number of customers is fairly limited. The two published intellectual capital reports represent 16 and 20 pages for 1999 and 2000, respectively, and these are the two years for which Systematic has prepared intellectual capital reports in connection with the Danish Commerce and Companies Agency's project. In the future, Systematic expects to publish an intellectual capital report every other year as a separate work containing e.g. a description of the company and an extract from the annual report with the related annual accounts. Systematic publishes its intellectual capital report in both Danish and English and both are available on the Internet address www.systematic.dk.

The Model in the Intellectual Capital Reports

Systematic's first intellectual capital report is structured in such a way that the first 5-7 pages consist of a presentation and description of the company, whereas the last couple of pages consist of extracts from the annual report. The text as well as the indicators of the intellectual capital report are structured according to the company model shown in figure 9.1. Systematic's model is inspired by the Business Excellence model, but the company does not use this as an actual management tool.

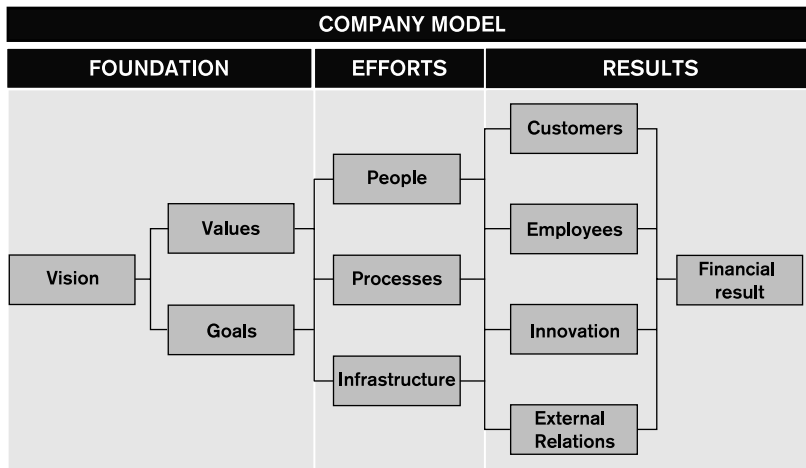


Figure 9.1 Systematic's company model

Systematic's Work with the Model

Systematic's model illustrates a more causal approach to knowledge resources and competences as it illustrates that results are created on the basis of input and transformations. In this model the final result is the financial result, but also results in connection with customers, employees, innovation and the external environment are specified. The model is the product of many considerations about which model the company should choose as basis for presenting its intellectual capital report. At first, Systematic considered using the well-known Skandia model developed by Leif Edvinsson, but despite its intuitive presentation and strong metaphor with the company as a tree with its roots, stem, leaves and fruits, this model was still not considered good enough for illustrating the elements making management an active part of Systematic.

Therefore, Systematic chose to adapt the Business Excellence model to the company and the development of this model was considered a great breakthrough in the work with intellectual capital reports. The

Skandia model was considered a capital model analogue to the financial balance whereas the Business Excellence model is more management and control-oriented.

"The value of the balance model is not really good until you have an index expressing the sum of the company's intellectual capital enabling you to draw a curve."

By saying so, Systematic's management expresses an observation that also Bontis *et al.* (1999) has mentioned "[i]dentifying the different types of intellectual capital can be likened to the identification of stocks of intangible resources; this however is not enough. It is essential to measure, and thus manage, also the flows of intellectual capital" (Bontis *et al.* 1999, p. 398). The management in Systematic acknowledges that the Business Excellence model does not in fact precisely describe current management activities for the development of the company's knowledge resources.

The model is used because of its communication potential. This may possibly cause problems because the intellectual capital report increasingly speaks internally to the company. Thus, inconsistencies between real priorities and priorities prescribed by the model may occur. In this way Systematic's use of the model parallels the use of some of the models generally found in the literature. The model presents a nice and clean view of the components being a part of the management of the company, but reality does not live up to the model's stipulated simplicity, thus leaving inconsistencies unresolved. This makes the model somewhat problematical, just like the presence of problems inherent in many known intellectual capital models as described in chapter 8.

The Intellectual Capital Report '99

Systematic's first intellectual capital report is structured according to the model shown in figure 9.1 so that the company's vision, values and objectives, which were already part of the management framework before the intellectual capital report project was initiated, are described in the first pages of the intellectual capital report.

The objectives do not only indicate financial goals, but also statements about which level the company wants to obtain/maintain for customer and employee satisfaction as well as quality and process goals.

In the intellectual capital report, the greatest importance is then attached to the categories: employees, processes, infrastructure and innovation treated fairly consistently so that for each area indicators are stated and supplemented with a text section elaborating and commenting on the figures. As mentioned before, innovation is not a separate knowledge resource as innovation is a combination of many relations between different knowledge resources. Systematic chooses only to include innovation in the model to show that innovation is included as a central topic in the managerial work in the company.

In the text section, indicators that are not shown in a schematic way are also included. This is e.g. background knowledge on average age, number of software developers and share of highly educated employees. All key figures are – as far as possible – stated for both 96/97 and 97/98. About the relation between text and figures, Systematic says:

...we want to tell a story and describe some things and then make the benchmarks match this. It is obvious that many of the figures speak for themselves. However, the text becomes more of a driving force than I had imagined at first. This is also logical because this is where you really think about what the message is.

It is also worth noticing that the first page of Systematic's first intellectual capital report states which accounting principles the intellectual capital report is based on. Here it is e.g. stated,

- that Systematic aims at treating all essential knowledge-related activities in Systematic in the intellectual capital report,
- that a prudence principle is used where measurements are characterised by estimates, and
- that the information in the intellectual capital report must be verifiable.

An external auditor did not endorse the first intellectual capital report, but this is under consideration.

The Intellectual Capital Report 2000

Systematic's second intellectual capital report has the title 'Intellectual Capital Report 2000' in spite of the fact that, numerically, it comprises statements for 1999. With the title 2000, Systematic wants to stress that an intellectual capital report is pointing forward contrary to the traditional annual accounts that are pointing backwards.

In addition to this, Systematic predicted that after publication in the spring of 2000 the intellectual capital report would to a great extent be used as a business card for the company, and the description '2000' thus makes the intellectual capital report more up-to-date and applicable for the whole year.

Systematic's second intellectual capital report begins with a management report and a description of the company, its vision, values and objectives. Moreover, the intellectual capital report is built up around two parallel stories where one story, in the same way as in the first intellectual capital report, illustrates the company's knowledge through text and numerical presentations; structured according to the model in figure 9.1.

The other story is presented as the theme of this year's intellectual capital report – '*Knowledge Management*'. Physically, the theme is separated from the first story of the intellectual capital report as it is presented in another format and material than the rest of the intellectual capital report. Through a description of various measures and current activities in the company, these pages illustrate how Systematic practices *knowledge management*.

Part of the accounting principles included in the first intellectual capital report are in the second intellectual capital report specified as applied accounting policies and are at the same time incorporated as part of the auditors' report.

Formulation of a Strategy for Knowledge Management in Systematic

On the basis of knowledge about the company and the two intellectual capital reports, this section illustrates an approach to analysing the contents of a knowledge statement with value-to-the-user, terms of production and knowledge resources and from this derives the critical management challenges and efforts. It is analysed (analogue to chapter 4 and 5) how one specifies and translates the general notions to a specific company and thus how one arrives at the concrete elements of the knowledge statement.

The purpose of this chapter is also to show how an intellectual capital report is read and, therefore, the example functions at the same time as an analysis and interpretation of Systematic's intellectual capital report and knowledge management. Here it should be mentioned that the analysis of Systematic has been prepared by the authors of this book with a view to an analysis of Systematic in a knowledge management perspec-

tive and an interpretation of Systematic's intellectual capital report. The analysis is thus not about assessing the managerial practice or specific problems, but serves only as an illustration of the method presented in this book. The analysis is only based on publicly available information and the contents are thus not an expression of the company's attitudes. The analysis is not 'complete', but just examples of how the questions asked in this book may be answered and, moreover, how they may contribute to the reading and understanding of intellectual capital reports.

Knowledge Statement

The knowledge statement expresses how the users are taken into account by the company's services and how the company is organised to be able to supply these services. **The knowledge statement** contains elements such as:

- The company's **mission**, especially directed towards the user
- The company's product or services; **value-to-the-user**
- The company's fundamental **terms of production**, showing the need for **knowledge resources** to be able to satisfy the user's needs

Value-to-the-User

Let us first look at the value-to-the-user expressing the difference the service makes to the user when it is used in practice. By means of concrete situations and examples from Systematic, the value-to-the-user is identified by answering a number of questions:

1) *Who* are the users of Systematic's systems?

In Systematic it is relevant to clarify the relation between user and customer, as these seldom are one and the same person. The customer is often a purchasing organisation in the company/armed forces and the user is either the customer's customer or employees at a more operational level. In this example of formulating value-to-the-user, users are characterised in the following way:

→ Systematic's users are often characterised by being employees in an organisation that, by means of Systematic's systems, are able to carry out their work satisfactorily and more effectively as they obtain a better basis for making the right decisions. A user is e.g. a pilot in a F16, a service employee in a financial institution or a nurse/doctor in a hospital.

2) In which *situation* are users of Systematic's systems?

→ The users are under the auspices of the armed forces often pri-

vate soldiers, operators and middle managers who operate in situations characterised by extremely high risks and enormous human and monetary consequences if something fails.

- The users in the civilian sector are in situations where their work contribute to a greater whole (the company's value creation), i.e. their function is part of a larger collective value chain that will break if everyone does not perform what is demanded.

3) What are the users' *needs* in that situation?

- The user needs to collect large amounts of data and structure it into applicable information to be able to make decisions and act correctly.
- There is a need to enhance the efficiency of information channels and to create better opportunities for communication – also between systems that were not originally designed to communicate with each other.

4) How are Systematic's systems/services *used*?

Here it should be taken into consideration that Systematic supplies systems as well as services (primarily in the form of consultancy services):

- By means of Systematic's systems, the users will be able to perform their tasks in a safe and satisfactory way. The pilot will e.g. be navigated safely around the airspace through commands. This safety is obtained by the fact that the control tower knows the other objects in the air and on the ground as the air traffic controller through Systematic's programmes is able to supervise the airspace, collect data and pass it on as useful information to the pilot.
- Another example is the Electronic Patient Journals where information about patients is stored centrally and the system ensures that all elements in the system can communicate and transfer information. This gives the doctor, the nurse, the hospital orderly, the anaesthetist, etc. a flexibility as they promptly are able to find the necessary information about the patient no matter which hospital the patient is admitted to in the county.
- The system is thus used to collect and systematise information whether as daily communication or for the purpose of decision-making at different levels.
- Systematic's consultancy services are more directed towards the customer than towards the user. During the development of the system, the customer receives advice on technology and on how to adapt the customer's own organisation and data structure so that an optimum use of the supplied system is obtained.

- 5) Why does the user *benefit* from Systematic's services? What *improvements* do they offer the user?
 - The user is able to obtain an effective communication and make decisions on a better basis.
 - By means of the system, the risk of human mistakes is significantly reduced creating enhanced safety and satisfaction in the users' work.
 - The procedure is made easier for the user as the systems reduce the number of manual data transmissions.
 - Through dialogue during system development, the user has influence on the design of the completed system.
- 6) What are the *distinctive features* of the system/service?
 - The system is flexible as it is created by integration of sub-components and thus it can be developed and expanded concurrently with technological progress and changes in the user's needs.
 - The system is reliable with a high up-time ensured through continuous tests during development.
 - The user gets a solution defined through serious consultancy and developed by SW-developers with great technical skills ensuring that the technology and the solution is adapted to the user's needs, abilities and existing tools.
- 7) What is the *connection* between these distinctive features and the improvement of the user's situation?
 - Through its flexibility, the system can develop concurrently with the user and the need to integrate new technology. Thereby, continuous development of the system is ensured in line with the user's need to structure information.
 - Through its reliability, safety for the user is obtained as the user can rely on the system's dependability (in the form of up-time as well as in the safety of the data transmission) in very critical situations.
 - The consultancy services ensure that the system is adapted to the individual customer and that the best technological solution is identified. Thereby, the user gets an optimum tool in his/her daily work making the routine jobs easier and placing the user in a better position for decision-making.

Terms of Production

The identification of terms of production should be seen as a necessary step for identifying knowledge resources. When a company is aware of its terms of production, knowledge resources needed for supplying

value-to-the-user as well as irrelevant knowledge resources appear. Identifying the terms of production may seem commonplace to the company as it usually knows whether it is a service or a manufacturing company, project-oriented or based on function etc., but by dwelling on these questions and by thinking systematically and untraditionally, new perspectives and aspects may appear. Systematic is e.g. not just a service company within the IT industry – it is a development *and* consulting house as it is able to enter into a dialogue with, advise and develop the customer during the development of the solution. This places demands on other knowledge resources than if Systematic had been an IT house selling standard systems.

The terms of production will be revealed by answering the following question:

- 1) What **kind** of company is the company in question? (e.g. service, production etc.)
 - Systematic is a system development house dealing with highly advanced and complex IT solutions. Concurrently with the development of the systems, the software developers also function as consultants and Systematic may therefore also be designated a consulting house.
- 2) What are the company's **methods of production**?
 - The working method is project-oriented, often in consortiums with other development and consulting houses contributing relevant knowledge of the domain. Beyond this, customers are involved in all phases of the development process so that the customer becomes the supplier of necessary information about its own and the users' situation and needs. The system can be adapted to a specific user's situation, the user's abilities and existing technology. This places demands on the customer's abilities and knowledge of IT solutions and it is Systematic's task to help and educate the customer.
- 3) How does the company's **distribution and supply system** work?
 - The consultancy services are supplied through close personal contact with the customer, either in the customer's company or in the environment in which the system is to be used or at Systematic. The final system test takes place at the implementation with the customer and thus Systematic supplies the system directly to the customer.

Knowledge Resources

Awareness of the company's value-to-the-user and terms of production helps identifying the knowledge resources demanding management and development in order for the company to fulfil the knowledge statement and the ambition therein. Knowledge resources are identified by means of the following questions:

How does the value-to-the-user place *demands* on knowledge resources?

1) What **individual resources** are needed?

→ The development of the systems are performed by highly educated software developers and engineers i.e. it is primarily the knowledge of the employees and the interaction among the developers and also with the customer that create a unique solution with a high level of value-to-the-user. As Systematic deals with complex problems and complex systems developed over a long period of time, individual knowledge resources in the form of competences within advanced software development, project management and understanding of the environment of the individual customer and user are needed.

2) What **organisational resources** does the company need?

→ As the projects often supply tailor-made solutions for customers, the projects may get an autonomous touch where focus is on a particular project. Being able to take full advantage of competences across projects, routines of knowledge sharing such as storage of experiences is important for making the most of knowledge resources all over the house. Moreover, qua the high quality demands to the systems there is a need to develop the organisational knowledge resources encouraging project management and quality management. It may be preparation of standard routines, templates, quality standards etc.

3) What knowledge resources are internal and external respectively?

→ Software developers and a project-oriented method of work constitute the internal knowledge resources. It is essential to the supply of value-to-the-user that the customer/user who is an external knowledge resource is made an internal part of the project group during the development of the project.

Management Challenges

The sections above formulate the specific elements of Systematic's knowledge statement. To be able to realise the knowledge statement

and its ambition, it must be translated into a number of strategic and critical management challenges and together with the knowledge statement these constitute Systematic's knowledge management strategy.

The following questions may help formulate **the management challenges**:

What problems are the key to the realisation of the knowledge statement e.g. with regard to:

- Establishment of insight into relevant circumstances – e.g. user situations or special technologies?
- Composition and acquisition of the company's knowledge resources?
- Upgrading or development of the company's existing resources?
- How are these problems connected?

On the basis of the above-mentioned questions, a number of management challenges are formulated that are critical towards Systematic's ability to supply the required value-to-the-user by means of the knowledge resources:

→ *Recruiting and Retaining Employees*

The heavy demands on highly educated software developers in the IT industry imply that the company's ability to recruit and retain the best employees is a critical challenge to Systematic. The company's future growth prospects and maintenance of a high level for complex solutions depend on this ability. The efforts initiated to fulfil this management challenge are e.g. presentations at educational establishments and personnel policy activities.

→ *Process Improvements and Project Management*

The solutions are primarily developed in long-term projects and the company's ability in terms of time to control projects and concurrently store the accumulated knowledge during the development of the project is crucial for supplying high-quality solutions efficiently. This demands a transfer of knowledge on previously developed methods, solutions and documentation of these. This management challenge is e.g. handled by the following efforts: implementation of business manual, knowledge agents on processes and documentation of projects.

→ *Competence Development*

The knowledge statement contains an element of understanding

of the user's situation and business environment – being able to take example from the customer and understand the customer's language. Employees must therefore continuously be supplied with an insight into this. With a view to handle tasks in a closer cooperation with the customer and to better fill a consultancy function, competences within e.g. project management are also enhanced. Concrete efforts may be project management training and completion of an internal education programme.

→ *Development of Customer Cooperation*

Systematic must supply high-quality software useful to the end user. This presupposes a number of efforts for obtaining a closer cooperation with the purchasing organisation and the end user, as the purchasing organisation fills a role as supplier of specification of requirements and information and thus determines which solution Systematic should supply. The more insight the customer has in this, the better the result will be for both parties, and it is considered to be Systematic's role to make the customer better at identifying the users' needs and at the same time ensure a continuous development of the customer's organisation. Efforts with regard to this management challenge are a close contact during the preparation of the specification of requirements and an open and honest dialogue with the customer during the whole cooperation process.

Link between Reporting and Strategy for Knowledge Management

Systematic's intellectual capital report may be translated into figure 9.2 below illustrating the connection between the knowledge statement, management challenges, efforts and indicators. The figure serves as a presentation as Systematic did not develop its intellectual capital report according to this structure.

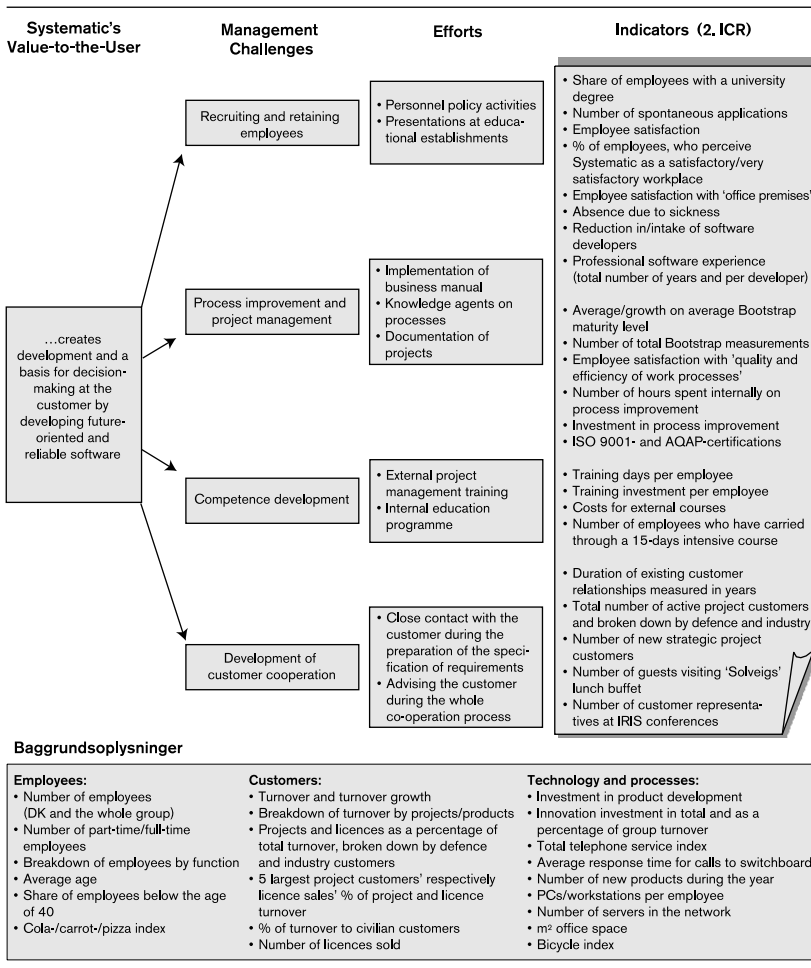


Figure 9.2: Systematic's value-to-the-user, management challenges, efforts and indicators

The figure contributes with a reading of the structure for the arguments contained in Systematic's intellectual capital report. Figure 9.2 shows the translation of the knowledge statement into management challenges, efforts and indicators and shows how such a translation may be performed in an analytical way. However, it does not show precisely how the different elements supplement each other. It is important to note – which should appear more clearly from the reading and the text than from the indicators – that the four management challenges are not dependent of each other even though they may each be attached to their own set of indicators.

The four management challenges are all part of the realisation of the

knowledge statement. If there were not some new employees, the focus on managing effects of structured processes and project management would not be as important as it is now as there would be fewer inexperienced employees to integrate in the project work. If the users and the customers did not develop, there would not be a need to develop relations to the customers. Neither would there be a need for developing the organisational competences in quality and project management as a final number of services and products were to be supplied. For example the demands for developing organisational competences, collective procedures and processes also imply that human resource development is initiated so that the employees can understand and are motivated for making use of the technologies made available to them through new project management methods. In this way, all management challenges are part of an interdependent movement towards new organisational competences aimed at facilitating the production and implementation of large, integrated, customer-oriented software solutions.

Some readers may not agree on the sensibility of Systematic's strategy. The intellectual capital report contributes with a knowledge statement, a number of management challenges and efforts as well as a set of indicators. However, when a company like Systematic makes attraction of employees a high priority and documents this in a portfolio of measurements; when they describe their project management improvement and document this through activity measurements; when they send more project managers to project management courses; when they educate employees; when they work on developing customer relations, documented by a number of employees that e.g. carry through education within the customers field, then it is most likely that the knowledge statement is not only words, but actually a reality within the company management .

The Figures of the Intellectual Capital Report 2000

The analysis model mentioned earlier was developed for use in the concrete intellectual capital report project and may be used to analyse information contents of intellectual capital reports. The model has two measurements, partly a measurement of type concerning the objects of the intellectual capital report (employees, customers, processes and technology), partly a measurement concerning management actions behind a figure split into three forms of indicators (effects, activities

and resources). The types refer to the categories referred to by the figures in the intellectual capital report; the other measurement concerns the way in which the figure is included in the company's decision-making process.

Table 9.1 shows the indicators stated in Systematic's second intellectual capital report, grouped according to the principles of the analysis model. From its first to its second intellectual capital report, Systematic has not changed much in its numerical material illustrating the company's knowledge. Thus, all four types are still illustrated by means of figures and related text.

2. ICR	Effects	Activities	Resources
Em- ployees	<ul style="list-style-type: none"> • Number of unsolicited applications • Employee satisfaction • Absence due to sickness • Total satisfaction with opportunity for on-the-job skills development • % of employees who perceive Systematic as a satisfactory/very satisfactory workplace • Reduction in software developers • Employee turnover for software developers 	<ul style="list-style-type: none"> • Training days per employee • Training investment per employee • Costs for external courses • Number of employees who have carried through a 15-days intensive course 	<ul style="list-style-type: none"> • Number of employees in the group • Number of employees in DK as of 30th September 1999 • Average number of full-time employees • Breakdown of employees by function • Number of part-time employees • Average age • Share of employees below the age of 40 • Share of employees with a university degree at Master's or Ph.D. level • Cola index • Carrot index • Professional software experience (total no. of years) • Professional software experience per software developer (years) • Intake of software developers

Continue

2. ICR	Effects	Activities	Resources
Customers	<ul style="list-style-type: none"> • Number of guests visiting 'Solvejgs' lunch buffet • Number of customer representatives at the IRIS conference • Duration of existing customer relationships measured in years • Number of new strategic project customers 		<ul style="list-style-type: none"> • Turnover • Turnover growth • Breakdown of turnover by projects/products • Projects as a percentage of total turnover, broken down by defence and industry customers • Licences as a percentage of total turnover, broken down by defence and industry customers • Number of active project customers • Number of active project customers, broken down by defence and industry • 5 largest project customers (% of project turnover) • % of project turnover to civilian customers • 5 largest licence sales (% of licence turnover) • Number of licences sold
Process	<ul style="list-style-type: none"> • Average maturity level acc. to the Bootstrap model • Employee satisfaction with 'quality and efficiency of work processes' • Pizza index • Average response time for calls to switchboard • Total telephone service index • Number of new products during the year • ISO 9001- and AQAP-certifications 	<ul style="list-style-type: none"> • Number of hours spent internally on process improvement • Investment in product development • Investment in process improvement • Innovation investment in total and as a percentage of group turnover 	<ul style="list-style-type: none"> • Number of total Bootstrap measurements • Growth on average Bootstrap maturity level
Tech-nology	<ul style="list-style-type: none"> • Employee satisfaction with 'office premises' • Bicycle index 		<ul style="list-style-type: none"> • PCs/workstations per employee • Number of servers in the network • m² office space

Table 9.1: Systematic's indicators in its Intellectual Capital Report 2000

Table 9.1 shows that the weight is on resources for employees and customers as well as on effects of processes, the latter, however, to a lesser extent than in the first publication.

The very special indices such as the cola, pizza and bicycle indices that caused great attention in the first intellectual capital report are also included in the second intellectual capital report, but have been extended with a carrot index. These indices are still subjects of great attention. To Systematic, recruitment is a central and critical management challenge, but if the indicators are structured according to the analysis model, it appears that there is also much focus on aspects of complexities in quality management and process improvement calling for Systematic to create special organisation procedures encouraging knowledge sharing. The steadily increasing number of employees makes it harder to practice direct management and the pressure that the managers' knowledge becomes directly anchored in the company's processes is noticed. Consequently, the need for creating a stable and balanced relationship among employees, technology and customers may be read in Systematic's intellectual capital report. One of Systematic's management challenges is to monitor effects and structure certain inputs at employee level and then adapt these into processes – routines and management supporting the project work with the customers so that high-quality solutions are delivered on time. This 'ability', that the organisation has, has been created through standardised processes and highly qualified employees and is reflected in high-quality products. As a comment to its first intellectual capital report, Systematic said:

We solve a problem together with the customer and supply a piece of software, i.e. in principle we are more a consultancy company offering its knowledge and expertise in some areas than we are a real product house that has to market a standard solution. My picture of Systematic is that it makes unique solutions and that they are very much based on the people and the processes that we have ... Our TQM project is closely related to our intellectual capital report project. It is about processes and we would like to include more measurements on projects being supplied on time in the intellectual capital report.

Here, the organisational processes are seen as the core of the knowledge management activities. Systematic is far from complicated considerations about knowledge as epistemology and abstract knowledge that are often seen in philosophical discourse within knowledge litera-

ture. In Systematic knowledge is related to concrete and specific 'problems' arising from subjects around employees and project management techniques. All indicators in the second intellectual capital report are stated for 96/97, 97/98 as well as 98/99 and it is thus possible to follow the development of the company's knowledge management strategy (figure 9.2). If the development of Systematic's indicators by means of the analytical model is examined more closely, the intellectual capital report allows the reader to come closer to the development of the company's knowledge resources.

In table 9.2 the development is shown over three years for selected indicators.

	Effects	97	98	99	Activities	97	98	99	Resources	97	98	99
Employees	<i>Satisfaction:</i>				<i>Development:</i>				<i>Recruitment:</i>			
	Culture	3.9	3.8	4.0	Days/person	3.6	5.2	7.8	# software developers	69	90	103
	Nærmeste ledelse	3.3	3.4	3.6	Costs/person (DKK000)	11	10	20	Number of employees	98	124	137
	Arbejdsopgaver	3.6	3.7	3.6					Candidate and Ph.D. (%)		66	69
	Topledelse	3.4	3.5	3.6								
Customers	Satisfaction*	-	4.1	-					Number of projects	23	26	28
	% customers recommending SSE*		88						% turnover from civilian projects	23	39	52
	Value for the money*		3.9						# sold licences (000)	2.4	12.0	1.6
									Durability of customer relationships:			
									0-3 years	13	15	16
Processes									4-6 år years	5	6	5
									7-13 år years	5	5	7
	BOOTSTRAP measurement	2	2.3	2.5	Process improvement (thousand hours)	1.2	3.2	4.3				
	customer satisfaction with quality *		3.9		Product development (mio. Kr.)	3.3	6.7	7.5				
	Telephone service index (%)	92	95		Process improvement (DDK million)	0.5	1.3	1.7				
Technology					Development as a % of turnover	6.1	10.2	10.3				
	Employee satisfaction with office premises	4.1	3.7	3.1					PC per employee	1,3	1,4	1,8
									# servers	13	19	32

Table 9.2: A selection of Systematic's indicators

Note: * Customer satisfaction is only measured every other year.

Table 9.2 confirms the company's focus on employee development and process improvement. First, it shows that Systematic has increased its resources in the form of software developers just as the company still invests in activities developing them. At the same time, it appears that employee satisfaction is increasing. By way of measurements on the employee category it appears that there is a certain attention to the development of the resource base and the improvement of the employees' market value through skills enhancement activities.

The customer category illustrates that the turnover to an increasing extent results from civilian projects than from defence projects even though the number of active customers only increases by very few customers. This increases the company's resource base as it is enlarged with new customers in other business areas.

From the process category, it appears that the attention is directed towards skills enhancement activities through large investments in product development and to a minor extent investments in process improvements. The number of hours spent on development activities is increasing heavily, i.e. skills enhancement activities with a view to processes are to a high degree in focus. It also appears to result in improvements in the process quality as is reflected in the increase in the BOOTSTRAP² measurements.

Thus, Systematic is a company, which develops its resources in the employee category, it aims at making itself depend less on the defence sector by getting a larger part of the turnover from the civilian sector and it invests heavily in employee and process development. These indicators do not contradict – but rather support – that the development in project management, quality and supply on time are parameters in the management challenges. These are parameters initiated to improve processes and to attract potential employees, i.e. Systematic's knowledge resources are increased through the management's activities that, on the one hand, make the company attractive to potential employees and, on the other hand, make it possible for the whole organisation to develop, manufacture and maintain complex software solutions for specific users. However, to be able to do this, it also demands an insight into the customer's/user's situation in relation to the preparation of specifications of requirements. Therefore, competences within the development of customer relations and the set-up of partnerships are also a management challenge to Systematic. This involves that the employees are trained in the customer's way of working and that the company develops domain knowledge within the customer's industry/sector so that this insight may be reflected in the software.

The result of this is that the management challenges, which are mobilised, involve four different activities to be performed. One activity is to attract and retain employees; especially now that the company experiences rapid growth and IT employees are in great demand. Systematic's intellectual capital report presents a clear view on this subject:

We put a strong emphasis on attracting, developing and retaining the best software engineers in the market. We must provide a stimulating and challenging workplace with active investment in the professional and personal development of our employees (Intellectual Capital Report '99, p.9).

Recruitment of employees is a high priority area. An integrated part of the company's knowledge management practice is to point out the best and most competent employees and then develop their professional and personal competences. The intellectual capital report reflects that the development of employees takes place and that new employees really are attracted to the company.

Another management challenge is to make the employees an integrated part of a system supplying quality software within the agreed time and budget. Quality is important here as software solutions are applied in highly critical situations like e.g. communication in the armed forces where faults may have fatal consequences, as it could be a matter of life or death, or in financial institutions where security, confidence and precision are principal subjects.

The intellectual capital report explains the importance of bringing the company's various resources together to obtain a collective strength towards the customer:

All software is developed in project teams according to structured methods Quality is assured through consistent use of our development model with focus on project management, requirements management, configuration management and close dialogue with our customer. (Intellectual Capital Report 2000, pp. 6 and 7).

This attention towards transferring the supply of software to an integrated project from initiation of the project to final delivery and subsequent support indicates that the primary investment in process improvement is not only a randomly chosen activity. Furthermore, from the increasing BOOTSTRAP measurement it appears that the activities are not in vain either.

Initiating the processes and making them function presupposes the

employees to be motivated for working according to and fulfilling the requirements integrated in the methods defining the processes. Thus, the third management challenge is a continuous development of employees so that they know the user's situation and can develop software that lives up to the requirements. Here, the build-up of insight into the users' needs and the value-to-the-user of the software is a central management challenge. Part of this is investments in training and employee development that are also increasing cf. the measurements stated in the intellectual capital report (see also table 9.2). Another part is the learning taking place when the software engineers participate in different projects and thus build up an insight into the user's situation through practice.

The Intellectual Capital Report 2000 (p. 11A) says:

Experience shows that delays are typically due to a failure to clarify specific user requirements and to acknowledge that the customer himself is a significant sub-supplier in the development process, as a supplier of specialist domain knowledge, test data etc.....It is our ambition that the success of a project should not only be measured by our ability to deliver on time and to the price and quality agreed. Ideally, both parties will also have gained knowledge, not only to the benefit of the development and operational use of the system, but also with respect to future projects.

This management challenge is about the development of employees through interaction with the processes used at the completion of a project. However, the intellectual capital report also mentions a fourth management challenge in relation to customers. Long-term customer relations are part of the build-up of insight into their situation helping Systematic to meet the users' requirements and maybe even suggest new solutions to the customer when these solutions have been developed and seem like optimum solutions to the customer. From the intellectual capital report, it appears that the duration of customer relations has been stable during the last three years. There is a proportionally limited number of customers, but more than half of the customers have been 'active' for more than four years.

The set of management challenges may be read from Systematic's intellectual capital report. They are not all clearly presented in the text of the two intellectual capital reports and information from the interviews of Systematic's top management has also been obtained. It should be noted that what may be read from Systematic's intellectual capital report is a proposition about how the company can and should

develop its knowledge resources. Other readers may disagree with us – but this is up to an evaluation of the relevance of the management challenges mobilised through the intellectual capital report. The relevance may be evaluated against the company's knowledge statement that draws the relations and the interaction between the management challenges. Systematic's knowledge statement is about reliable and non-defective software in critical situations that at the same time is designed in a development environment creating future flexibility for the customer. Regarding the users, i.e. defence units, pilots and soldiers, doctors and nurses, lives are at stake if the technology does not work the way it should. Therefore, the knowledge statement refers to reliability.

These are the fundamental elements of Systematic's knowledge statement that focuses on the ability to make the whole company integrate with the user's situation with a view to developing and manufacturing reliable and relevant solutions for the customers through structured processes. Here, knowledge as an organisational effect is included; they are routines making fragments consisting of knowledge about software, abilities to manage a project, insight into the customer's situation and the ability to integrate new employees so that they become part of the organisational system possible. The intellectual capital report contains this point as it says that Systematic's objective is to be a company

... that has demonstrated its capability in the completion of complex development and integration projects, to time, budget and quality. This not only requires efficient project management, [but also] well-documented policies, processes, procedures, methods etc..... Finally, we strongly believe that customers must be actively involved in a project, from an early stage. (Intellectual Capital Report 2000, p. 4).

Conclusion

Even though it is possible to make a 'naked' analysis of the indicators (see table 9.1) and even though it gives some insight into the company, the complete intellectual capital report is more than the figures. The application of the analytical model separates certain aspects from the context of the intellectual capital report. To be able to read the intellectual capital report, the specific situation of the individual company must also be considered. Such insights should be considered in the context as they have to be fitted into the knowledge statement and the

management challenges. For that reason, indicators have to be accompanied by interpretations and this is what the knowledge statement is. The result is that there are no indicators without a knowledge statement, as the figures do not speak for themselves.

Through the analysis of Systematic's intellectual capital report this section has given an angle of approach to how an intellectual capital report may be read. It should be emphasised that an intellectual capital report reports on the company's knowledge management activities. To be able to understand an intellectual capital report – and thus be able to read such a report – it is of no value to think in financial values of knowledge resources and competences. It adds much to the general picture to interpret the company's infrastructure development in which the whole development of competences and the interaction between these take place.

We, therefore, suggest that in order to read an intellectual capital report, two different, though related, subjects should be considered:

- 1) The overall knowledge management strategy, including a knowledge statement with the company's value-to-the-user as the principal subject, knowledge resources and competences as these elements tell us the complex story attaching knowledge resources to their application. This should then be translated into the company's specific management challenges.
- 2) An accounting system based on classification (the analysis model). This system can classify indicators so that they support the story about the implementation of the knowledge statement in the company.

The analysis model is a method for classifying efforts and indicators. It classifies according to types (employees, customers, processes and technologies) and management activities concerning the combination of resources, skills enhancement and the monitoring of effects. This makes it possible to separate the intellectual capital report from its context and thus making it possible to read it 'at a distance.' Thus, the complexities of knowledge management are translated into three types of management activities and into four types of indicators.

The knowledge statement and the management model restate the indicators from the intellectual capital report and state the connection between knowledge management strategy and the design of the specific indicators, selected to monitor the implementation of knowledge management.

In Systematic's case, the intellectual capital report is a heterogeneous collage of words, pictures, vignettes, indicators and visions. It is not easy to read the intellectual capital report and no institutionalised methods implying that certain things can be taken for granted as in annual accounts exist.

Systematic's work on developing and applying an intellectual capital report shows the connection between the 'external' intellectual capital report and the 'internal' knowledge management activities. The content of the intellectual capital report is not only activities in connection with knowledge management. The intellectual capital report is also an active part of the knowledge management practised by Systematic as it creates new networks and 'catches' the interest of valuable knowledge resources, such as future employees and customers. The 'external' is thus also directly 'internal'. The 'external' document does not only reflect current knowledge resources. It also takes up a position as co-producer of knowledge resources.

¹ See Veis (2000, p. 271)

² BOOTSTRAP is the European pendant to a CMM measurement.