Knowledge perspectives in profit and loss account

Lecture by H. D. Kreft to the

4th Humatics Task Force Meeting, on 29 / 30 October 2004
in the Akademie der Ostdeutschen Sparkassen

With the help of humatics as a theory of operable knowledge characteristics, it is now possible to show how the change of knowledge perspectives appear on the level of controlling data.

Contents:

Summary: 1
The terms "knowledge balance", "intellectual capital", "human capital". 2
The basis of operable knowledge characteristics: knowledge functions..... 3
Profit and loss account and knowledge matrix..... 5
Representation of the change in perspective in the profit and loss account..... 7
Concluding comments..... 8
References 9
Curriculum Vitae..... 11

Summary:
These lecture notes are intended as a contribution by the field of humatics to the worldwide discussion on the inclusion of knowledge in a balance sheet. They explain why knowledge cannot appear in the balance sheet, while the benefits of knowledge certainly can be shown in the profit and loss account. They outline the three basic requirements which must be fulfilled by knowledge management if knowledge data is to be accepted by controllers as hard data. The example of an employee switching from the Development department to the Sales department within a company is used to illustrate the methods. The concept of the knowledge perspective is dealt with in detail as a fundamental aspect of knowledge management in the future.

The terms "knowledge balance", "intellectual capital", "human capital".

People involved in the discipline of knowledge management are frequently confronted with problems they have caused themselves because existing economic terms are used incorrectly. This is true for example, of the terms like "knowledge balance", "intellectual capital", "human capital". All words try to suggest the solidity of terms which are used for establishing balance sheets. An analyse of some problems which arise could be found in [1], [20]. A small collection of all the uncountable papers, books, statements which deal without weak or no reflection on the terms are given by [2, 3, 9, 10, 12, 13, 23, 24]. This list can be prolonged to large extend. Some scientific clarifications are given in [4, 5, 6, 7, 11]. This last contributions could be seen as the international state of the art (2004) in case we are not dealing with the "bit of knowledge" as Hayek has proposed to mentioned it in 1936 [16]. Physical aspects of the related terms entropy, information, knowledge can be found in [18].

In accordance with international balance sheet standards for centuries now, the left-hand side of a balance sheet shows only the assets belonging to the company, while the right-hand side shows how these are financed. As knowledge is inextricably bound to people and, since the end of slavery, free people can no longer be seen as the property of a company, knowledge cannot be carried as assets in a balance sheet. The benefits of knowledge (also of intellectual activities), however, can be made available to a company (for example, by an employment or services contract). The benefit is expressed in money flows (i.e. amount of money per time, e.g. income, sales). It thus appears where the flow data are booked in a company: in the profit and loss account. This is also the case, for example, for any leased goods. The leased truck or photocopier does not appear in the balance sheet, but the income and expenditure related to this used object do appear in the profit and loss account.

Knowledge management - which is increasingly fighting for its reputation with controllers, IT managers, human resources managers etc. – must thus learn to use assumed terms which are accepted in different disciplines correctly. Humatics as the theory of operable knowledge characteristics [19, 21, 22] goes one step further and observes three basic requirements which give knowledge management the solid basis essential for its use in controlling .

1. Reproducible results
2. Algorithmic methods
3. Autonomous adaptation of real events

What do these three requirements mean for knowledge management?

1. Reproducible results

Even when carried out at different times by different people, controlling must always deliver the same results under the same conditions. This first requirement is, of course, fulfilled in conventional controlling. Operational data (such as quantities, weights etc.) have to clearly reflect real operation situations under repeated analysis. It is not acceptable, for example, that Ms A counts X number of goods in the warehouse and then Mr. B comes along and counts Y.

2. Algorithmic methods
Controlling results must be based on mathematical methods. Conventional controlling, for example, uses often the rule of three, while for establishing balance sheets it is used double-entry booking. The underlying mathematical methods can also be represented on computers (automates). Thus we are talking about algorithmic methods, i.e. methods that can be represented in programs

3. Autonomous adaptation
If, for example, an employee moves from one section of the company to another, the cost structures shown in controlling tables (e.g. in the profit and loss account) will change in a manner reflecting this change. In the same way, this change – which is, basically, a shifting of knowledge quantities – has to change autonomously (in relation to rules) be reflected in the controlling data.

Allow me to state quite openly here: The three conditions cited have not been fulfilled by knowledge management up to now. I have already published a more precise analysis of the conventional approaches earlier this year with an exhaustive list of sources (see: Critical Analysis on Knowledge Evaluation and Balancing around 2004 [25], German written analyse).

When the three conditions cited above are fulfilled, humatics refers to operable knowledge characteristics. How such operable knowledge can also fulfil the rigorous standards of the controller [14] is shown here.

The basis of operable knowledge characteristics: knowledge functions
The essence of the operable knowledge in humatics are the so-called knowledge functions (See [21] and many information are also given in [22]). As knowledge functions are used – albeit unconsciously – in any job interview, let us examine what actually happens in an interview. Let us assume that employees are to be recruited for various tasks (in the upper section of Fig. 1 each letter in the X-axis symbolises an employee to be recruited). We are hoping that each new employee will make a contribution to revenue in the long term (represented in Fig. 1 as a bar in the Y-axis) which must be considerably larger than the costs expended for the employee. Such per capita distributions of the income are known in companies and their results readily available. What is missing is the second important distribution of the per capita revenue to the skills and abilities for which employees are recruited. This second distribution is one of the main innovations of humatics. Fig. 1 shows a housekeeper for whom - in the second distribution - his organisational talent has the highest evaluation and his driving licence the lowest. This is probably because the caretaker responsible for a large building complex may have to coordinate various tradesmen and this is where his organisational talent is required. This simple process of the extended per capita distribution already leads to a simple knowledge function which can be used for corporate purposes. The skills and abilities which are juxtaposed in the X-Axis of a knowledge function are named constituents (of the knowledge function). If a knowledge function appears in the form of a bar chart we name it Q-Distribution. In accordance to our above stated criteria we can name all the data which we can derive mathematically from Q-Distribution operable knowledge data. So, if we speak of operable knowledge features we know that there must be a mathematically derived data behind this term. Companies working on the market must have already mastered the correct evaluation of skills, abilities otherwise they would never have been able to assert themselves against the competition on a free market. So, Humatics represents in mathematical structures what is

already everyday practice. I would also like to mention here that there are many other economic and purely scientific procedures for the generation of knowledge functions [21].

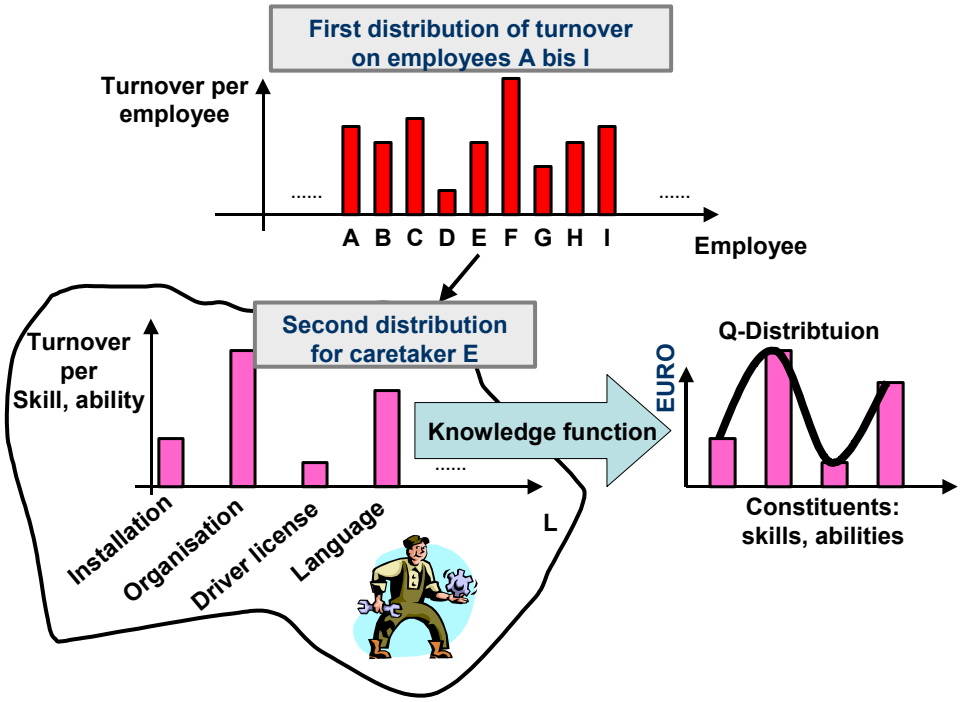

Fig. 1: The twofold distribution of revenue to generate knowledge functions

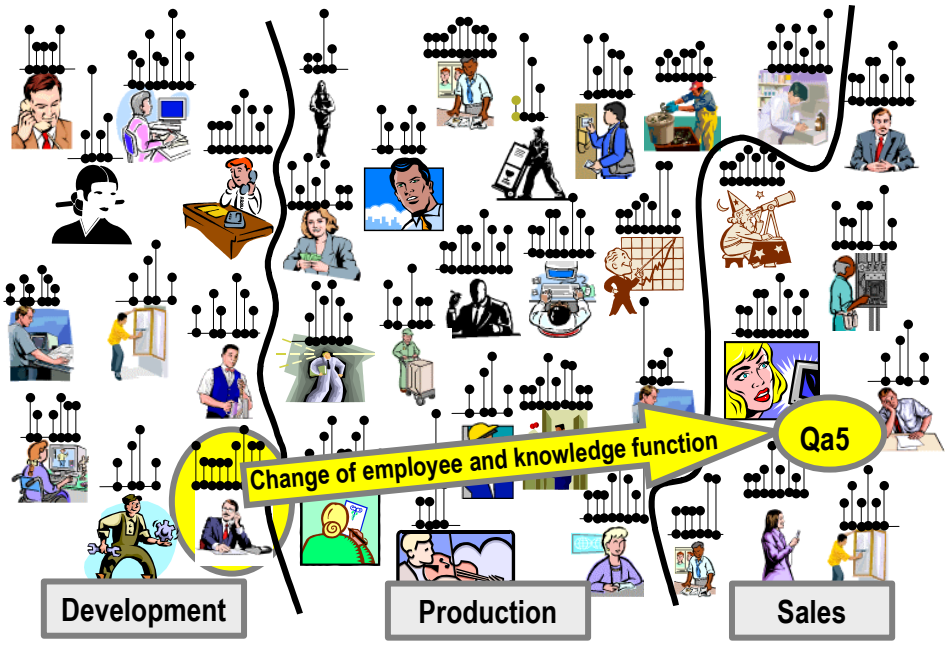

Fig 2: An employee with knowledge function switches from Development to Sales

The advantage is that now we can apply mathematical procedures to knowledge functions and determine such quantities [21]. Of the many (more than 24) thus quantifiable knowledge characteristics, we are only going to deal with two here: the first is the knowledge quantity H (named human potential) which is measured in the new unit human bit (hbit) and the second

is the economic temperature T which is measured as revenue per knowledge unit (i.e. money flow per hbit). The quantity H can be understand as the long looked for quantity of knowledge (see Hayek: "bit of knowledge", [16]). The human bit is given mathematically by an extension of Shannon's method [15] for evaluating units of information (bit). For details how to determine the unit human bit (hbit) see [21, 22].

What it exactly means if we can apply a knowledge quantity to real situations can be explained using the practical example of an employee moving from Development to Sales (see Fig.2). The illustration shows employees with their individual knowledge functions in the three corporate areas of Development, Production and Sales. The arrow indicates the switch of an employee from Development to Sales. The background to this might be that a product has come from Development into Sales where there are now more technical questions from customers about the product, and Sales wants to react to this by improving its technical competence. A developer has volunteered for this new challenge in Sales. What the company expects, therefore, is that the knowledge of the developer will have the positive effect of increasing the sales of the new product. How can this expectation be represented in the form of knowledge functions? After all, the switch is being carried out on the basis of an assumption which already exists in the heads of the parties involved, i.e. in their knowledge before they have had the actual experience. If knowledge functions reflect real knowledge then they should also reflect this special "foresight" of knowledge. This is to be demonstrated here.

Profit and loss account and knowledge matrix

(1) Profit and Loss and Knowledge-Matrix first year start situation (without transfer of employee)

	Profit and Loss Usual Controlling			Knowledge-Matrix Humatics	
	1 U Turnover Mio. €	2 B Amount of Employees hb	3 ε Turnover per Employee Mio € / hb	4 H Amount of Knowledge hbit	5 T = U / H Economic Temperature € / mhbit
E: Entwicklung	2,0	10	0,2	70	28,571
P: Produktion	4,0	25	0,2	175	22,857
V: Vertrieb	4,0	20	0,2	140	28,571
Gesamt Firma	10,0	55	0,2	385	25,974

(2) Profit and Loss and Knowledge-Matrix second year with transfer of employee (without change of perspective)

	Profit and Loss Usual Controlling			Knowledge-Matrix Humatics	
	1 U Turnover Mio. €	2 B Amount of Employees hb	3 ε Turnover per Employee Mio € / hb	4 H Amount of Knowledge hbit	5 T = U / H Economic Temperature € / mhbit
E: Entwicklung	1,8	9	0,2	63	28,571
P: Produktion	4,0	25	0,2	175	22,857
V: Vertrieb	4,2	21	0,2	147	28,571
Gesamt Firma	10,0	55	0,2	385	25,974

(3) Profit and Loss and Knowledge-Matrix second year with transfer of employee witht change of perspective

	Profit and Loss Usual Controlling			Knowledge-Matrix Humatics	
	1 U Turnover Mio. €	2 B Amount of Employees hb	3 ε Turnover per Employee Mio € / hb	4 H Amount of Knowledge hbit	5 T = U / H Economic Temperature € / mhbit
E: Entwicklung	1,8	9	9	63	28,571
P: Produktion	4,0	25	25	175	22,857
V: Vertrieb	4,2	21	21	146	28,767
Gesamt Firma	10,0	55	55	384	26,042

(4) Profit and Loss and Knowledge-Matrix second year with transfer of employee, change of perspective and increase of sales

	Profit and Loss Usual Controlling			Knowledge-Matrix Humatics	
	1 U Turnover Mio. €	2 B Amount of Employees hb	3 ε Turnover per Employee Mio € / hb	4 H Amount of Knowledge hbit	5 T = U / H Economic Temperature € / mhbit
E: Entwicklung	1,8	9	9	63	28,571
P: Produktion	4,0	25	25	175	22,857
V: Vertrieb	4,4	21	21	146	30,205
Gesamt Firma	10,2	55	55	384	26,589

Fig 3: Profit and Loss accounts extended by the knowledge matrix.

Fig. 3 shows four tables, (1) to (4), showing on the left the familiar data from the profit and loss account or controlling data where U stands for revenue, B for the number of employees.

On the right we have the new data from humatics: the knowledge quantity H in human bits (hbit) and the economic temperature T (in revenue per knowledge unit). These parts of an extended profit and loss account in which the operable knowledge data of humatics are also included, is referred to as the knowledge matrix. (1) shows the starting situation before the employee switches from Development to Sales. In table (2) the change has been made. The only changes in table (2) are the reduction of the employee number and knowledge quantity (see columns 2 and 4) in Development and the resulting, proportional increase of these data in Sales (i.e. application of the rule of three). Thus, nothing special has happened, the change has not altered the bottom line. How a perspective change is reflected by knowledge functions (see above: autonomous adaptation) is shown in Fig. 4.

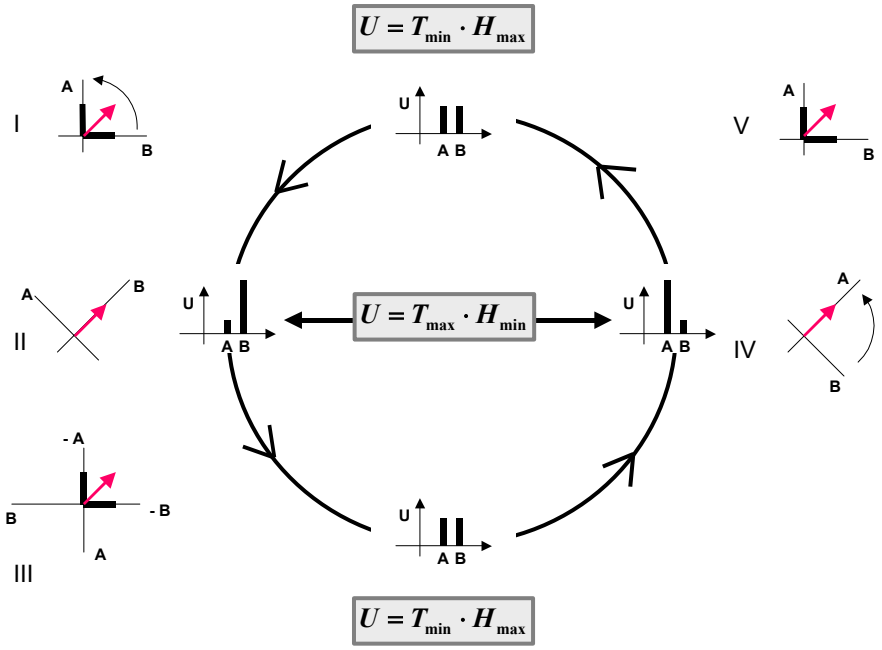

Fig. 4: Perspective change in knowledge functions by rotation

In Fig. 4 we will deal first only with the elements which are on the circle proceeding in an anticlockwise direction with the arrows. We can see the change in a very simple knowledge function which consists of only two constituents (A, B). A could be, for example, the technical competence for the new product to be sold. This is the knowledge that the Sales department wants. B, for example, can be the ability to speak a foreign language. As there are already a lot of people in Sales who can speak a foreign language, this is not particularly highly evaluated. The upper part of the circle shows a Q-Distribution with equal evaluation its two constituents. As we move around the circle, preference is given first to constituent B (left-hand side of the circle) and then to A (on the right-hand side). The first humatic fundamental equation U = T H (see [21] for a more detailed explanation) shows that at a constant U in the upper and lower position – i.e. the largest possible equal evaluation of the constituents – the amount of the human potential H is at its highest value H_{max} and therefore the economic temperature T (revenue per hbit) is at its lowest. The opposite is the case if the knowledge function is very "sharp", i.e. if some knowledge characteristics are evaluated more highly than others, as is the case in the two positions on the left and right of the circle. Where knowledge functions become "sharper", the Shannon formula provides decreasing values of H and increasing values of T. This means that the human potential (the broadness of knowledge) be-

comes smaller the higher some of the skills and abilities are evaluated (as is the case for a specialist).

Now we want to show that such a reduction of the human potential H is the result of the differing perspectives from which the knowledge of an employee in Development or Sales is observed. This change of perspective is continually applied in corporate practice. This occurs as follows: As the specific, technical product knowledge A is also present in other developers in the Development department it is a value which is multiply present and can thus not be evaluated very highly. This, however, does not apply to Sales as the knowledge A is unique there. It is of particular significance now that from the perspective of the individual employee his individual knowledge remains constant regardless of how it looks from the perspective of the respective department.

All of these various aspects are covered by humatics. In accordance to the above mentioned requirement of autonomous adaptation the perspective change must result automatically (algorithmically) from knowledge functions. We will now show that this is the case when we represent the internal perspective change as a coordinate rotation of knowledge functions. This should be explained in detail and is represented for both elements of the simple knowledge functions in Fig. 4 in the figures I to V around the circle. First we can see that the red arrow (vector) does not change its direction or length in the graphics I to V. This indicates that from the perspective of the employee nothing changes (he sees his skills, abilities, so to speak, from the point of view of inside the arrow). A different view (perspective) results when we rotate the coordinates (i.e. we alter the outer view) in an anticlockwise direction (we could, of course, also rotate in a clockwise direction). Position I shows the situation before the rotation starts, the two thicker coordinate parts A, B are equal. This corresponds to the representation of a knowledge function with two equal constituents (see Fig. 4, top of the circle). In position II the rotation (i.e. the change in perspective) has progressed to the extent that there is only a representation of the arrow on B, i.e. B is the most highly evaluated constituent. The rotation continues through 180° to position III, where we again have equal coordinate parts A and B (now they are negative, which is of no consequence for the mathematical evaluation). In position IV the rotation has progressed so far that only A is evaluated, and in position V - having travelled through 360° - we are back to the starting position with the equal constituents. We can, therefore, derive the alteration of the human potential and the economic temperature from rotations alone. It should also be mentioned in passing that, mathematically, rotations are group characteristics whose generators can be represented as tensors (e.g. in the form of differential derivations of vectors), which opens up a completely new field for the interpretation of knowledge functions.

Representation of the change in perspective in the profit and loss account

Let us return now to the operable knowledge characteristics in the profit and loss account. In table (3) of Fig. 3 we have taken account of the fact that the developer knowledge appears in Sales under a changed perspective. We know that the product knowledge is more highly evaluated from the Sales perspective, i.e. the knowledge function has become "sharper", the Shannon formula gives a lower value for H. We show this case here for demonstration purposes by reducing the knowledge quantity H of the developer in Sales symbolically by 1 hbit so that the total knowledge quantity in Sales drops from 147 (table 2, column 4) to 146 (table 3, column 4). This reduction would of course be automatically registered by the program as a result of the rotation of coordinates (of the change in perspective). If we divide the constant

revenue (column 1) by this reduced knowledge quantity in the Sales perspective (column 4), the temperature T increases in Sales accordingly (between table 2 and 3). This is the desired result. If the change from Development to Sales is to make any sense, the revenue contribution of the knowledge in Sales must have an increased value. This indicates to the controller a significant, corporate change which he can take directly from the extended profit and loss account. In this case we are dealing with an ex ante situation (i.e. a view before an event happens, that is usually a scenario). It is only with the aid of operable knowledge characteristics that the progress of a corporate scenario can be observed solely on the basis of starting conditions. This is fully analogous to scientific methods in physics in which changes of complex systems can be determined on the basis of starting conditions. In conventional controlling such changes are not apparent to the management. For example, in contrast to the revenue per knowledge unit (economic temperature), the per capita revenue remains constant (see Fig. 3, table (3)). So, the operable knowledge characteristics T reflects an internal change in a company without any outer effect. Perspective changes for knowledge have long been an intuitive tool of any good manager. This is how companies can benefit from correctly applied knowledge management: intuition is complemented by reproducible, verifiable quantities.

Table (4) of Fig. 3 shows the ex post situation (i.e. the view after an event, these are real values) with an increased revenue which leads to an further increase of the economic temperature. The view of the Sales department has been confirmed, the market has rewarded the change in perspective, the new perspective was the right one. Humatic analysis could be used to determine how high the growth in revenue would be if an internal change in perspective takes place. For further details please refer to [21, 22]. The representation of operable perspective changes makes it clear that management in the future will have access to completely new methods of company orientation and performance control.

Concluding comments

For companies it is known that the evaluation of knowledge of employees depends on the perspectives which different departments may have in relation to that individual knowledge. The mathematical methods described here show how this effect can be produced by coordinate transformation of knowledge functions. The results of this transformation can be shown directly in the profit and loss account.

H. D. Kreft

References

Nr	Source (Date of creation)	Commentary of the author
	Web address, last access **In case there is in the address a carriage return, please insert address manually.**	
[1]	Information Research, Vol. 8. No. 1, Oct.2002	Critical paper on the use of definitions of knowledge experts.
	http://informationr.net/ir/8-1/paper144.html: 22.1.04	
[2]	Buch Konrad Group als Download (1988)	Basis of many papers. Also of historical interest.
	http://www.sveiby.com/articles/IntangAss/DenOsynliga.pdf: 22.1.04	
[3]	Statements of Karl Eric Sveiby, 1999	In German language.
	http://www.team-success.de/ord-neu/simulat/cel-know.htm, 1.2. 2004	
[4]	Uni Ahrhus, Buhk et. al, 2001	Basis of a new development in looking on knowledge management. Fundamental.
	http://www.pnbukh.com/PDF_ARTIKLER/SJM_2001.PDF, 1.2.2004	
[5]	Kopenhagener Uni; Mouritsen, 2002	Philosophical, conceptual, informativ.
	http://www.euintangibles.net/library/localfiles/knowledge%20management%20final%20kk%20jm.pdf, 1.2.2004	
[6]	Dänisches Ministserium of Science Technology and Development 2003	State of the art for methods which have to deal without quantifiable knowledge, download of: Analysing Intellectual Capital Statements (03-03-2003) Intellectual Capital Statements - The New Guideline (03-03-2003) Intellectual Capital Statements in Practice (23-04-2002) A Guideline for Intellectual Capital Statements - A Key to Knowledge Management (17-07-2001) Developing Intellectual Capital Accounts - Experiences from 19 companies (01-08-1999) Intellectual Capital Accounts - Reporting and managing intellectual capital (01-05-1998)
	http://www.videnskabsministeriet.dk/cgi-bin/theme-list.cgi?theme_id=100650&_lang=uk, 1.2.2004	
[7]	Bugh, Uni Aarhuis, 2003	Accounting requirements for "intellectual properties".
	http://www.pnbukh.com/PDF_ARTIKLER/the_relevance_of_intellectual_capital.pdf	
[8]	Bugh, Uni Aarhuis, 2004	Scientific basis for the Danish approach.
	http://www.pnbukh.com/PDF_ARTIKLER/jiC%202003-b.pdf	
[9]	School of Business Stockholm, Gröjer, 2001	Problems how to separate between intangible and tangible assets.
	http://www.fek.su.se/home/bic/meritum/download/JEG.rtf; 1.2.2004	
[10]	Knowledge assets of nations, 2003 22.1.04	Problems of determining knowledge of nations.
	http://unpan1.un.org/intradoc/groups/public/documents/un/unpan011601.pdf 1.2.2004	
[11]	Journal of Intellectual Capital, Buhk Nov. 2003	IC-Reporting: Interesting since the term Knowledge Management is not used.
	http://www.pnbukh.com/PDF_ARTIKLER/jiC%202003-b.pdf	
[12]	Journal of Knowledge Management, Malhorta, 2004	A new marketing idea from the US: Introduce the new "Real Time Business Performance" instead of knowledge management.
	http://www.kmnetwork.com/KnowledgeManagementRealTime EnterpriseBusinessModels.pdf, 2.1.2004	

[13]	Sveiby, Lessons from the pioneers 2001	Sveiby: Autobiographic, a vision and many ways to go.
	http://www.kmadvantage.com/docs/km_articles/KM_-_Lessons_from_the_Pioneers.pdf; 1.2.04	
[14]	Jahrbuch für Controlling, Seicht, 2002	German written state of the art for controllers.
	http://www.iwp.uni-sb.de/veroeff/download/heiden/lorsonheidenjahrbuchseicht2002.pdf , 1.2.2004	
[15]	Claude E. Shannon: A mathematical theory of information, 27.12.03	Explanation how to quantify information, the basis of the unit bit.
	http://cm.bell-labs.com/cm/ms/what/shannonday/shannon1948.pdf	
[16]	Hayek: "Economics and Knowledge" 1936, London Economic Club, 10.10.03	Important paper mentioning of the "bit of knowledge"
	http://www.virtualschool.edu/mon/Economics/HayekEconomicsAndKnowledge.html	
[17]	Thomas S. Kuhn, The structure of scientific revolutions	Fundamental for understanding how scientific break through come up.
	ISBN: 0-226.45803-3, The University of Chicago Press Ltd. London	
[18]	Carl-Friedrich v. Weizsäcker, Zeit und Wissen,	The fundamental book for understanding the relation between Entropy, Information, Knowledge. (German written)
	ISBN 3-446-16367-0, Carl Hanser Verlag, München 1992	
[19]	Hans-Diedrich Kreft, Das Humanpotenzial, von der sozialen zur fairen Marktwirtschaft	Social impacts of the quantification of knowledge (German written).
	ISBN 3-89700-142-X, Verlag für Wissenschaft und Forschung, Berlin 2001	
[20]	Umstätter, Information, Wissen, Interpretation 1992	Analyse of the problems in separating the terms Information and knowledge.
	http://www.ib.hu-berlin.de/~wumsta/infopub/pub1991f/pub70.html; 6.2.04	
[21]	Geld und Wissen, H.-D. Kreft	Fundamental to the principle of humatics (German written).
	ISBN 3-89998-021-2, Weissensee-Verlag, Berlin	
[22]	Humatics – Webpage, informative for operalbe knowledge aspects, 2004	Actual information on humatics
	www.humatics.de	
[23]	Wissen messen – Ansätze, Erfahrungen, kritische Fragen, North, Probst, Romhardt, 1998	Fundamental paper, German written
	http://know.unige.ch/publications/zfo%203-98%20Messung.PDF, 8.2.04	
[24]	Nonaka, Ikujiro / Takeuchi, Hirotaka: Die Organisation des Wissens	Prosaic, cultural comparition
	Campus Verlag Frankfurt/M, New York 1997 (englisch: The Knowledge Creating Company 1995), ISBN 3-593-35643-0. 299 Seiten	
[25]	Wissensbilanzierung um 2004	Comparition of the methods for "balancing" knowledge up to 2004.
	www.humatics.de	

Curriculum Vitae

Dipl.-Ing. (B.Sc. eng.), born in 1943 in Hamburg, scientist, engineer and inventor, multiple entrepreneur, owner and participant of different companies.

Company holdings
ADE - Angewandte Digital Elektronik GmbH,
ADE -Applied Digital Electronic Inc. / USA, Paoli
CLM CombiCard License Marketing
Vision Patents AG

More than 70 internationally patented inventions many of which are already being sold as products by well-known companies: Electronic house-door Key Ikotron, Ikon AG, Berlin; POMUX, electr. length measurement System, Max Stegmann Company, Donaueschingen; Chip card patents (Siemens, Gemplus, PAV).

1986. Frankfurt: **Arthur- Fischer- DABEI prize** "Invention and innovation for humankind"

1987. Frankfurt: **Innovation prize of the German Economy** for the non-contact Chip card

Since 1988. Bonn/Berlin: **Member of the Research and Development Committee of the DIHK** (Head of German Commercial Chambers)

1989, Berlin: **Chairman of the association "Free Elections GDR",** first public presentations on the "fair economy" with representatives of the GDR citizens' movement

1996. Helsinki: **ESCAT- European SmartCard prize**

1997. Darmstadt: **GMD SmartCard prize** of the Society for Mathematics and Data Processing for smart card inventions

1999, Hamburg: Completion of the work **"Humatics"** (operability of knowledge, Thermoeconomics)

1999, Berlin: Awarded the **Federal Service Cross** of the Federal Republic of Germany at an award ceremony by German President Johannes Rau

23. 2. 2001, Wittringen: Awarded the **Rudolf Diesel Gold Medal** for extraordinary achievements as an inventor at an award ceremony by First Minister Clement

March 2001, Berlin: **Book, Das Humanpotential**, Wissen und Wohlstandswachstum (Human potential, knowledge and prosperity) ISBN 3-89700-142-X, Berlin, VWF Verlag für Wissenschaft und Forschung GmbH

6. Sept. 2001, Helsinki: **Member of Hall of Fame** of ESCAT for latest achievements in the measurement of human knowledge

24. Oct. 2001, Neuss: Awarded the **Prize of Innovation** for exploring the operability of knowledge by Netz innovativer Bürger and Bürgerinnen (network of innovative citizens)

Dec. 2003, Berlin: **Book, Geld und Wissen**, (Money and Knowledge), Weißensee Verlag, ISBN 3-89998-021-2 (www.weissensee-verlag.de)

Further information: **www.Hans-Diedrich-Kreft.de** and **www.humatics.de**