PAPER PRESENTED AT THE 6TH WORLD CONGRESS ON THE MANAGEMENT OF INTELLECTUAL CAPITAL
JANUARY 15-17, 2003
HAMILTON, ONTARIO, CANADA

INTELLECTUAL CAPITAL RESEARCH – RIGOR OR RELEVANCE

A DISCOURSE ON THE SCIENTIFIC FOUNDATIONS OF THE IC MOVEMENT

DANIEL ANDRIESSEN [a*]

[a] *Nyenrode University, The Netherlands Business School*

Abstract

Intellectual Capital (IC) is a subject studied by academics mainly working in the field of management research. The academic nature of management research has been the subject of huge debates within the discipline. The debate focuses on the relevance of management theory as developed by the academic community, as well as on the rigor of management theories presented in popular literature: the dilemma of "rigor or relevance". This paper reconciles this dilemma by introducing two approaches to intellectual capital research: IC research as an explanatory discipline and IC research as an design discipline. It states that there is room for both in academic intellectual capital research.

Keywords: Intellectual Capital, Methodology, Epistemology, Management Research

* Corresponding author. Daniel Andriessen, Van der Marckstraat 9, 2352 RA, Leiderdorp, the Netherlands. Tel: 0031-71-5899160; Fax:0031-71- 5424911; E-mail: Andriessen.daan@freeler.nl; Web: www.weightlesswealth.com.

1. Introduction

The popularity of intellectual capital (IC) as a business issue has primarily been sponsored by practitioners (Bontis, 2002). But there seems to be a growing interest from the academia. According to Bontis the academics state of the field is in its embryonic stage and its research is primarily of the anecdotal variety. He argues researchers need to pursue more empirical research (Bontis, 2001). What kind of research should that be?

Academics wanting to study intellectual capital face the following dilemma. On the one hand companies need to solve many important problems in the field of intellectual capital, ranging from a better understanding and control of their intangibles to more meaningful reporting systems for their stakeholders. These are difficult, contingent and contextual problems for which there are no universal solutions. On the other hand academics need to do rigorous academic research to help better understand intangible phenomena and design better solutions. This requires a certain rigor in the way the problems are addressed which often leads to results that have limited use in practice. Schön (1983, p. 42) describes this as the dilemma of "rigor or relevance".

"This dilemma of rigor or relevance arises more acutely in some areas of practice than in others. In the varied topography of professional practice, there is the high, hard ground where practitioners can make effective use of research based theory and technique, and there is the swampy lowland where situations are confusing 'messes' incapable of technical solution. The difficulty is that the problems of the high ground, however great their technical interest, are often relatively unimportant to clients or to the larger society, while in the swamp are the problems of greatest human concern. Shall the practitioner stay on the high, hard ground where he can practice rigorously, as he understands rigor, but where he is constrained to deal with problems of relatively little social importance? Or shall he descent to the swamp where he can engage the most important and challenging problems if he's willing to forsake technical rigor?"

The purpose of this paper is to reconcile this dilemma. Trompenaars and Hampden-Turner (1997, p. 199) describe reconciliation as a process of "*be ourselves but yet see and understand how the other's perspective can help our own*." It combines the strength of the two extreme positions of a dilemma to create synergy. It involves thinking not in terms of either/or but through/through: improving relevance through rigor and improving rigor through relevance.

This can be done by allowing room in intellectual capital research for two reinforcing approaches. Intellectual capital research can be practiced as an *explanatory discipline*, studying organizations with the intention of describing, explaining and predicting the effect of intellectual capital on business results. Or it can be practiced as a *design discipline*, developing methods to improve intellectual capital measurement and management. Both can be done in a scientific [1] way, providing the researcher follows sound academic standards.

The object of study of intellectual capital research is the collection of intangible resources of organizations. These are phenomena that are part of the social world - the array of non-physical phenomena produced by interacting human beings - as opposed to the natural world - the array of physical phenomena. Therefore intellectual capital research is part of the social sciences as opposed to the natural sciences. To better understand how the social sciences work and what their object of study is we first need to understand how people make sense of the world around us.

2. How people make sense

In May 2000 my colleagues at KPMG and me were preparing a conference on new ways of doing business in a new economy. In one of the meetings we discussed the themes we wanted to address, until my colleague Steve, who was the supposed chair for the conference, said: "now I am utterly confused. We are talking about the current economy as 'new economy', 'knowledge economy', 'intangible economy' and 'network economy'. Which one is it?!"

The truth is that all of these descriptions of the economic world probably are right. How can that be? In fact it happens all the time. Through the use of language we create distinctions with regard to the world out there that give us insight, allow us to make predictions and create the foundation for our actions. This is a process we call sensemaking. People constantly try to make sense of the world by means of interpretation: the process of making distinctions through the use of words and their rules for usage.

"The act of indicating any being, object, thing, or unity involves making an act of distinction which distinguishes what has been indicated as separate from its background. Each time we refer to anything explicitly or implicitly, we are specifying a criterion of distinction, which indicates what we are talking about and specifies its properties as being, unity, or object. This is a commonplace situation and not unique: We are necessarily and permanently immersed in it." (Maturana and Varela, 1987, p. 40).

So when we refer to the economy as a 'knowledge economy', we make an act of distinction by distinguishing between economies in which knowledge as a means of production plays a vital role and economies in which this is not so much the case (like in an agricultural economy).

This process of making distinctions should be understood as a two way process. People interpret phenomena based on previously gained knowledge and experiences embedded in their frame of reference. At the same time this frame helps us to construct the phenomena we observe. *"The world is brought forth in language. Still, we do not first have a language and then name things with it. Rather, the world and language shape one another."* (Von Krogh and Roos, 1995, p.53).

For example, once we have chosen to describe the current state of the economy as 'the knowledge economy' our attention is drawn to phenomena, like the knowledge intensity of companies and products and the rise of the knowledge professional (Tissen et. al, 1998). These phenomena do not exist as such in reality but are brought to light through words we have chosen to use. If we choose different words, like 'network economy', we will recognize other phenomena like the growing importance of alliances and partnerships.

In my view observation of the world out there is not a passive activity. There is no such thing as an objective reality that speaks out on its own and only needs to be observed. Instead the only way we can "observe" reality is by actively using language to create distinctions that separate one array of phenomena from another. Our distinctions guide our observations. "*The world does not speak. Only we do. The world can, once we have programmed ourselves with a language, cause us to hold believes. But it cannot propose a language for us to speak. Only human beings can do that.*" (Rorty, 1989, p.4).

As a result, when trying to make sense of the world we do not try to create a representation or picture of the world in our mind. "*In fact, the human mind does not represent the world. Rather, it brings forth, or forms the world as a domain of distinctions that are inseparable from the structure of the cognitive system*." (Von Krogh and Roos, 1995, p. 53).

3. How sets of distinctions are selected

The making of new distinctions is guided by previously gained knowledge and experiences. "*Knowledge enables distinction making and distinctions, in turn, enable (the development of) knowledge*." (Von Krogh and Roos, 1995, p. 54). This process already starts when babies are born and are being taught to distinguish between light and dark, hot and cold, up and down, good and bad.

This process of sensemaking is unique for every individual since every person is unique with regard to the knowledge and experiences gained in life. People's choice for using a particular set of distinctions is influenced by cultural background, upbringing, education and experiences. "*Everything said is said from a tradition*", says Varela (1979, p.268). That's why a remark or statement often tells us as much about the person who made it as it does about the phenomenon he or she is referring to.

People's choice for a particular set of distinctions is often not a pure rational one, but based on intuition ("it doesn't feel good"), normative preferences ("I don't like that word"), sense of beauty ("This distinction produces a nice symmetrical matrix"), or goal orientation ("Raising attention to this phenomenon is not in my interest"). Also, in selecting the right words, the whole array of connotations of a particular set of words plays an important role.

> This might explain the why many intellectual capital models use different constructs: IC= Human Capital + Structural Capital (Edvinsson & Malone, 1997); IC= Human Capital + Structural Capital + Customer Capital (Stewart, 1997), IC= Human Capital + Structural Capital + Relation Capital (Bontis, 2002); IC=Individuals' Competence + Internal Structure + External Structure (Sveiby, 1997); IC= Human Capital + Intellectual Assets (Sullivan, 2000). It is partly because the author wants to emphasize a particular phenomenon and partly because of non-rational considerations as described above.

4. Why scientific progress in social research is difficult

So far I have used the phrase 'the world out there' when talking about the phenomena that a set of distinctions refers to. But we need to differentiate between making distinctions with respect to the natural world and the social world. These worlds are two very distinct sets of phenomena. The biggest difference being that the social world doesn't exist like the natural world does.

Natural scientists often complain about the lack of scientific rigor of the social sciences. I state that the kind of scientific progress that seems to exist in natural sciences is impossible in social sciences. Social sciences study an object that doesn't sit still while being observed, like nature does [2].

Instead the object under investigation is a set of unities (human beings) that itself is constantly in a process of sensemaking; a process that is unique within every individual. The behavior of this object is guided by this sensemaking process and by the object's intuition and feelings. No wonder this object does not behave according to general laws, and interpretation of its behavior is a problem of *equivocality* (Weick, 1995).

In fact it is the object under investigation that continuously creates the social world. Therefore the social world as such doesn't exist. It is created through sensemaking, communication and action and can take almost any shape, depending on how one chooses to look at it. "*The social world ontologically is the accumulation of people's internalized images of that world*" (Van Aken, 1996, p.16, translation DA).

'Organization', 'Management' and also 'Intellectual Capital' are examples of phenomena in the social world. They do not exist unless people refer to them that way. What is referred to depends on one's definition. Intellectual capital was not waiting out there to be discovered. The concept was constructed and practitioners and academics are now constantly trying to prove it is a useful concept to either explain phenomena or improve business performance.

Mankind has constructed the social world from the time he was able to communicate, putting layer upon layer of sensemaking systems. These layers include economics, law, science and religion and have shaped the way we think and act. As a consequence, the social world can be described by almost an infinite number of sets of distinctions – some of them contradictory, others overlapping - as the history of the social sciences has proven.

This is not caused by the immaturity of the social sciences but by the characteristics of its object of study. In response to the critique of the natural scientists one can argue that practicing social science is more difficult than natural science, since the social researcher first needs to construct reality before he or she can study it. For intellectual capital research this means the researcher first needs to carefully define the concepts used and then operationalize them to make them observable before he or she can study this phenomenon.

5. What intellectual capital research should be all about

We have seen that knowledge about social phenomena like intellectual capital is created by constructing a social reality using sets of distinctions. Intellectual capital research uses distinctions like human capital, structural capital and relation capital to create a new way of looking at organizations and construct phenomena that until recently did not exist in that particular form.

If indeed we continuously shape the world as we experience it by selecting our own preferred distinctions in a rather subjective way, does that mean that 'anything goes'? (Feyerabend, 1993). Is any set of distinctions as good as any other? Obviously that is not the case. But what makes one set of distinctions better than others? To answer this question we first need to know: Better for what? Remember the question my colleague Steven asked: What description of the current economic situation should we use? The answer depends on what we want to use it for. In general distinctions can be used in research for two rather distinct purposes (Van Aken, 2000):

- A set of distinctions can be used to create theories that describe, explain and predict the world out there. This is the purpose of the *explanatory sciences* such as the natural sciences and major sections of the social sciences. An example is the research by Bontis (1998) exploring the impact of intellectual capital on business performance.
- The same set of distinctions can be used to diagnose a situation, define the problem and design practical methods to improve the situation. This is the purpose of the *design sciences*, such as the engineering sciences, medical science, and modern psychotherapy. An example is the work of Andriessen and Tissen (2000) and Andriessen (2002) designing and evaluating a method for the measurement of intangible resources.

A particular set of distinctions like intellectual capital can be used to various degrees for either one of the two purposes (or for both at the same time). It can be used to create *empirical propositions* that describe, explain or predict reality. And they can be used to create *practical propositions* that diagnose situations, define problems or offer practical methods. The extent to which a set of distinctions like IC is able to produce propositions for descriptions, explanations and predictions I will call the *empirical claim* of that set. The extent to which a set of distinctions is able to produce propositions to diagnose a situation, define a problem and design practical methods I will call the *practical claim* of that set.

Using this division between empirical and practical claims we can see that a set of distinctions can be used to create different kinds of propositions. We can describe a situation and create *empirical theory* that – by using causal relationships – can provide explanations and predictions. For example the term intellectual capital can help us in explaining why companies with little physical or monetary assets can create a lot of added value.

Or we can diagnose a situation and design *practical methods* that – by using a series of consistent steps – can create solutions for improvement problems (figure 1). For example, the concept of intellectual capital can help us to diagnose whether a company manages the right things and it can be used to design better management tools.

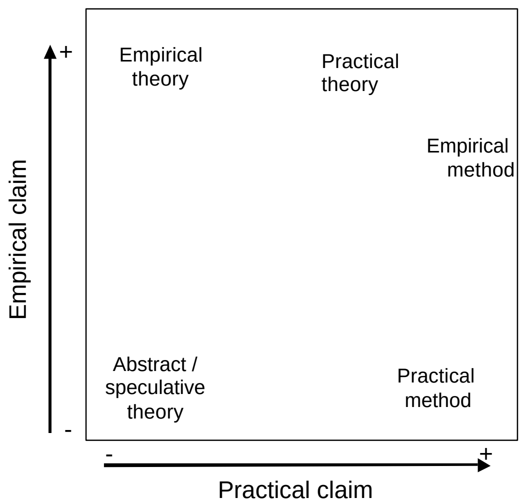

Figure 1 Different purposes for a set of distinctions

So we have seen that a set of distinctions can have two purposes: to produce empirical propositions and/or practical propositions. We can now test whether a particular set of distinctions is a good one. Intellectual capital research should be all about testing empirical or practical propositions based on IC distinctions. But the test should be different for each of the two types of propositions.

6. How intellectual capital research can be practiced as an explanatory discipline

The scientific testing of empirical propositions follows a procedure that often is called the 'empirical cycle' (Swanborn, 1981). A set of distinctions is used to observe phenomena and to create empirical propositions formulated in a research question. The distinctions are then used to create an empirical theory by means of induction and deduct testable hypotheses. These hypotheses contain predictions about the expected state of these phenomena that can be falsified by research.

A research-design is chosen to test the hypotheses, for example statistical testing using data gathered through the use of questionnaires. In order to test the hypotheses, their variables first need to be made observable and – in many research-designs – measurable. This step is called the operationalization of the variables. An operationalization theory is required to underpin the validity of the operationalization. The state of the variables can be observed, either qualitative or quantitative. The results are evaluated, which leads to a conclusion about the validity of the theory and thereby of the empirical proposition (see figure 2).

This seems to be a logically consistent and compelling procedure that automatically leads to validation, but closer inspection shows it is not. There is a hole in this empirical cycle, especially when it is applied to the social world. This hole is situated in the operationalization. We cannot prove the validity of the operationalization theory. We can never prove that we accurately measure what we want to measure.

If we find that the results of an observation are different from what was expected, it follows from the empirical cycle there are three possible causes (see feedback arrows in the left side of figure 2):

- We have falsified our hypotheses and therefore need to alter our empirical theory;
- We have failed to measure what we wanted to measure and therefore need to alter our operationalization theory;
- We made errors in our observations and need to correct those.

The problem is we will never know for sure which mistake was made. The best we can do is to have a group of scientific practitioners agree upon the validity of the operationalization and the accuracy of the observations, so to be able to falsify or not falsify a theory. If this is true then this conclusion leads to a 'consensus theory' of truth with regard to the empirical proposition of the set of distinctions.

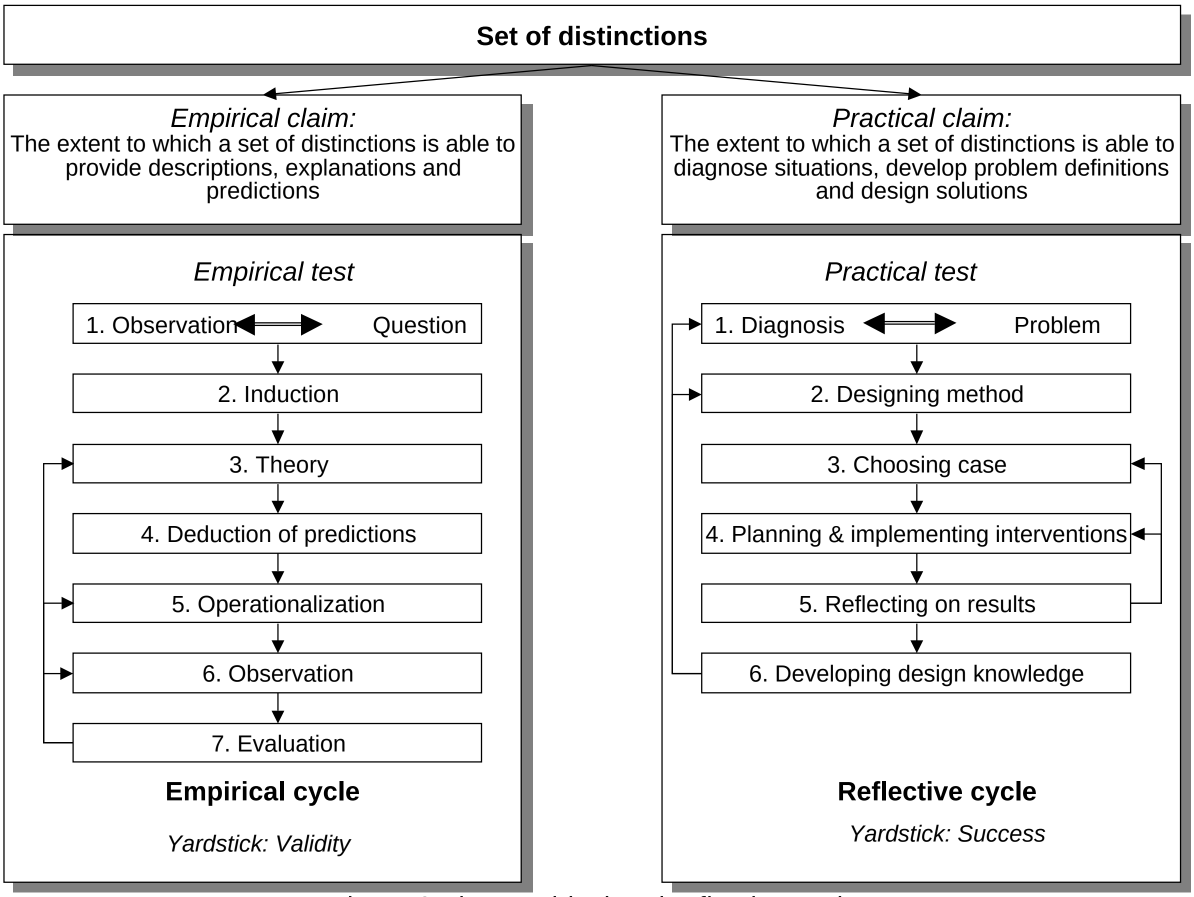

Figure 2 The empirical and reflective cycle

How could we scientifically test the empirical propositions that can follow from the distinction created by the term 'knowledge economy'? The prediction it could make is that the current economy is more knowledge intensive than all previous ones. To test this prediction we need to operationalize the variable 'knowledge intensity' and measure it throughout history. If we find that today's economy is not the most knowledge intensive, it follows from the empirical cycle that there are three possible conclusions that can be drawn:

- Our empirical proposition is invalid;
- We didn't measure 'knowledge intensity' correctly and therefore need to alter our operationalization theory before we can test the empirical proposition;
- There are errors in our data (e.g. because of lack of appropriate historical data) and need to do better observations.

7. How intellectual capital research can be practiced as a design discipline

The 'reflective cycle' (Van Aken, 2000) is the process for the scientific testing of practical propositions (See figure 2). In the reflective cycle a set of distinctions is used to diagnose a class of situations and define a class of problems. A practical method is designed to provide a general solution for the class of problems. At this stage the solution will still be context independent.

To test it, the method needs to be translated in the context of a specific case. So the next step is the selection of a case in which the method is used to solve the case-specific problem, using the problem solving or regulative cycle. *"This cycle consists roughly of: defining the problem are out of its "messy" context, planning the intervention, applying the intervention and evaluating."* (Van Aken, 2000, p. 6). This cycle is used to plan and implement interventions that will hopefully solve the problem in this specific case.

The next step in the reflective cycle is reflection on the results of the case. This leads to the development of so-called design knowledge, i.e. knowledge that can be used in designing solutions to the class of problems (Van Aken, 2000). It might lead to improvements in the method or to alterations in the way the class of situations is diagnosed or the class of problems is defined. Reflection might also lead to the conclusion that the problem in this specific case was not part of the class of problems for which the method was designed.

The reflective cycle is used several times, generating indications and contraindications for the success of the method. Further knowledge is developed about the application domain of the method: the class of problems and the class of contexts for which the method will be able to provide a solution. The conclusions that can be drawn from the evaluation of the tests are ambiguous, as was the case with the testing of empirical propositions. When the results of an implementation are different from what was expected, it follows from the reflective cycle that there are four possible causes (see feedback arrows in figure 2):

- We made the wrong diagnosis and defined the wrong problem;
- We designed an unsuccessful method;
- We picked cases outside of the application domain of the method;
- We didn't apply the method correctly.

In most cases it will be quite difficult to find out what the mistake was. In IC research we have the advantage that we can ask the object under investigation about his or her experiences. This can create insight into the particular organizational and context variables that influence the success of the intervention. But even this will not lead to a decisive and compelling conclusion.

> How could we scientifically test the practical propositions based on the distinction created by the term 'knowledge economy'? As we saw above, a *practical proposition* of the distinction could be that the main driver for success for companies is knowledge and when there is a lack of knowledge companies need to invest in knowledge development and knowledge management.

We would have to diagnose the knowledge intensity of a number of companies and design an intervention to improve it, for example through implementing knowledge management. Then we would have to find and number of cases where this is a problem and in each case we would have to make a design for knowledge management and its implementation. In each case local circumstances would have to be taken into account. As a result each design would be unique.

Then we would have to implement the designs. An evaluation of each case would show whether the intervention was successful. Since the practical proposition was that knowledge drives business success, this would have to be the dependent variable that we use to judge the success of the intervention. If we find that our interventions didn't improve the business success of the companies involved, it follows from the reflective cycle that there are four possible conclusions that can be drawn:

- Knowledge intensity isn't an important independent variable for business success;
- Knowledge management is not a good method to improve knowledge intensity;
- In the cases studied knowledge intensity wasn't a problem so the cases were not part of the application domain of the method;
- In the various cases we didn't design or implement knowledge management properly.

8. How both approaches can reinforce each other

The purpose of IC research practiced as an explanatory discipline is to produce empirical theories that are tested and have proven to be valid. It is the purpose of IC research practiced as a design discipline to produce practical methods that are tested and have proven to be successful in solving problems. So an important difference between the two approaches is the yardstick used for finding truth (see below).

But there is also an important thing the two approaches have in common. They both involve the use of cause-effect statements. Theory, as used in the empirical cycle, can be described as "*a set of interconnected general and specific statements, of which at least some are statements predicting certain events under certain conditions*" (Swanborn, 1981, p. 89-90, translation DA). So a theory includes a number of cause-effect statements. Some of them are formulated as predictions or hypothesis that are tested through observation.

A practical method is based on means-end statements that provide guidelines about a finite number of acts to be performed in order to reach a specific end. Their general form is "If you want to achieve Y in situation Z, then something like action X could help". Means-end statements are a specific type of cause-effect statements. According to Kuypers, means are chosen causes and ends are intended effects (1984, p. 177, translation DA).

This is where the two approaches complement each other. The explanatory approach can provide causal models that can be used by the design sciences to ground means-end statements. The design approach can, by testing which means-end statements are successful in practice, provide an indication for the validity of cause-effects statements, give information about the specific context in which they are valid and point towards independent variables that are missing in the empirical theory.

Not only practical methods that are based on tested and grounded means-end relationships should be called scientific. Practical methods can be very successful while the causal relationships are unclear, un-testable or different for each case. When their success is tested in practice in a scientific way, following scientific rules and procedures, they can still be called to be scientifically legitimate (see figure 3).

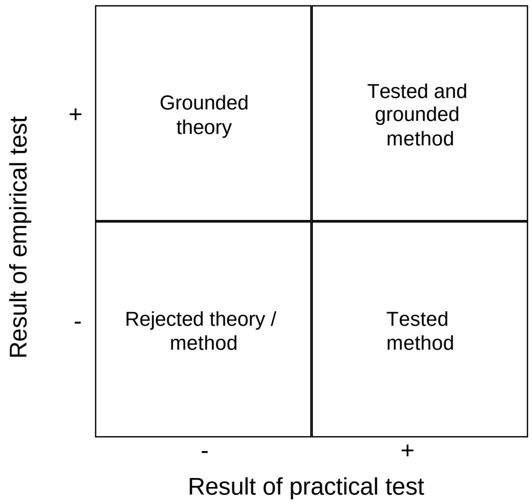

Figure 3 Results of applying empirical and/or practical scientific tests

When a theory fails to pass the empirical test, it is rejected, as is a practical method that fails the practical test. If a theory passes the empirical test, we can say it is grounded. If that theory is the basis for a practical method and that method turns out to be successful in solving problems, the practical method is a tested and grounded method. If a practical method is successful in solving problems and it is not based on grounded causal relationships, it is a tested method. Chinese medicine (Van Aken, 2000) and homeopathic medicine are examples of systems of very powerful, tested means-end relationships that are not based on scientifically grounded causal relationships.

9. When intellectual capital research can be considered scientific

This paper is a contribution to the science of intellectual capital research. Science is a specific way of making sense that is different from ordinary sensemaking because it follows its own rules. "*The system of science brings forth its own world of scientific exploration and proof*." (Von Krogh and Roos, 1995, p. 63). The sets of distinctions scientists use are the building blocks for creating theories, formulating hypotheses, drawing conclusions or designing methods.

There are as many different views on the rules of scientific method as there are scientists. Yet, common in these views is that the scientific process of sensemaking should be somehow structured, internally consistent and aimed at testing the validity of its conclusions. My personal rules for science include the following:

- Use an internally consistent set of distinctions with clear definitions of the concepts used;
- Make the assumptions used explicit, including those on epistemology;
- Formulate a clear research question *or* design problem, and deliver precise answers;
- Attempt to test the propositions (either empirical or practical) that result from the distinctions used, using the appropriate tests;
- Use a structured, step-wise method for testing that is made explicit.

10. What the truth is about the truth

The debate about the nature of truth has been going on for over 2000 years. Dominant in the Western way of thinking is the 'correspondence theory of truth' that states that the criterion for truth is ‘correspondence with reality’. This theory presupposes a reality with certain characteristics that speak out for themselves and allow for collation with our representations. This theory does not fit with a view as described above in which the world as we experience it is continuously shaped by the distinctions we decide to apply to it (Von Krogh and Roos, 1995). So there is a need for a better criterion of truth. The division between the empirical and practical propositions suggests there can be in fact two alternative and equally legitimate criteria for truth.

First, an *empirical proposition* of a set of distinctions is true if observations based on that set validate predictions derived from that proposition. This we may call the *contextual validity criterion* of truth. The word contextual acknowledges the fact that the validity can only be contextually observed through the same distinctions used to construct the proposition.

Second, a *practical proposition* of a set of the stations is true if action based on that proposition leads to success as defined by that proposition. This we may call the *contextual success criterion* of truth. This to acknowledge the fact that the success can only be contextually defined via the distinctions used to construct the proposition.

These two criteria for truth are equally legitimate and together can be seen as an alternative to the correspondence theory of truth; an alternative in line with a world view in which the world as we experience it is constantly being shaped by the distinctions we use. Both can be used in intellectual capital research. Academics that want to practice IC research as an explanatory discipline will use the *contextual validity criterion* of truth as their yardstick when testing hypothesis explaining the impact of IC on business performance. Academics that want to practice IC research as a design discipline will use the *contextual success criterion* of truth when checking the success of their methods for managing or measuring IC.

11. Conclusion

Intellectual capital research can be as scientific as any other social research. It can be practiced as an *explanatory discipline*, studying organizations with the intention of describing, explaining and predicting the effect of intellectual capital on business results. Or it can be practiced as a *design discipline*, developing methods to improve intellectual capital measurement and management. Both can be done in a scientific way, providing the researcher follows sound academic standards.

In the field there is a need for both, as the two approaches can reinforce each other. Intellectual capital research practiced as an explanatory discipline can help to ground means-end statements that are part of IC methods. Intellectual capital research practiced as a design discipline can provide indications for the validity of IC theory and point towards independent variables that are missing.

There is a strong need for empirical research in intellectual capital. But the research should not be limited to quantitative explanatory research. Academics should put as much effort in designing and testing solutions to practical and important problems, which most often involves planning interventions in specific cases and descending into "the swampy lowland where situations are confusing 'messes' incapable of technical solution". This too can be done scientifically but this requires rigor methods for designing and testing methods. But if it is done that way it deserves as much academic credit as quantitative explanatory research.

Notes

[1] In this paper I follow Van Aken (2000) and use the term 'scientific' like the German word 'wissenschaftlich' or the Dutch term ' wetenschappelijk', meaning 'according to sound academic standards'; thus its meaning is not confined to the natural sciences.

[2] As we know from quantum-mechanics the natural world doesn't sit still either when being observed.

[3] A set of distinctions can also be used to build systems of propositions that are “empirically void" but internally logical consistent. This is what is happening in the *formal sciences* like mathematics. This application is not relevant for the purpose of this study (Van Aken, 2000).

References

Aken, J.E. van (1996), ‘Methodologische vraagstukken bij het ontwerpen van bedrijfskundige systemen’, Bedrijfskunde, jaargang 68/2, p. 14-22.

Aken, J.E. van (2000), ‘Management Research based on the Paradigm of the Design Sciences; The Quest for tested and Grounded Technological Rules’, (unpublished draft 26 september 2000).

Andriessen, D. and Tissen, R., (2000), Weightless Wealth; Find Your Real Value in a Future of Intangible Assets, Financial Times Prentice Hall, London.

Andriessen, D. (2002), The Financial Value of Intangibles; Searching for the Holy Grail, Paper presented at the 5th World Congress on the Management of Intellectual Capital, McMaster University, Hamilton, Ontario.

Bontis, N. (1998), Intellectual Capital: An Exploratory Study that Develops Measures and Models, Management Decision vol 36 no 2, pp. 63-76.

Bontis, N. (2001), Assessing Knowledge Assets: A review of the models used to measure intellectual Capital, International Journal of Management Reviews, Volume 3 Issue 1, p.41-60.

Bontis, N. (2002), "Managing Organizational Knowledge by Diagnosing Intellectual Capital: Framing and Advancing the State of the Field", in Bontis, N. (Ed), World Congress on Intellectual Capital Readings, Butterworth Heinemann, Boston, pp.13-56.

Edvinsson, L. and M.S. Malone (1997), Intellectual Capital: Realizing Your Company's True Value by Finding Its Hidden Brainpower, HarperBusiness, New York.

Feyerabend, P. (1993), Against Method, Verso books, London.

Kuypers, G. (1984), Beginselen van Beleidsontwikkeling, Coutinho, Muiderberg.

Krogh, G Von. and J. Roos (1995), Organizational Epistemology, Macmillan Press, London.

Maturana, H.R. and F.J. Varela (1987), The Tree of Knowledge; The Biological Roots of Human Understanding, Shambhala Publications, London.

Rorty, R. (1989), Contingency, Irony and Solidarity, Cambridge University Press, New York.

Schön, D.A. (1983), The Reflective Practitioner, Basic Books Inc, New York.

Stewart, T.A. (1997), Intellectual Capital; The New Wealth of Organizations, Doubleday, New York.

Sullivan, P.H. (2000), Value Driven Intellectual Capital: How to Convert Intangible Corporate Assets Into Market Value, John Wiley & Sons, New York.

Sveiby, K.E. (1997), The New Organizational Wealth: Managing & Measuring Knowledge-Based Assets, Berrett-Koehler Publishers, San Francisco.

Swanborn, P.G. (1981), Methoden van sociaal-wetenschappelijk onderzoek, Boom Meppel, Amsterdam.

Tissen, R., D. Andriessen, and F. Lekanne Deprez, F. (1998), Value-based Knowledge Management; Creating the 21st century company: knowledge intensive, people rich, Addison-Wesley Longman, Amsterdam.

Tissen, R., Andriessen, D. and Lekanne Deprez, F. (2000), The Knowledge Dividend, Financial Times Prentice Hall, London.

Trompenaars, F and C. Hampden-Turner (1997), Riding the Waves of Culture, Nicholas Brealey Publishing, London.

Varela, F.J. (1979), Principles of Biological Autonomy, Elsevier, Amsterdam.

Weick, K.E. (1995), Sensemaking in Organizations, SAGE Publications, London.