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The emergent properties of intellectual capital

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Publication date:
2007

Document Version
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

Citation for published version (APA):
Nielsen, C., Dane-Nielsen, H., & mårtenssen, M. (2007). The emergent properties of intellectual capital: a conceptual offering. Paper presented at Visualising, Measuring and Managing Intangibles and Intellectual Capital, Ferrara, Italy.

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The emergent properties of intellectual capital:

A conceptual offering

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Abstract

An immense amount of research has been conducted within the field of intellectual capital during the past decade. Contributions have focused on uncovering aspects such as the management, leveraging and the reporting of intellectual capital. Much attention has been directed towards problems of accounting for intellectual capital and at the ways in which the value of intellectual capital at one level of an organization influences the value of intellectual capital at higher or lower levels of the organization. However, despite much focus, theory within this field is still in its infancy. In this paper, we propose an understanding of intellectual capital through the theoretical lens of emergent properties. We argue that the inherent difficulties of understanding the interdependencies of intellectual capital across different levels of organization can be traced to a lack of understanding of the differences between synergetic effects, causal relationships and emergent properties. This conceptual offering concludes that perceiving intellectual capital from the perspective of emergent properties contributes to eliminating a series of basic misunderstandings in connection with accounting for the value of intellectual capital and therefore offers a sound theoretical basis from which we may widen our knowledge of this field.

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1. Introduction

An immense amount of research has been conducted within the fields of intellectual capital and intangibles during the past decade. Looking back at this debate, it becomes evident that the interest in gaining a better understanding has emerged in a variety of different settings. Standard-setting bodies and several non-government organizations have e.g. been interested in gaining insight into how intangibles will affect accounting practices, while academic contributions have sought to verify valuation and accountability problems. In parallel, private organizations as well as government organizations in collaboration with researchers have experimented with their own models of intellectual capital reporting and management.

However novel and interesting this field has been, and however many contributions that have emerged, a recent global symposium gathering the most prominent thinkers and researchers, confirmed that sound theoretical contributions within this realm are more or less non-existing. Despite the fact that previous contributions have focused on, and to some extent been successful in uncovering aspects such as the importance of managing intellectual capital, leveraging intellectual capital in relation to value creation and the reporting of intellectual capital to external stakeholders and shareholders, the extent and strength of theorizing is still criticisable.

The development of theory in the field of intellectual capital must be based on interdisciplinary research. To understand organizational value creation it is vital to understand the significance of intangibles and intellectual capital as different types of knowledge and to understand that knowledge exists in different forms and therefore operates in different ways. In this manner, such notions also become crucial for understanding the value of the organization seen from the organizational perspective and the value of the organization seen from a market perspective. Hence, although intellectual capital theory by tradition is directed towards the fields of business economics and accounting, the field inevitably also draws upon elements of microeconomics, sociology and social psychology, as such fields become important in order to position intellectual capital from a research perspective.

Much uncertainty in relation to the understanding of intellectual capital stems from the fact that unlike e.g. in the traditional accounting regime, it is not possible to add and subtract the value of intellectual capital and transfer value from one level of the entity to another, e.g. from departmental level to corporate level. From a literature review we find that there are at least three relevant levels concerning intellectual capital, namely the individual level, the

organizational level and the market level. In the remainder of this article we take our point of departure in these three levels.

Individual knowledge is characterized by personal intellectual abilities. One peculiar property of these abilities is that they are present in the organization during the day, but disappear in the case where that individual leaves the organization; either to go home or to leave it entirely. In order to maintain that particular knowledge within the organization, such knowledge has to be passed on to someone else or another type of knowledge container, e.g. a piece of paper or a computer. The effect of individual knowledge can be measured at the individual level (e.g. IQ, specific competences or performance), but the impact from individual knowledge on value at the organizational level is not that easy to recognize.

Intellectual capital at the organizational level must to some extent emerge from a process where individual level knowledge acts as components with structural mechanisms in the form of communication and the environment consisting of other structural properties of the organization. However, it is undisputable that intellectual capital at the organizational level has different properties than merely the sum of individual knowledge within the organization. In this manner, indicators measuring organizational level performance may show a picture of intellectual capital at organizational level but without indicating individual level knowledge. The individual knowledge does not disappear, but is embedded in the organizational structure. Thereby organizational interrelations and command structure define the way in which the organization operates and thereby constitute the mechanisms for the emergence of organizational properties. Finally, estimating the value of intellectual capital from a market perspective constitutes yet another and higher level of analysis.

While existing theorizing in the field of intellectual capital is found to be inadequate with respect to offering a framework that incorporates and addresses the problems of different levels of analysis, we suggest that the perspective of emergent properties may solve such difficulties. The starting point for the emergent properties perspective is that phenomena at different levels of analysis have different characteristics, unique patterns of behaviour or have other specific properties. Thus, higher level properties are often not explainable by the properties of the lower level elements that cause the phenomenon. It is said that novel properties have emerged. The emergence of new properties from one level to another is a result of a process where subunits react in a process according to particular mechanisms under influence of the initial conditions determined by the environment for the process.

We wish to stress the importance of shifting the basis for intellectual capital research from self-generating and self-reflective literature to solid knowledge of true scientific facts from the various relevant disciplines. We therefore believe that this approach holds the potential for

seminal research within the field of intellectual capital and intangibles. The remainder of this paper is structured as follows: Section 2 describes the foundations of emergentism and leads to the description of our model of analysis in section 3, namely the emergent properties perspective. Section 4 discusses and analyses existing research in the field of intellectual capital reporting and management from an emergent properties perspective. Finally, we conclude with respect to the contribution of our analysis to the understanding of the emergent properties of intellectual capital.

2. The foundations of emergentism

It is known from various fields of science; in particular from biology that nature develops into a number of different levels and that natural phenomena can be referred to these specific levels. For instance, in biology cells are subunits of organs and organ systems are subunits of the human organism. In the social world we find similar different levels. Boulding (1956) refers to such levels from a general systems theory perspective, eventually identifying nine different levels, which are applicable in the discussion of the general relationships of the empirical world. In an analogy of the biology example above we can refer that individuals are subunits of organizations. An organization's characteristics are thus made up of a series of properties from a process beginning with the individuals' (subunits) knowledge and skills, moving through group practices and traditions to organizational value creation through a number of mechanisms consisting of communication and organizational infrastructure.

Many classic authors in the field of sociology have expressed ideas regarding the intricacies of different aspects relating to different levels of analysis. Among such contributions, we find Simmel, who operates with two different sociological levels of analysis, namely the psychological components of social life and the importance of social interrelationships (see Ritzer 1996 for a thorough review). Simmel (1907) adopted the principle of emergence, which was the idea that higher levels emerge out of the lower levels and according to Ritzer's (1996, 158) analysis, this entails the creation of higher supra-individual formations as independent representatives for the interacting forces. Here the key message seems to be that a new entity which is qualitatively different emerges from the sum of the individual elements. We find a number of perspectives which relate to such notions, namely synergism, reductionism and holism. We will discuss later in the text how these perspectives differ from the perspective of emergent properties.

The notion of emergentism in sociology was developed as a consequence of the common recognition of emergent properties in physics, chemistry and biology, and more recently

among researchers within psychology. Emergentism is therefore not a new idea. For instance, as early as in 1843, Mill wrote in his 'System of Logic': "All organized bodies are composed of parts, similar to those composing inorganic nature, and which have even themselves existed in an inorganic state; but the phenomena of life, which result from the juxtaposition of those parts in a certain manner, bear no analogy to any of the effects which would be produced by the action of the component substances considered as mere physical agents. To whatever degree we might imagine our knowledge of the properties of several ingredients of a living body to be extended and perfected, it is certain that no mere summing up of the separate actions of those elements will ever amount to the action of the living body itself" (Mill 1843, book 3, chapter 6, paragraph 1).

Later, a number of British emergentists developed theories in the line of emergentism in the field of philosophy of mind, among them Alexander, who in his 'Space, Time and Deity' (1920) states that "mental processes are not merely neural but something new, it involves a distinctive quality which emerges, rather merely being a resultant from the neural process". Furthermore, he claims that "Emergent qualities are novel qualities that supervene on a distinctive kind of physico-chemical process" (Alexander 1920). This is one of the major points differentiating this theory from other classical sociological theories and theories in social psychology.

It has been argued that there is a broadly perpetrated fiction in modern society, which is compatible with the development of the political philosophy of natural rights, with classical and neoclassical economic theory, and with many of the intellectual developments (and the social changes which generated them) that have occurred since the seventeenth century. This fiction is that society consists of a set of independent individuals, each of whom acts to achieve goals that are independently arrived at, and that the functioning of the social system consists of the combination of these actions of independent individuals. Such notions are e.g. expressed in the economic theory of perfect competition in a market, according to Coleman (1990, 300) most noticeably in Adam Smith's imagery of the "invisible hand".

Opponents of such a systemic approach label themselves social individualists. Bunge (2000) argues that social individualists insist on studying only the components of social systems, that is, individuals, while ignoring their structure or set of connections. In other words, they do not wish to be mistaken for holists. In dealing with the behaviour of social systems, Coleman (1990, 2) initially claims that only in isolated cases do social phenomena directly derive from the behaviour of individuals and that it is the behaviour of the system or the behaviour of institutions as subgroups that has to be explained. In this manner he distances himself from the social individualist perspective.

In Coleman's (1990) systems theory there are a number of central elements relating to the role of the individual in relation to the system that we wish to emphasize. Firstly, the interaction among individuals is seen to result in emergent phenomena at the system level, that is, phenomena that were neither intended nor predicted (Coleman 1990, 5). Furthermore, action only takes place at the level of individual actors and organization action is derived via some sort of interdependence of individuals' actions, not merely from aggregated individual behaviour. Therefore, 'system level action' solely exists as an emergent property characterizing the system as a whole. Only in this sense can we talk of system behaviour. Nevertheless, system-level properties will result, so propositions may be generated at the level of the system (Coleman 1990, 28).

In the words of Knorr-Cetina (1981) we can therefore question whether collectives in fact have distinctive properties? While the physical sciences seem to recognize the distinction between molar properties, i.e. properties of collectives considered as individuals, and molecular properties, i.e. properties of components considered as lower-order individuals (Knorr-Cetina 1981, 142), there is no presumption in the physical sciences that the parts of the collective should exhibit the same range of properties as the collective itself.

Bunge (2000) describes an alternative to individualism and holism, which is in fact quite similar to emergentism. He claims "everything is either a system or a component of a system, and every system has peculiar (emergent) properties that its components lack" (Bunge 2000). He mentions that physical, biological and social systems normally are characterized by factors other than their components, environment, structure and mechanisms. According to Pepper (1926), such a theory of emergentism must involve three propositions: 1) that there are levels of existence defined in terms of degrees of integration; 2) that there are marks that distinguish these levels from one another over and above the degree of integration; and 3) that it is impossible to deduce the marks of a higher level from those of a lower level and perhaps impossible to deduce marks of lower level from those of a higher level. Emergentism therefore acknowledges that in the move between different levels of analysis, new and qualitatively different properties will arise from original components as a function of mechanisms, structure and environment.

In such a perspective, one is therefore forced to conceive of these phenomena as residing, not in the elements, but in the entity formed by the union of these elements. Durkheim (1982, 39) exemplifies this by arguing that the living cell contains nothing save chemical particles, just as society is made up of nothing except individuals. Yet it is very clearly impossible for the characteristic phenomena of life to reside in atoms of hydrogen, oxygen, carbon and nitrogen. Durkheim (1982) goes further in the line of realizing that emergent properties explain the change in the qualitative when individuals form higher level properties, when he

discusses the difference between psychology and sociology: "Social facts differ not only in quality from psychical facts; they have a different substratum, they do not evolve in the same environment or depend on the same conditions. This does not mean that they are not in some sense psychical, since they all consist of ways of thinking and acting. But the states of the collective consciousness are of a different nature from the states of the individual consciousness; they are representations of another kind. The mentality of groups is not that of individuals: it has its own laws" (Durkheim 1982, 40). Opposition to such a theory of emergentism seems to arise primarily from researchers who do work within sciences where intensions play a significant role and where it is often assumed that phenomena exist outside the physical world.

As mentioned previously, there are a number of perspectives which are sometimes mistakenly equivocated with emergent properties. Among these is synergism, which represents the idea that the whole is more than the sum of the effects from each individual part. Emergentism should not be understood as synergism even though the definition of synergism indicates that the resulting synergetic effect is larger than the sum of its parts. The efficiency gains from synergies appear at the same level and are of same nature. What is gained through synergy is of quantitative nature as subunits of synergy can be separated and function separately, but in emergentism subunits cannot produce the emergent properties separately and the outcome from the effect of emergentism is qualitative of nature. Emergentism is therefore different from synergism, because it represents something that is qualitatively different to the properties at a different level of analysis, e.g. that of lower-level components.

Emergentist theory is not holist theory although holist theory would include the emergent properties without clarifying the differences in qualitative nature at different levels. Holism does not incorporate an understanding of distinct levels of analysis, although a holistic approach attempts to operate with phenomena instigated by the actions of agents and social phenomena. In holist theory social phenomena can be viewed as the whole without the analysis of individual action, although the theory recognizes downward effects from social phenomena to individual action. Emergentism is therefore not equivalent to holism either, because emergentist theory explains phenomena as a result of the effects of subunits and mechanisms (for instance individuals and communication structures in an organisation) that emerge from one level to another and not just the effects of a non-defined "whole". While holism merely states that the characteristics of a system and its behaviour cannot be predicted simply from looking at the system's parts (Enigl 2003), an emergent property is a higher level property which cannot be deduced from or explained by properties of the lower-level entities.

Finally, a third alternative to emergentism is the reductionist point of view. Emergentism is a non-reductionist approach. The reductionist perspective solely attempts to explain phenomena at the organizational and the market level as caused by the effects of subunits alone and neglecting social action. Reductionist theory does not hold that phenomena at higher levels are the result of a process where components and mechanisms create new properties that do not exist at the lower level. Analysis and theory building based on subunits as the key elements in the reductionist causal upward explanation prove inconsistent with the reality in which these phenomena exist and insufficient in explaining why they exist. Nevertheless, in this reductionist point of view, the methodological individualism is the most predominant explanation type as an alternative to the popular holist view, where expressions as synergism along side methodological collectivism are being utilized indiscriminately and without formal definitions or specific purposes.

3. The emergent properties perspective

While the previous section illuminated the theoretical notions on which the emergent properties perspective rests, this section will introduce and describe in greater detail the framework which will be mobilized in the analysis of intellectual capital theory in section 4. Our point of departure is that phenomena at different levels of analysis have different characteristics, unique patterns of behaviour or have other specific properties. Thus, properties on a higher level are often not explainable by the properties of the elements at a lower level that cause the phenomenon. It is said that novel properties have emerged. The emergence of new properties from one level to another is a result of a process where subunits, which also could be named elements, entities or components, react in a process according to particular mechanisms under influence of the initial conditions determined by the environment for the process. Subunits are unable to produce the new emergent properties alone without the necessary mechanisms assisting the process and the environment in which the processes take place.

In this connection, it is important to state that emergent properties are phenomena in the physical and social reality. Therefore, the emergent property perspective offered here can be used in a model of the reality to be analyzed, i.e. as the basis for an explanation type. From the notion of emergentism it is understood that phenomena arise from a hierarchy of levels in nature and that properties at a higher level have emerged from the effects from lower-level entities. The transition from a lower level to a higher level takes place through a process caused by the effects from the properties of the lower level components and involving the necessary mechanisms and laws plus the environmental conditions allowing for the process

to take place. The resultant higher level properties differ from the properties found at the lower level. The effects of the higher-level properties cannot be reduced to the effects of lower-level properties because the processes involve structural mechanisms and a number of environmental factors influencing the processes. Thus higher level entities and phenomena cannot be predicted directly from the knowledge of the properties at the lower level.

It can be argued that the organization of individual knowledge results in an emergence of collective intellectual capital which is different from the sum of individual knowledge. The mechanism is organization of activities in which individual knowledge is utilized. Emergentist theory also includes downward causation, where higher level phenomena have downwardly causal effects on lower level processes assuming higher level properties constitute the environment for the lower level.

For each level a suitable discipline has been developed in order to do research and build theory for description and analysis. Within the disciplines of Organization Theory, Organizational Behaviour, Human Resource Management, Knowledge Management and Social Psychology the subject is being dealt with from different angles such as the effects of collective knowledge by the collaboration of individual knowledge at the organizational level, organizational decision making or the organizational learning process. In this context collaboration is understood as the propensity to work in groups and in teams. It is thus the collaboration of skills that constitutes the mechanism in the process transforming individual knowledge to higher level emergent properties. The collaborative communication involving the exchange of work-related information and ideas is part of the mechanism transforming individual knowledge into an integral part of the organizational knowledge base. Individual knowledge in this manner transcends into intellectual capital as collective knowledge.

To conclude on the verbal model offered above, the emergent properties perspective offers a different way of viewing the real world compared to the traditional views, which normally would either offer methodological individualism as the explanation of phenomena at a higher level caused by phenomena at a lower level, or offer methodological collectivism, which is used to explain lower level phenomena from a higher level perspective. In methodological individualism the direction of explanation goes from the individual level towards the collective level, and in methodological collectivism the direction of explanation goes from social phenomena towards the individual level, and individual action is viewed as something created from the collective.

Applying the emergent properties perspective entails a bi-directional explanation. It must go from the lower level towards the higher level, i.e. from the individual level to the collective

level, in our case from individual knowledge to organizational intellectual capital, and it must also go from the higher level towards the lower level, i.e. from the organizational level to the individual level as the organizational level constitutes the environment for the individual level. This explanation model offers obvious advantages for the analysis of the distinction between individual knowledge, organizational intellectual capital and the value of intellectual capital at market level. An example of this is the transparency explanation of the demands for improved intellectual capital reporting from a market point of view. The next section of this article constitutes a discussion and analysis of the most predominant streams of research within the field of intellectual capital from an emergent properties perspective.

4. Discussion and analysis of intellectual capital in an emergent properties perspective

In their seminal review of the field of intellectual capital research, Cañibano *et al.* (2000) identify three strands of literature in relation to accounting for intellectual capital (IC). The first strand concerns the recognition, measurement and depreciation of intangibles, while the second strand of literature concerns the relevance of some intangibles for the purposes of firm valuation. Finally, Cañibano *et al.* (2000) argue that there is a distinct strand of literature concerned with the issue of the classification and the economic nature of intellectual capital (see also Gröjer 2001). Petty & Guthrie (2000) and Andriessen (2004), likewise provide overviews of the literature and approaches to measuring intellectual capital. A notion of different analysis levels seems to emerge from the identification of the above three categories of literature. While strand one is concerned with correlating organizational characteristics to a market level notion of value, strand two seems to be concerned with illustrating how certain characteristics at individual and organizational levels of the organization interact to create value on the firm level. Finally IC management relates mainly to the individual level of the organization through a focus on knowledge management. <BUT HOW DOES ALL THIS INTERACT?>

For the purpose of classification, it may make sense to distinguish between certain strands of literature in this manner. However, this does not imply that these strands of literature do not have any interconnections. As a matter of fact, it is the purpose of this article to contribute to the general understanding of the economic nature of intellectual capital by discussing insufficiencies of prior understandings and theory, thereby illustrating why and how specific strands of literature become problematic. Thus, with the aim of contributing to

understanding the relationships between intellectual capital and organizational performance we choose to focus our analysis on the reporting and management of intellectual capital.

The past decade has brought a number of studies showing the declining ability of financial statements in giving a truthful indication of companies' intrinsic financial value. These studies can be viewed as an offset for much of the literature concerning the importance of reporting and managing intellectual capital. According to Lev & Zarowin (1999), there is a weakening association between capital market values and key financial variables (see also Brown, Lo & Lys 1999, 107), and the traditional financial report therefore no longer represents the intrinsic value of the company. However this discussion has not been lopsided, and some research does in fact dispute that the value relevance of financial statements has declined over time (e.g. Francis & Schipper 1999; Core, Guay & Buskirk 2003).

Some authors view the problems with the lack of explanatory value of financial statements as an effect of a significant rise in the degree of innovation in recent years (Chang 1998), or they claim that "today's more volatile growth rate curves require a more complex approach to valuation" (Rutterford 2000, 13). Sullivan & Sullivan (2000, 328) attribute the inherent difficulties in the valuation of knowledge-based companies to the shift in the nature of value creation, because "[t]raditional accounting methods [...] are inadequate for valuing companies whose assets are largely intangible". Largely this can be related to the fact that the usual IC accounting treatment is to expense the items (Cañibano *et al.* 2000).

Among the seminal discussants of the above problem are Hendriksen & van Breda (1992) who argue that the inclusion of intellectual capital in the balance sheet is problematic because such "assets" do not satisfy the recognition criteria of SFAC 5. Lev & Zarowin (1999), however, remain proponents of the view that such types of intangible assets, i.e. intellectual capital, should be accounted for using the same methods as for tangible assets. Basically, this discussion boils down to the correctness of the formula applied by Edvinsson & Malone (1997), namely: $MV = BV + IC$. In the 1990s intellectual capital was increasingly seen as an important supplement to or even corrective of tangible capital in the production of value.

If not unrealistic, this formula is at least problematic because it implies that IC is dependent upon management's and accountants' depreciation and amortization choices. We contest this. Furthermore, Pike *et al.* (2001) criticize this formula, arguing that it is "flawed since the variables are not separable as required by the equation. Additionally, the obvious accounting flaw is that the right hand side of the equation does not have a single set of units" (*ibid*, 4). Thus, citing Justice (1707), they argue that virtual and real money cannot be added to each other. The expression of intellectual capital value is found to be ambiguous, as we must

differentiate between virtual value at the organizational level and real value. Here it is important to stress the difference between value at the organizational level and at the market level, as the nature of the two values is different from one another. Such a perspective is very much in accordance with an emergent properties perspective. It is not possible to combine market and organizational levels because these have different perceptions of value. In fact, IC may not have a market value in monetary terms at all. Therefore this equation, and the financial valuation of intangible assets as a whole, becomes problematic from an emergent properties perspective.

Other authors are more concerned with the value relevance of intellectual capital, i.e. concerned with the question of whether intellectual capital is important for the valuation of companies and whether the market reacts to such information. Amir & Lev (1996) indicate that accounting information lacks relevance especially in high-tech industries. In a related study, Lev & Sougiannis (1996) find a positive association between firms' R&D capital and subsequent stock returns. Such notions are problematic because they incorporate a misconceived understanding of causality and integrate different levels of analysis.

It is a misunderstanding that we can put a monetary value on IC. The value given to IC in the market does not correspond to the value it has inside the organization, because the different categories of organizational intellectual capital are nothing more than components in the process creating value at share market level. The share market response is driven by the market mechanisms and the economic environment in which this market operates. Market mechanisms exist only because buyers and sellers do not operate as individuals but are organized in a structure operating as a whole in the market place. The value of intellectual capital at the market level is the value at a certain time and is a situational phenomenon in time and place.

Reporting and management of intellectual capital

Initially taking its point of departure in the ideas of capitalization and value relevance of intellectual capital, the literature concerning the reporting and management of intellectual capital constitutes a different arena of debate. Whereas the above debaters sought comfort in new ways or methods with which it would be possible to adjust existing accounting practices to convey a fuller picture of corporate value, the contributors to this stream of research do not try to put intellectual capital into accounting boxes. Rather, they take what can be termed a strategy perspective to the problem (Roslender, Nielsen & Bukh 2007). There are numerous so-called business reporting models concerned with providing external readers with a more complete picture of companies' intellectual capital. Fincham and

Roslender (2003) classify these strategy oriented models for the reporting of intellectual capital into two types of approaches, and denote them as scorecard approaches and narrative approaches.

Spurred by the then quite recent developments in performance measurement (cf. Eccles 1991) such as the development of the Balanced Scorecard (cf. Kaplan & Norton 1992), the earliest approaches to measuring and reporting on intellectual capital adopted similar scorecard approaches to the problem. Therefore there are substantial similarities amongst these early IC reporting methodologies, which we will encounter in a short while in terms of classifying IC according to internal and external perspectives as well as forward-looking and historical perspectives.

Concurrently with Sveiby and Stewart, Edvinsson & Malone (1997) developed their IC-tree, an approach also known as the Skandia Navigator because it was partially derived from Edvinsson's work at Skandia, resulting in what many consider to be the world's first IC statement in 1995. Initially, this model segregates intellectual capital into human capital and structural capital. Here human capital is viewed as everything the company cannot own. Structural capital, which can be further divided into customer and organizational capital, is defined as: "...everything left at the office when the employees go home ...Unlike human capital, structural capital can be owned and thereby traded" (Edvinsson & Malone 1997, 11).

Such proposed disaggregations of intellectual capital are perceived more or less as a standard way of viewing intellectual capital (cf. Meritum 2002, Jacobson et al. 2005) although over the years we find small variations from author to author and model to model. One of the problems with these scorecard models is that several different levels of analysis are summed in an additive fashion. The methodologies applied link different levels of analysis in a causal and linear manner. However, this is not in line with reality as in practice there is no linearity and the interrelations are much more complicated. Furthermore, these scorecard models lack any conception of the mechanisms and processes whereby components at a lower level emerge to become higher level properties.

Furthermore, there is clear evidence that these models misconceive value correspondence between the levels of analysis, i.e. from individual to organization to market level. This is particularly evident in an array of similar models trying to establish index ratings of IC. Roos et al.'s (1997) IC-index was among the pioneers in this respect (Rylander et al. 2000). The IC-index approach utilizes a set of indices with the aim of measuring and benchmarking the efficiency of strategy internally (1997, 91), ultimately relating the overall index to shareholder value. Roos *et al.* (1997) argue that their indices become leading indicators for financial performance by showing the direction and speed, i.e. the rate of change, of value creation as

opposed to the static measures of traditional financial reporting. Other approaches try to calculate an index indicating the efficiency of value creation (Kalafut & Low 2001) or earnings per knowledge capital (Lev 2001). Bukh, Larsen & Mouritsen summarize this predicament: "Both Stewart, Sveiby and Edvinsson are interested in classification rather than measurement. ...They state no formulas for choice of indicators. These are only present in examples, not in any integrated model" (Bukh, Larsen & Mouritsen 2000b, p. 19).

In accordance with Roos et al. (2001), Jacobson et al. (2005) argue that it is the synergy in the intangibles that creates uniqueness and wealth, because "Companies become unique and successful by combining various types of intangible resources and not by separating human capital from structural capital and customer capital from organizational capital" (Jacobson et al. 2005, 575). This is a problematic stance, because synergetic effects solely relate to the same level. In combination with structure human capital, which refers to individual knowledge, will create intellectual capital as an emergent property. In the terminology of Jacobson et al. (2005), structural capital has the same level as human capital, which inevitably confuses the whole issue relating to different levels of analysis.

It can thus be considered problematic that Roos et al. (1997) and other index approaches have one overall goal, namely to try to aggregate the individual indices and relate this overall measure to market value, in this sense holding on to a shareholder value perspective. Thereby they attempt to hold on to all three levels of analysis, in effect not being able to contribute anything sensible to any of them. Considering the scorecard approaches generally they seem to be concerned with identifying separate sets of performance measures with either relational, causal or no interconnectivities at all. A crude interpretation could therefore be that merely one set of alternative performance measures would be sufficient for enticing a better understanding of value creation. We consider this to be a serious flaw in these approaches because the reader is left without explanation of how these – highly unfamiliar – types of measures relate to each other and to the overall performance of the firm.

The second type of IC reporting models is what Fincham & Roslender (2003) call the narrative models. Compared to the scorecard approaches they rely more upon 'soft' narratives, although by no means excluding key performance indicator-type information (Roslender 2005). The perspective underlying these types of models is precisely that merely providing the potential reader with an alternative set of performance measures will not get the point through. As a matter of fact, such new types of information impose markedly higher understanding costs to users, because they do not have the necessary rules of thumb to incorporate them in their analyses (Nielsen et al. 2006).

The Meritum guideline (2002) was the physical result of a Pan-European research project with attendance of academics from Spain, Sweden, Norway, Denmark and many other countries. The purpose of this reporting model is to assist companies in the recognition and disclosure of the intangibles that are critical to their value creation. The underlying idea is the linking of corporate vision and strategy with critical intangibles and success factors through a narrative envisaging how the different stakeholders benefit from the firm's knowledge production activities (Meritum 2002, 68). Here strategy acts as an encompassing guide to the choice of performance measures complemented by a context-giving narrative.

Probably the most notable of the narrative models is the Danish guideline for IC statements (Mouritsen et al 2003). The model comprises the most empirically applied business reporting model worldwide until now. According to Mouritsen *et al.* (2001a), intellectual capital statements are reports that through text, indicators and illustrations present the firm's knowledge management effort. Following the Danish Ministry of Science and Technology (Mouritsen et al., 2003a), the purpose of an intellectual capital statement is to communicate the use value, knowledge resources and management challenges of the company. In a narrative form the use value outlines the ambition of the company's knowledge management, because it not only accounts for present performance, but also formulates a strategy for the company's know-how in the future. The company's management challenges are a set of meaningful and lasting elements in the managerial agenda that provide continuity in handling the development and composition of knowledge resources.

To develop and compose knowledge resources, efforts or activities are made to increase or decrease 'knowledge containers' such as employees, customers, processes or technologies and the effects of those efforts are monitored via indicators e.g. about staff turnover and job satisfaction, in-service training, turnover split on customers, customer satisfaction, precision of supply etc. (cf. Nielsen et al. 2006).

Mouritsen et al.'s (2003) IC model can be described as a relational model of measuring and reporting on IC and neither indicators nor activities are considered to be causally linked between each other. Rather, according to Mouritsen, Bukh & Bang, "initiatives and thus indicators may be seen as bundles that support and measure management challenges in an ecological way rather than as individual initiatives and indicators that contribute to support and tell something about the management challenges" (2003, 19). This model becomes problematic because the four archetype categories of knowledge resources identified (i.e. employees, customers, processes and technologies) comprise a mixture of two levels of analysis, namely the individual and the organizational level. Through the narrative the model does, however, attempt to explain the mechanisms by which bundles of intellectual capital indicators relate to value creation.

In the above discussions of the IC field there is an evident notion that individual level performance and organizational performance and value are interlinked, which we see as an over-interpretation. Although organizational performance is somehow related to or caused by the individual level of performance, organizational performance is a result of organizational intellectual capital which is created through a process as an emergent property. Furthermore, IC imposes problems not only in relation to valuation. Management control too is challenged, as intangible resources constitute the key to value creation. Discussions in relation to this perspective can be found in Johanson et al. (2001) who are an integral part of the Swedish human resource management school. More recently, a special edition of Management Accounting Research has focused on the issue that “the existing framework of management control may, in fact, be irrelevant, that the control needs of the current environment are significantly different from those developed in an earlier period and that improvements are urgently required” (Nixon & Burns 2005, 260). Such a perspective is elaborated on in relation to IC and knowledge management by Mouritsen & Larsen’s (2005) contribution to this special edition.

In the words of Thorbjørnsen & Mouritsen (2003), the role of the individual in intellectual capital statements is often highlighted as perhaps the key to knowledge management. This is because they are said both to be the true bearers of knowledge and at the same time a potentially fragile resource, because they cannot be owned (see also Edvinsson & Malone 1997, 11). According to Baxter & Chua (1999), we can separate knowledge management into two different waves, namely the process paradigm and the measurement paradigm. They argue that while the process paradigm is concerned with the sharing and diffusion of knowledge, the measurement paradigm is more concerned with visualizing knowledge. Mouritsen & Larsen (2005) label these waves the 1st and 2nd waves of knowledge management.

Baxter & Chua (1999) and Mouritsen & Larsen (2005) argue that in the 1st wave, knowledge management takes its point of departure in the individual. Thereby its primary concern becomes the sharing of knowledge between individuals in the organization. Thus the management of the individual-based knowledge, e.g. in the form of systems and intranets, will always take place at an organizational level. Such management is primarily concerned with making tacit knowledge explicit, e.g. through codification and thereafter transforming individual knowledge to organizational knowledge. In relation to these mechanisms, Nonaka’s (1994) knowledge spiral is the most notable contribution, identifying the four knowledge sharing processes: socialization, externalization, internalization and combination. This approach would be improved if the distinction of levels was emphasized, as by

definition sharing of knowledge takes place at the organizational level through the organizational structure and thereby becomes intellectual capital as an emergent property.

In this context, knowledge management is about creating an appropriate organizational infrastructure with the aim of facilitating the circulation of individual knowledge to potential users (Baxter & Chua 1999, 8) with the intent of reassembling, repositing or reusing (McNamara, Baxter & Chua 2004), e.g. knowledge transfer. Most contributions related to this wave are concerned with a technology perspective on knowledge management (cf. Hansen et al. 1999), in what Christensen & Bukh (2005) pronounce an artifact-oriented epistemology.

In the second wave (Mouritsen & Larsen 2005), knowledge management concerns the composition, use and development of the organizations' knowledge resources. In the second wave context the discussion is poised from an IC and a reporting perspective and the discussion is concerned with the organization as a whole rather than the individual, which was not the case in the first wave. Here, knowledge management can be characterized as a set of knowledge management challenges and activities paired with measurements relating to the actual state and realization of these.

As described in the above paragraphs, the Danish IC framework is quite clear about the interrelations between measurement and reporting on the one side and the management of IC on the other side. According to Mouritsen et al. (2003), the IC statement is a report on the company's knowledge management strategy, effort and success. From their perspective, knowledge management relates to what the company actually does, i.e. the activities performed in relation to upgrading, acquiring and attaining knowledge that makes a difference to the company's value creation.

Concluding remarks

The conceptual offering described in this article entails that perceiving intellectual capital from the perspective of emergent properties can contribute to eliminating a series of basic misunderstandings in connection with the accounting for IC value and therefore offers a sound theoretical basis from which we may widen our knowledge of this field.

Initially, we presented a framework for analyzing and understanding the interrelationships of value at different levels of organization. In section 4, we analyzed on the literature concerning the reporting and management of intellectual capital from an emergent properties perspective. From this perspective it was evident that the direction of explanation could be both upwards and downwards, i.e. from the individual level to the organizational level in

relation to the formation of organizational intellectual capital, and from the organizational level downwards to the individual level in order to explain the environment for learning processes and the expression of individual knowledge in the act of collaboration.

From an emergent properties perspective, intellectual capital at the organizational level is viewed as a structural arrangement of lower level components and thus becomes the organization of knowledge resulting in an emergence of collective intellectual capital greater than or different from the sum of individual knowledge. Here it therefore constitutes a production factor, i.e. a competitive advantage, while at the market level it must have an exchangeable financial value. These two notions of value are not interrelated in a linear fashion and therefore we must dismiss much research in the field that does not contemplate this problem.

Emergent properties offer a perspective that can help to explain micro-macro link from the individual level to group and market levels, e.g. from lower levels in the organization to the market level where the organization is considered an independent entity interacting with other organizations. Furthermore, we conclude that it is not relevant to analyse macro phenomena at micro level or to describe micro phenomena in macro level terminology. Even though intellectual capital at the organizational level is a function of individual knowledge as a primary component, such knowledge would have no effect on value creation without the organizational structure.

The emergent properties perspective therefore offers a unique critique in relation to a series of flaws in existing IC concepts and strands in the debate, perhaps helping to explain why some parts of the academic community have had difficulties in accepting such contributions. There seems to have been a number of holes in existing theory that primarily pertain to problems of moving value from one level to another. Our theorization shows that such ideas do not make sense in the world of IC, as the value of knowledge at the individual level cannot possibly correspond to the value of intellectual capital at the organizational level, e.g. in relation to value creation potential. Furthermore, these ideas become even more problematic when trying to relate value at an organizational level to market values.

It is our hope that this contribution may offer food for thought, not only in relation to understanding the concept of value in relation to different levels of intellectual capital, but also in relation to emphasizing the importance of interdisciplinary research. In our case we illustrate how a theoretical proposition stemming from the fields of biology and sociology can be applied in the field of accounting. We have argued that the inherent difficulties in understanding the interdependencies of intellectual capital across different levels of organization can be traced to a lack of understanding of the differences between synergetic

effects, causal relationships and emergent properties. This conceptual offering concludes that perceiving intellectual capital from the perspective of emergent properties contributes to eliminating a series of basic misunderstandings in connection with accounting for the value of intellectual capital and therefore offers a sound theoretical basis from which we may widen our knowledge of this field.

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