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The emergent properties of intellectual capital:

A conceptual offering

By

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Abstract

Much attention has been directed towards problems of accounting for intellectual capital and how 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. In this paper, we argue that the inherent difficulties of understanding the interdependencies of intellectual capital across different levels of an organization can be traced to a lack of understanding of the differences between synergetic effects, causal relationships and emergent properties.

Key words: Intellectual capital, emergent properties, sociology, biology

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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 number of recent global symposia gathering the most prominent thinkers and researchers seem to confirm 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. In turn, this article takes its point of departure in Mouritsen's (2006) concluding remarks concerning the fact that "it is possible and advisable to develop research that has an ambition to understand intellectual capital as a concept and not only as an application of a pre-set idea" (Mouritsen 2006, p. 820).

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 be aware of the significance of intangibles and intellectual capital as different types of knowledge and to realize 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 theory inevitably also draws upon elements of microeconomics, sociology and social psychology as such fields are 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 the individual that possesses this knowledge leaves the organization; either to go home or to leave it entirely. In order to maintain this 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 of 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, acting as a component with structural mechanisms in the form of communication, and the environment, which is constituted by the structural properties of the organization, interact to create a higher level phenomenon. However, it is undisputable that intellectual capital at the organizational level has other 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. As will be evident in the literature review concerning the foundations of emergentism, many sociologists have developed theories which comprise an understanding of emergent properties that is similar, but inadequate, to that of this paper. Among similar branches of thought is that of complexity theory, which e.g. has been applied by Stacey (2007) to the study of organizational dynamics.

A previous attempt at analysing intellectual capital as an economic phenomenon with neurobiological mechanisms has been conducted by Bueno *et al.* 2005. Bueno *et al.* (2005) apply a biological approach based on Holland's (1992) understanding of complex systems as a metaphor, in turn using the term "emergent" in arguing that "the whole system is not a simple sum of its parts"

(Bueno *et al.* 2005, p. 397). While Bueno *et al.*'s (2005) project merely is to make use of biology in order to construct a metaphor for explanation of intellectual capital parallel to that of biology, the perspective of the present contribution is that a correct perception and application of an emergent properties model has the ability to move the field of intellectual capital much further. This perspective therefore argues that phenomena in the social space are real and that intellectual capital exists as emergent properties at different levels of organization.

As such, the present contribution focuses on explaining how mechanisms resulting in emergent properties at different levels within biology are similar to the processes resulting in different phenomena at different levels in the social space, and we thereby also envisage why intellectual capital has different dimensions at different levels of organization. It is evident that studies such as Holland 1992, Bueno *et al.* 2005, and Stacey 2007 have not really grasped the notion of emergent properties as these authors solely refer to actual components, entities or individual parts rather than to the properties of these. Bueno *et al.* (2005, p. 404) e.g. claim that interaction is between "a thing, group, team, organization or environment", clearly not being aware that it is not the carriers of intellectual capital as an emergent property that are interesting, but rather the emergent properties themselves that must be focussed on.

The starting point for the emergent properties perspective is thus that phenomena at different levels have different characteristics, unique patterns of behaviour or 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.

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' (subunit's) 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, p. 158) analysis, this entails the creation of higher supra-individual formations as independent representatives of 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 with 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, p. 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, p. 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, p. 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, p. 28).

In the words of Knorr-Cetina & Cicourel (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 & Cicourel 1981, p. 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 a 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, p. 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 qualitative properties evident when individuals form higher levels of organization as 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, p. 40). Opposition to such a theory of emergentism seems to arise primarily from researchers who 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 the same nature. What is gained through synergy is of a 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 organization) 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 higher levels as caused by the effects of subunits at the lower levels. 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 alongside methodological collectivism are being utilized indiscriminately and without formal definitions or specific purposes.

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 a given phenomenon. In such an instance, 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 for the process. These initial conditions are determined by the environment. Subunits are unable to produce the new emergent properties alone without the necessary mechanisms assisting the process and the above-mentioned environment in which the processes take place.

In this connection, it is important to keep in mind that emergent properties are phenomena which can be observed in a multitude of different contexts. Among others, emergentism is present in physical, chemical, biological, physiological, psychological, social psychological and sociological processes and contexts, and in these, new entities with new characteristics arise at higher levels. Therefore, the emergent property perspective offered here can be used in a model of the “reality”¹ 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 basic 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

¹ It is not our wish to constrain ourselves to any certain paradigm of thought in relation to e.g. a subjectivity/objectivity dimension wherefore we have put reality in brackets and leave it up to the reader to establish his/her own perception according to belief.

phenomena cannot be predicted directly, or should we say merely, from the knowledge of the properties at the lower level. Figure 1 illustrates how phenomena emerge at a higher level from components at a lower level through a process involving mechanisms which, in turn, are controlled by natural laws and background conditions, i.e. under the influence of the environment in which the processes take place.

Let us take a closer look at the individual attributes of the emergent properties model. First, we have a series of different *levels*. In figure 1, we have depicted 3 levels. However, the number of levels will vary from context to context. It is, however, important to explicate that all levels exist at all times. The processes at the different levels are therefore simultaneous phenomena. They can be said to constitute ongoing dynamic processes in a system of components, mechanisms, interactions, processes and entities with properties different to the originating components. The higher the level, the greater the complexity of relations and interactions.

At each level, we have a number of *components*. At the immediate lower level, components are the elements from where components at our present level emerge. These new components have new properties or, in other words, act as they themselves are new properties. It is the properties and their specific effects that are important, not the actual components. To illustrate this, think of employees and their knowledge. In the knowledge-intensive company, it is the knowledge that creates the value, not the employee. In this case, the employee is merely a knowledge container; i.e. the component and the knowledge constitute the properties we wish to utilize.

The *transition process* (or just process) by which new components and their properties emerge at the immediate higher level is a process without intermediate stages. The transition process is not a linear function, and it is governed by natural laws and influenced by the environment in which the process takes place. A process is instigated by mechanisms involving components and laws in a certain environment giving the necessary background conditions. As a result, components and mechanisms result in the transformation of new entities at the higher level.

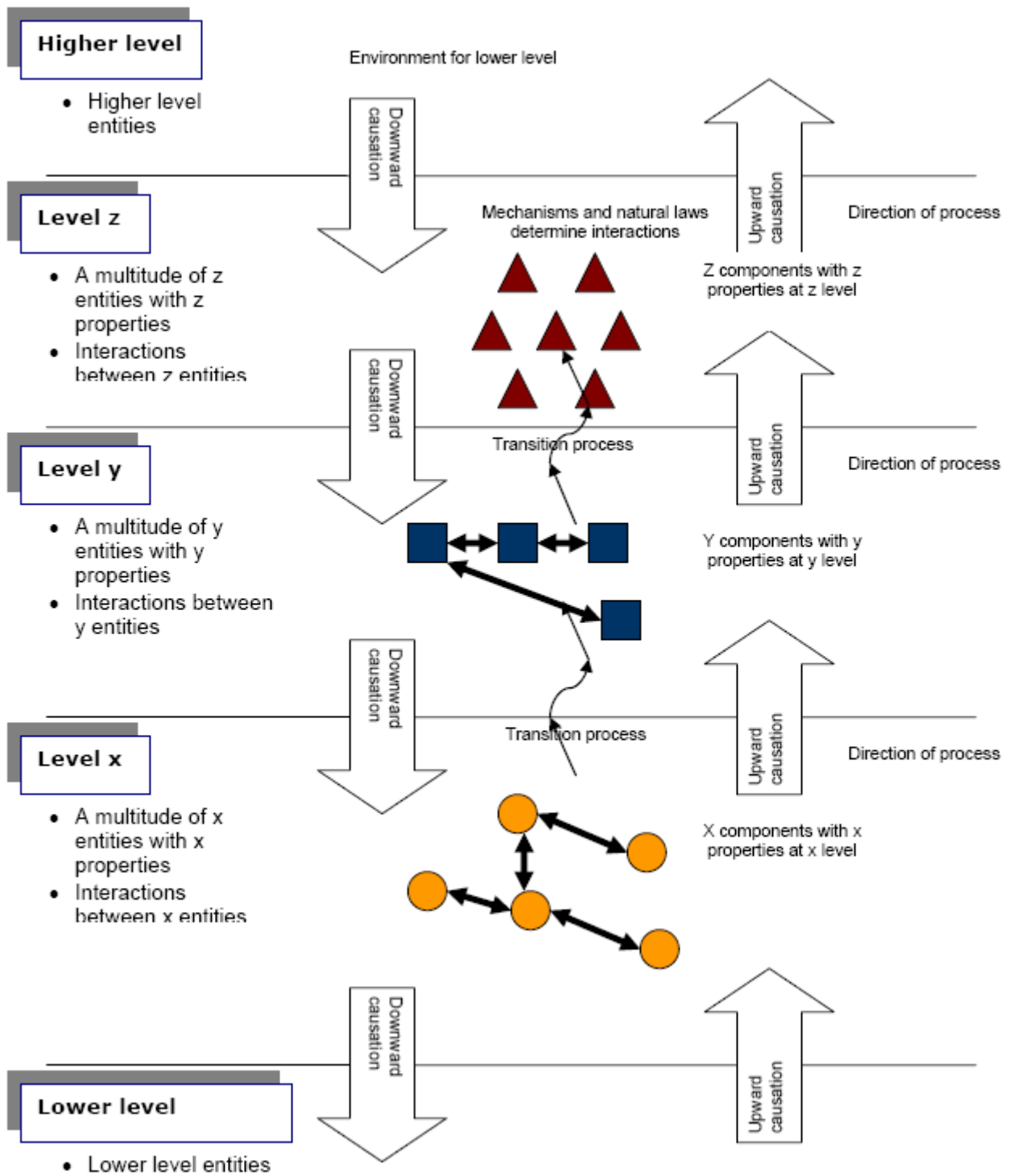


Figure 1. The emergent properties model

The immediate higher level constitutes the *environment* for the actual level under scrutiny. The properties of other levels also have an impact on the actual level. Hence, the transition process is influenced by the environment through the natural laws, mechanisms and other conditions that are present there. For a transition process of components with certain properties at a lower level to new entities with other properties at a higher level to take place, it demands certain environmental

conditions, background conditions or initial conditions. In this setting, *natural laws* are laws by which processes take place, from simple laws of physics to more complex systems with feed back mechanisms in biological systems and social systems. The final element(s) influencing the transition process is/are the *mechanisms*. A mechanism is the function by which components with certain properties under certain conditions will undergo a process and emerge at a higher level as new components with new properties.

Finally, from our explanations and from figure 1, it becomes evident that *influence* goes both ways. In the literature on which the emergent properties perspective is based, such influence is denoted causation. In turn, this model can be said to incorporate both *upward causation* and *downward causation*. In the course of upward causation, the resulting new components with novel properties become sub-units for the emerging properties at an even higher level, while higher level properties result in impacts in the environment for lower-level processes in the course of downward causation.

Thus, we have now described the emergent properties model. In order to apply such a model as an explanation-type in relation to any given context, the particularities identified above must be described. To conclude on the model offered above, the emergent properties perspective offers a different way of viewing “what is out there” 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. The next section of this article analyzes the concept of intellectual capital from an emergent properties perspective.

Discussion and analysis of intellectual capital in an emergent properties perspective

The evolution from industrial to knowledge society is a metaphor which is almost unavoidable in any respectable journal concerned with organizational and societal aspects. We will neither take the stance for nor against whether this transformation is happening, less the importance of it. But that will not stop us from using it as our point of departure for a journey into the interrelations between biology, organizational and societal structures, economy and knowledge.

The past decade has brought a number of studies illustrating 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. As such, Lev & Zarowin (1999) for instance find a weakening association between capital market values and key accounting variables. Hence, they put forth that the traditional financial report no longer represents the true value of the company. Other 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). Sullivan & Sullivan (2000, p. 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". Therefore, because intellectual capital, knowledge and competences to a rising degree become the fabric of value creation, new means and instruments of measuring and managing these "inputs" must be mobilized.

Much literature seems to imply that IC theory can be readily constructed in much the same way as accounting measures and standards are. One possible problem with such a point of departure is that it may be a misunderstanding that we should 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 dimensions by which it is measured differ between the levels. Furthermore, 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 organizational intellectual capital at the market level is the value at a certain time and is a situational phenomenon in time and place.

Basically, this discussion boils down to the correctness of the formula applied by Edvinsson & Malone (1997), namely:

Formula A: $MV = BV + IC$, where

MV: Market value of company n

BV: Book value of company n

IC: Intellectual capital present in company n

In the 1990s, intellectual capital was increasingly seen as an important supplement to, or even as corrective of, tangible capital in the production of value, like in the case of formula A. 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*, p. 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.

Nevertheless, formula A played a major role in the conception of a number of reporting and measurement models in the adjacent years, as did the then quite recent developments within performance measurement (cf. Eccles 1991) such as the development of the Balanced Scorecard (cf. Kaplan & Norton 1992). Most of these early 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 in terms of classifying IC according to internal and external perspectives.

Concurrently with Sveiby (1997) and Stewart (1997), Edvinsson & Malone (1997) developed their IC-tree (see figure 2), 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, p. 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.

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, which distinguishes between the intellectual capital classes, human

capital, structural capital and relational capital, was to assist companies in the recognition and disclosure of the intangibles that are critical to their value creation. Figure 2 below illustrates in general the three classes of intellectual capital that can be derived from the above discussion and which in general also are applied by companies and researchers. The precise wording and denotation of each class of intellectual capital is not important for the discussion later on in the paper as our contribution here is to a general understanding of the mechanisms whereby intellectual capital is aggregated and transformed.

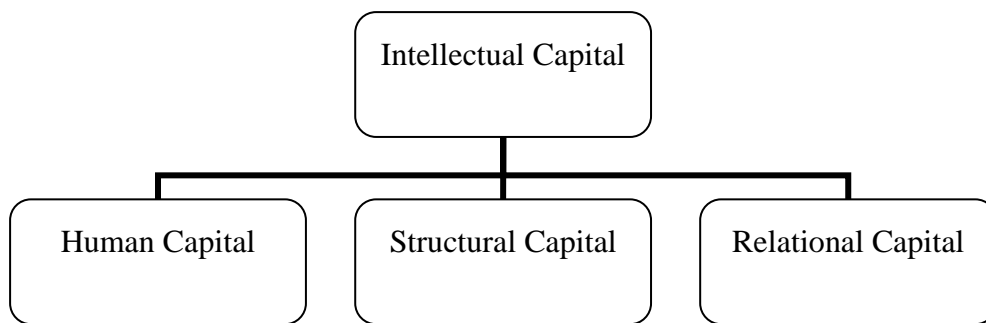


Figure 2. The three generic classes of intellectual capital

One of the problems with these scorecard models² that divide intellectual capital into several subclasses is that they assume that several different levels of analysis are summed up in an additive accounting fashion. It is thus clear that formula A indeed did have a relatively strong influence. 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 conception of the mechanisms and processes whereby components at a lower level emerge to become higher level properties. As such, it is clear that these models misconceive value correspondence between the levels of analysis, i.e. from individual to organizational to market level. Mouritsen & Larsen (2005) provide further interesting criticism of the scorecard models discussed above, stating that the depicted classes of intellectual capital do not become interesting in relation to value creation by themselves; rather it is the entanglement of them that makes the difference.

² Fincham & Roslender (2003) conduct a broad review of the supplementary models developed for measuring, reporting and managing intellectual capital where they introduce the distinction between scorecard models and narrative models. Although we agree to the classification of the Meritum guideline as a narrative model, we here choose to treat it together with the scorecard models as it applies the same general IC classification distinctions.

Hence, 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 by which this is possible is through the organization of activities in which individual knowledge is utilized. Such a conception is not much different from the thoughts put forward by Williamson (1975) in his transaction cost theory. Emergentist theory, which we are about to apply to the field of intellectual capital, differentiates itself from the previously mentioned IC models in that it also includes downward causation, where higher level phenomena have downwardly causal effects on lower level processes assuming that higher level properties constitute the environment for the lower level. As such, we ought to turn figure 2 ninety degrees to the right so that it depicts that we are trying to analyze different levels at the same time (see figure 3). This is in itself not problematic; however, it is problematic to assume that values on the respective levels are addable in the same sense as in the field of accounting.

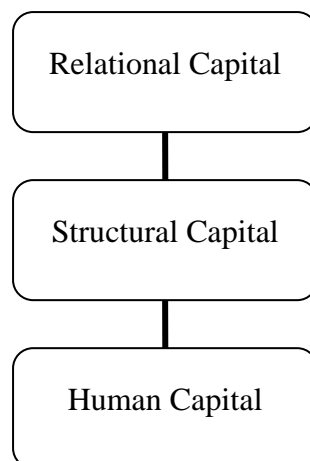


Figure 3. A layered example of the three generic IC classes

As such, we propose the emergent properties model offered in section 3 of this article as a means of visualizing the obvious problems of the traditional additive IC perspective. Figure 4 illustrates the application of the emergent properties perspective on intellectual capital. Based on the literature concerning emergent properties and coupled with the literature on intellectual capital (cf. Edvinsson & Malone 1997, Lev 2001), we choose to aggregate the model according to five levels, namely: sub-organism level, individual level, organizational level, market level and governmental level.

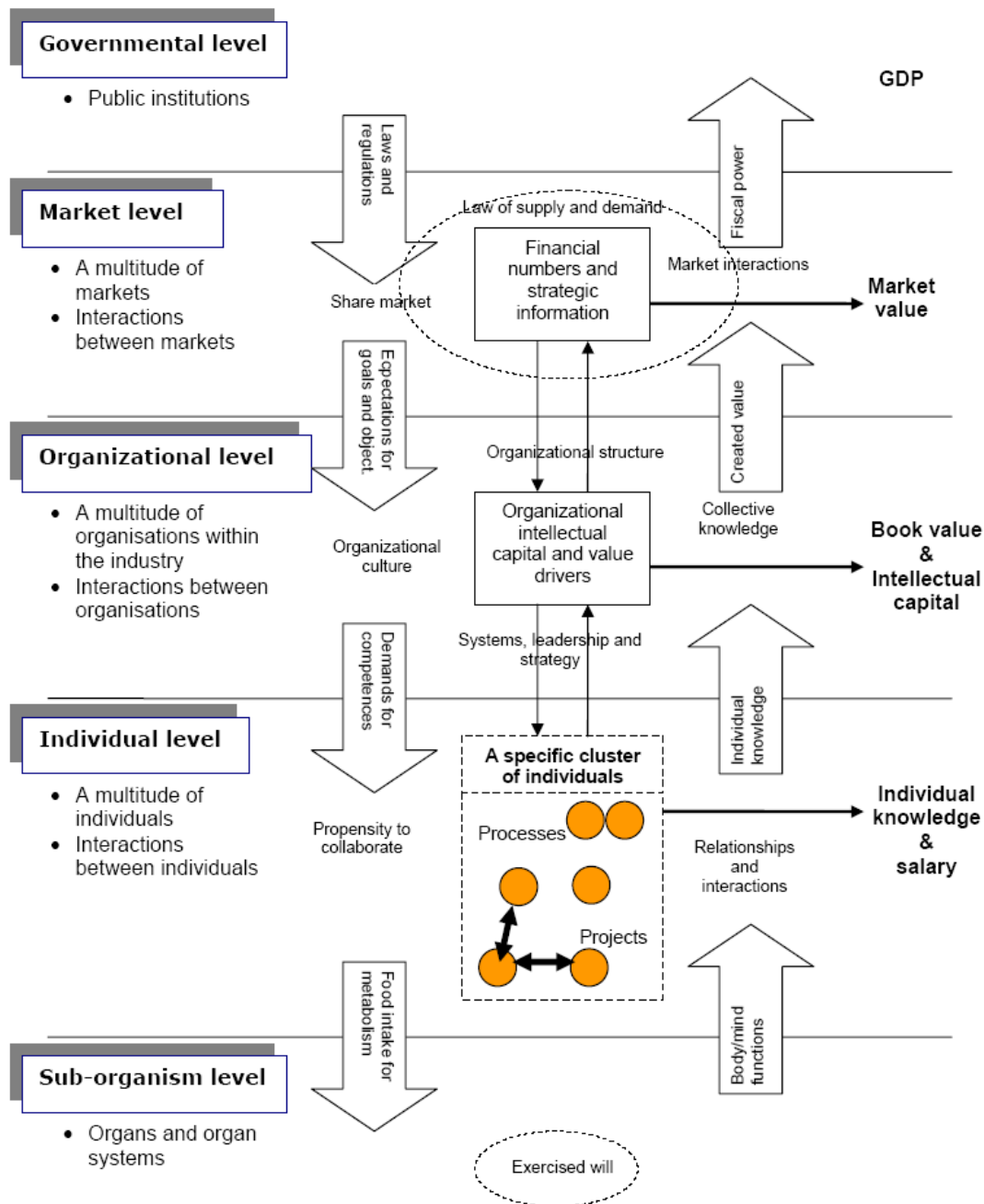


Figure 4. The intellectual capital emergent properties model

At each level, we find a number of pre-established suitable disciplines that have evolved from research and theory building, description and analysis. For instance, within the disciplines of organization theory, organizational behaviour, human resource management, knowledge management, sociology and social psychology, the subject of intellectual capital 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. Let us take a look at the 5 levels respectively, in turn addressing the interrelations and mechanisms between them and the immediate adjacent levels.

At the *sub-organism level*, we find the prerequisites for the functioning of the employee. The health of organs and organ systems as well as psychological well-being at the individual level and exercise will constitute the body/mind functions necessary for utilizing, sharing and developing the individual's knowledge. On the downward causation note, the individual's knowledge of dietary requirements ensuring sufficient and correct food intake for the metabolism forms the environment for the sub-organism level. The emergent property of the transition process between these two levels is the ability to gain individual knowledge at the individual level.

At the *individual level*, we have a multitude of individuals, each with his/her own individual knowledge, who may interact with each other and collaborate. In this context, collaboration is understood as the tendency to work together in groups. 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. Like other resources such as raw materials, services and the means of production, the value creation potential of employees is a subunit of organizational value creation. In this manner, the upward causation of individual knowledge transcends into intellectual capital as collective knowledge, while the downward causation from organizational level to individual level is the demand for competences. As a mechanism forming the environment for individual learning and in which individuals utilize gained knowledge is the organizational structure in which the individuals operate.

Individuals gain knowledge from the organizational environment through communication, either by reading what other individuals have written or by direct instruction from another individual or group of individuals. In relation to this, 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 some mechanisms of knowledge sharing take place at the individual level through collaboration, while others take place at the organizational level through the organizational structure and thereby become intellectual capital as an emergent property.

The tendency to collaborate is the mechanism that forms the higher level organizational intellectual capital. The important thing here, according to our model, is that it is the properties that are important to have in mind, not the components themselves. In the present case, it is the knowledge of the individual, and not the individual himself, that is important, as it is the intellectual capital

present in the organization that is important and not the organization itself. It is thus the knowledge of the individuals in collaboration that is transferred to the organizational level and which becomes the emergent property as intellectual capital.

Within the existing IC literature, there is a notion that individual level performance and organizational performance and book value are directly interlinked. From an emergent properties perspective, this is a misinterpretation. 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), which is an integral contribution to 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, p. 260). Mouritsen & Larsen (2005) elaborate on such a perspective in relation to IC and knowledge management in their 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 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, p. 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. This was addressed above in relation to Nonaka’s (1994) knowledge spiral. In this context, knowledge management as the environment for individual knowledge forms the downward causation as it is concerned with creating an appropriate organizational infrastructure with the aim of facilitating the circulation of individual knowledge to potential users (Baxter & Chua 1999, p. 8) with the intent of reassembling, redepositing or reusing (McNamara *et al.* 2004), i.e. transferring knowledge between individuals. By this, 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. The emergent property of knowledge which is created in the transition process between individual level and organizational level is intellectual capital.

At the *organizational level*, we have a multitude of organizations, e.g. within the same industry, and we have interactions and collaboration between organizations as well. A number of independent individuals located within the same building or compound does not constitute an organization, whereas individuals organized in a structured set up in the same building incorporating necessary communications and management structures constitute a formal organization. The organizational structure, e.g. comprising of systems, leadership and strategy, as well as the culture of the organization all affect the utilization of the organizational intellectual capital, which in turn drives the value creation of the company. The efficiency of utilization of organizational intellectual capital depends on the organization's ability to adjust to market demands.

Through the upward causation of value creation, the organizational intellectual capital is transformed to a specific economic value at the market level. This process is governed by the law of supply and demand in relation to use-value of the products delivered. The components of this transition process are the organizational value drivers such as intellectual capital, machines, processes and structures that ensure future revenues and profits. At the share market level, there are certain demands for companies with certain prospects for future results. The downward causation from the market level, being the environment in which the organization operates, is thus expectations as regards the goals and objectives of the company. Such expectations or demands can be both formal and informal of nature. Formal demands could be in the form of legal affairs, and informal demands could be in relation to dealing with the market for products and the labour market, e.g. in order to recruit personnel.

Thus, the emergent property at the market level stemming from the organizational level is market value. The *market level* consists of a multitude of markets, i.e. markets for products and services and markets for shares, and these markets may interact with each other. The market level consists of information, e.g. financial numbers and strategic information relating to organizations. The downward causation from the governmental level, which forms the environment for the market level, consists of laws, standards and regulations from governments and other public institutions. Thereby, it regulates the environment in which the markets operate. Also, the overall financial climate and macro economic phenomena affect the market. Furthermore, in terms of relations, interactions at the market level reveal themselves as micro economic phenomena according to the laws of supply and demand.

It thus becomes our argument that prior models of intellectual capital (e.g. Sveiby 1997, Edvinsson & Malone 1997) misconceive value correspondence between the levels of analysis, i.e. from individual to organizational to market level. This is particularly evident in an array of similar models trying to establish index ratings of intellectual capital. 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, p. 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), earnings per knowledge capital (Lev 2001) or a value added intellectual coefficient (Pulic 2004).

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, p. 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 in general, 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.

It has been the aim of this article to illustrate that those authors treating the field of intellectual capital as a theory in line with accounting, in turn basing their models on concepts of addition and

separability of sub-classes of intellectual capital, as criticized by Mouritsen & Larsen (2005), will have to rethink their work. As such, the emergent properties perspective has illustrated the misconception of value being the same on all levels of analysis. At the same time, this perspective stemming from the fields of biology and sociology also illustrated some of the mechanisms of the ongoing transition processes that take place. Although this perspective in itself may not constitute a general testable theory of intellectual capital, it is our hope, at least, that it may provoke thought, development and further research into the field.

Concluding remarks

The critical IC researcher and enthusiast may argue that existing models of intellectual capital, such as those criticized in the sections above, do not need a structure coherent enough for us to call them a theory, and they may state that the ability of applying a “simplified intellectual capital language” is the gift in itself. However, in agreement with Mouritsen (2006), we regret that such models are still inspiring governmental and standard-setting bodies in their formation of rules and regulations for the business community. It could pose a serious problem that public bodies and institutions such as the IASB, OECD, Federal Reserve Bank, ICAEW, just to name a few, take their point of departure in the additive IC models, thinking that “this is just like accounting”. In the worst case scenario, our business community and capital markets may be affected by useless rules and standards hindering transparency and thus global business environments from prospering.

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 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 more scientific 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 the literature concerning 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 caused by 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 and 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 the micro-meso-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 at 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 and

business economics. 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 it therefore offers a sound theoretical basis from which we may widen our knowledge of this field.

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