Intellectual capital
Management approach in ICS Ltd

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Abstract

Purpose – The purpose of this paper is to demonstrate how the ICS intellectual capital methodology was developed starting from the underpinning academic theory.

Design/methodology/approach – The approach is founded upon a number of theoretical strands. The basic intellectual capital approach is based on a development of the resource based theory of the firm. Most intellectual capital approaches have problems with meaningful measurement. ICS addresses the valuation of intellectual capital resources by using axiology and multi-attribute value theory to produce a valuation framework and measurement theory to ensure that the results are reliable.

Findings – The ICS intellectual capital approach generates navigators (maps) of how resources are used in companies which have proven to be very useful. It has also demonstrated the value of deeper analysis of the intellectual capital resources. The measurement part, which is often used independently (known as the Conjoint Value Hierarchy (CVH), is shown as a powerful aid to decision making as well as to more straightforward valuation.

Research limitations/implications – The limitations are that the navigator and its associated analyses are non-rigorous while the CVH is rigorous, transparent and auditable. This mismatch can lead to problem and the challenge is to integrate them.

Originality/value – While parts have been reported previously, this paper is the first integrated review of ICS' methodology.

Keywords Intellectual capital, Measurement

Paper type Research paper

The development of our concept of intellectual capital

The paper begins with a review of the historical background to resource-based accounting and intellectual capital. This is then used as the starting point for a description of the intellectual capital approach used in ICS Ltd[1]. Aspects of measurement are then discussed as they apply to intellectual capital methodologies. The paper concludes with a review of the key barriers to the development of intellectual capital thinking as seen by ICS Ltd and some initial views on the important issues to be talked as matters of priority.

Intellectual capital has a surprisingly long history, one founded in the meso-economics of the first third of the twentieth century which was then developed in the second third into the micro-economic (firm-based) views. Chamberlin and Robinson (Chamberlin, 1933; Robinson, 1933) and later Penrose (1959) were contributors in this early work. Schumpeter's work of 1912 (Schumpeter, 1934) predates this work and sees the use of new resource combinations by entrepreneurs as the foundation of cyclical economic growth. However, Schumpeter's perspective was macro-economic and invention, as distinct from innovation, was treated as exogenous to the firm. Examination of the contributions of Robinson and Chamberlin show how the concepts they developed have survived to the present. For example, Chamberlin

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identified that some of the key capabilities of firms included technical know-how, reputation, brand awareness, the ability of managers to work together and particularly, patents and trademarks, many of these are common in relatively recent strategy and marketing literature (Day, 1994; Hall, 1992). Edith Penrose's much cited work on the theory of the growth of the firm dismissed the view that a firm was just an administrative unit and saw it instead as productive resources at the disposal of managers. She suggested that a firm is best gauged by some measure of the productive resources it employs. This led directly to the development of ideas concerning competitive advantage in the last third of twentieth century.

The concept of sustainable competitive advantage based on the utilisation of resources is simple and stems from the assumption that the desired outcome of management is a sustainable competitive advantage. Sustainable competitive advantage demands the possession of certain key resources and that they have characteristics such as quality or value, high barriers to duplication and so on (Barney, 1991). Sustainable competitive advantage can be achieved if the firm effectively deploys and maintains these resources in its field or operation. The key issue and the most important feature of useful intellectual capital[2] approaches is one of exposing strategic choice.

Penrose's work provided further guidance for the development of intellectual capital as an approach to business management. For example the clear definition of what a resource can be and how it differs from activities and services is crucial. This led to the notion that services yielded by resources depend on the resources that are used. A given resource can be used in different combinations with other resources to give different services or generate a variety of other resources. Furthermore, the development of a firm is constrained to an extent by the nature and qualities of the resource it currently posses. This thinking led others to consider the development and deployment of resources (Amit and Schoemaker, 1993; Barney, 1986, Barney and Zajac, 1994, Lei *et al.*, 1996; Schoemaker, 1992) and the relationship between resources and the scope of the firm (Chatterjee and Wernerfelt, 1991; Markides and Williamson, 1996; Prahalad and Hamel, 1990; Robins and Wiersema, 1995).

The term "resource-based view of the firm" was first used in 1984 in a paper (Wernerfelt, 1984) which was later awarded the *Strategic Management Journal* award for best paper. It was also in this decade that the rise of the new economy gathered pace and the traditional Porterian structures were found to be inadequate to describe firms and the performances of firms even in the same industry (Cubbin, 1988; Hansen and Wernerfelt, 1989). This later observation immediately brought in researchers concerned with strategy and strategic decision making (Amit and Schoemaker, 1993; Barney, 1986, 1991; Dierickx and Cool, 1989; Lippman and Rumelt, 1982; Peteraf, 1993; Reed and DeFillippi, 1990). Interest in these issues was not confined to academics. In Sweden, consultants, company chief executives and others convened what became known as the Konrad Group[3] to review the role of resources, both tangible and intangible in value creating or maintaining sustainable competitive advantage in firms. They issued a first publication in January 1988 entitled the *New Annual Report* and issued their final report in 1989 presenting the first method on intangible measurement, *The Invisible Balance Sheet* (*Den Osynliga Balansräkningen*). The publication presents key indicators for accounting control and valuation of know-how companies.

The issue of achieving and maintaining sustainable competitive advantage by means of combining and using resources naturally leads to the question of how the goodness or suitability of the resources should be described and measured. Barney (1991) proposes four conditions: value, rareness, inimitability and non-substitutability. Grant (1991) argues that levels of durability, transparency, transferability and replicability are important while Collis and Montgomery (1995) suggest five tests: inimitability, durability, appropriability, substitutability and competitive superiority. Amit and Schoemaker (1993) go even further, producing a list of eight criteria including complementarity, scarcity, low tradability, inimitability, limited substitutability, appropriability, durability and overlap with strategic industry factors.

In the development of intellectual capital at ICS, supporting thinking was also brought in, notably to assist with the treatment of value extraction from innovation (Teece, 1986) and human resources (Handy, 1989). The first methodology was published in 1997 (Roos *et al.*, 1997). To support the work overall and give a different perspective from the Konrad Group work, the work of Itami (1987) was used. Itami's treatment of the "mobilization" of resources being particularly helpful in the formulation of thinking of resource transformations. It was obvious at this stage that different managers in companies had different views on the importance of the resource transformations in the company and key outside stakeholders, such as investors, may take yet another view. The ability to accommodate multiple stakeholder view is therefore important.

The preceding paragraphs have touched on a number of issues that need to be consolidated into a homogeneous whole if it is to yield a practical approach to business management. These can be summarized as follows:

- It is strategic.
- It is about all a firm's resources.
- It is about their characteristics and quality.
- It is about how they are used in combinations to create value.
- It is about how value is seen by a wide selection of stakeholders.
- It is about how they are developed to ensure sustainable competitive advantage.

The measurement of intellectual capital has been problematical but it is the acid test of a working theory. Without measurement and the ability to predict then intellectual capital as a means of managing and explaining a firm's performance remains a hypothesis since it fails the classic test of the scientific method.

A key question at this stage is to determine what should be measured. There is increasing pressure from regulators, especially the Financial Accounting Standards Board in the USA who have been pressing and moving towards the mandatory disclosure of certain elements of intangible resources and the recording of elements of goodwill in mergers and acquisition; see FAS141 (Financial Accounting Standards Board, 2001a) and 142 (Financial Accounting Standards Board, 2001b). Thus, there is a growing requirement to disclose data on intangible resources. The ideal solution is to construct a single measurement system that is comprehensive inside the firm and is modular (permitting the simple use of parts throughout the firm) and which permits the disclosure of benchmarkable data (across the business sector of the firm thereby allowing meaningful comparison in the market) without compromising strategic intent.

When addressing intangible resources and their contribution it is clear that financial style measures are inappropriate. While some measures of intangible resources such as hiring and wage costs might be comparable, the value derived from any employee depends on how he or she is used and such is the complexity of the value contribution that ascribe a financial value to him or her is meaningless. Thus the wider concept of "value" has to be invoked. The study of value, known as axiology, moral philosophy and values stretches back to the ancient Greeks and, like many other things, seems to have lain largely dormant between the end of the classical period until renaissance times in the West. In the nineteenth century, the positivist movement sought to put science onto firm philosophical (rather than technical) foundations and in the early twentieth century, the logical positivists of the "Vienna circle" developed this further admitting only theories, methodologies or approaches that had either a basis in logic (such as mathematics) or could be "proved" experimentally (such as the other natural sciences). This second group can be problematic on the grounds of implied subjectivity. However, it can lead to the admission of axiology (see Frondizi, 1971), the study of value, into the fold of acceptability from the positivist point of view.

Axiology is and must be a general approach applicable to all questions of value but it has constraints in exploitation. Fortunately, most commentators admit economic value into the fold. Zúniga (2000) in her thesis on a general theory of value, discusses economic value and uses an example to demonstrate compliance. Both Zúniga and, much earlier, Menger (1883) discuss the nature of "goods" and value in an economic sense and distinguish between first order goods (which have immediate value) and higher order goods (which are enablers). They also consider the issue of independence of view and argue that while value and valuations may be personal, all observers may be wrong in their valuations since there is an ultimate *ex post* arbiter of value which is the market.

Axiology requires extension from its simple philosophical roots to enable it to be used in complex situations such as the valuation of intellectual capital in companies. Multi-attribute value theory (MAVT) (Keeney and Raiffa, 1993) is the most widely used theory in solving multi-attribute decision-making problems. Practically all approaches to multi-attribute decision making explicitly or implicitly make use of the concept of the relative importance of criteria the weights of criteria or attributes within a hierarchical system of value. While there are many approaches to the issues of weighting or determining the relative importance of attribute, the pair-wise comparison methodology of Saaty (1980) has been found to give good results and is widely used.

The foundation of measurement is measurement theory, a branch of applied mathematics. If it is adhered to then reliable measures can be obtained which mangers can use. If it is not, and adherence appears uncommon in non-financial measurement, then what results is a selection of probably misleading results of no real use to managers. While indicators, as distinct from proper measures, have their place as rough guides, care has to be exercized in their use. Table I compares measures and indicators.

ICS has developed a simplified indicator system known as the IC Index for internal managerial use but this is not discussed in this paper, since it is extensively covered in other publications (Roos *et al.*, 1997; Roos and Jacobsen, 1999, Bontis *et al.*, 1999; Bontis,

Measurement system	Indicators
Advantages	
Accurate if built properly	Quick to build
Produces a complete view of the object	Easy to operate
Data can be disclosed	
Results can be benchmarked	
Can be the basis of derived measures	
Can be used with other business models	
Transparent and auditable	
Takes multiple views of value into account	
Disadvantages	
Takes care and time to set up	Purpose specific
Data requirement can be large	Cannot be benchmarked with safety
Data quality requirements are stringent	Takes a single "average" view of value
	Cannot be aggregated to value complex objects
	Possibility of duplication

Table I.
Comparison of proper measurement and indicators

2000; Pike and Roos, 2000; Neely *et al.*, 2002; Marr *et al.*, 2002; Pike and Roos, 2004; Marr et al., 2004).

Measurement theory has its very early roots in ancient Greece but the ideas of the modern theory of measurement date from the ninteenth century work of Helmholtz(1887) and others. However, its formalisation is a surprisingly recent event. The catalyst for the formalization of measurement theory is generally accepted to be the psychologist S.S. Stevens (Stevens, 1946), but it was not until the 1960s that measurement was fully axiomatized with the publications of Scott and Suppes (1958) and Suppes and Zinnes (1963).

In pragmatic applications of measurement theory, a multi-stage process is generally involved in which the representation of the object to be measured and the measurements system are kept separate. In the first stage, an empirical relation system is specified to define the relations among the attributes of the studied entity, in this case, the company. Second, an isomorphic numerical relation system is defined, to provide values for the measures of the attributes and relations among these values. The general form of these measurement systems is hierarchical with a precisely defined business value context at the top. The pragmatic rules and requirements of an empirical relation system suited to modern business systems have been set out by M'Pherson and Pike (2001) and extended later (Pike and Roos, 2003). In the empirical system, there are two rules that must be observed:

(1) That at every level of detail, the sum of the meanings adds up and completely describes the meaning of the company and what it does. This is the condition of "completeness" and ensures that nothing (important) is missed out.

(2) Every attribute at every level is independent in terms of meaning from every other at the same level. This is the condition of "distinctness" and prevents double counting.

M'Pherson and Pike (2001) then continue with the numerical isomorph in which real measures are found which satisfy the desired measures in the empirical system.

Unfortunately, some of the attributes of value that should be measured are hard to observe in practice and proxies must be used for them.

- That the proxies are "agreeable" and do not change the meaning of the attributes above them in the hierarchy by violating either of the first two rules. This means that the real measurement system truly reflect the intention of what is to be measured.
- The "commensurability" condition ensures that data is all on the same 0 to 1 scale and is all defined on a ratio scale. This means that there is no chance that any of the results or later statistical post-processing are invalidated because of poor data.
- The mathematical constraints on the aggregation function are often lumped under and "independence" banner and assure that ill-conceived combination schemes which would produce wrong answers are not permitted.

By combining measurement theory with axiology and multi-attribute value theory it is possible to develop bespoke or general measurement systems to measure business performance and "account" for the value in intangible resources and their use.

Our concept of intellectual capital

ICS defines intellectual capital[4] as any intangible resources or transformations of those resources, which are under some level of control of the company that adds to a company's value creation (Roos *et al.*, 1997).

Resources

The researchers of the 1980s and early 1990s produced a variety of definitions. It is generally agreed that tangible resources are either monetary or physical, are owned by the firm, behave with diminishing returns and can be valued with reasonable agreement according to generally accepted accounting principles. Intangible resources in contrast may or may not be owned by the firm, they might only be partially under the firm's control, may they have complex return characteristics and they are hard to value. Indeed, Edvinsson and Malone (1997), while credited with equating market value to the sum of intellectual capital resources and tangible resource results, were not the first to suggest such an erroneous relationship. Grant (1991) suggested that the IP of pharmaceutical companies as tradable entities was the cause of the significant difference between market value and book value.

The definition of resources must surely be one of the most embarrassing features of the intellectual capital movement. Over the past ten years there have been a great number of formulae for describing intangible resources with few exploring much below a level where there are two groups of tangible resources and another two or three groups of intangible resources. None so far have backed their definitions with semantics or mathematics. This means that methodologies are not interchangeable and comparisons cannot be made between any two firms, as there is no guarantee that like resources are being compared.

The ICS methodology has a hierarchical menu of resources starting with "level 1" which comprises monetary, physical, human, organizational and relational resources. These are defined by a set of underlying resources at finer levels of granularity. Thus the menu continues with some 30 standard "level 2" resources which are supported in

turn by up to 100 firm-specific "level 3" resources. While the list may seem a long one, it is customized for different firms at level 3 only. Furthermore, while "level 3" resources are used in the precise definition of the "level 2" resources, in practice, it is usually unnecessary to consider more than about 25 resources since the efficiency, effectiveness, opportunities, threats to the firm are almost always visible even at this level of granularity. Although the definitions are not semantically validated, some effort has been expended in making their meanings complete and distinct, as this is a pre-requisite for later measurement activities. Resources, and some of their general characteristics, are shown in Figure 1, a telecom company providing the example. They are arranged in what is known as a distinction tree but it should be remembered that this is really nothing other than a presentational device since it is the combinations of and interactions between different resources that is important in the creation of value in firms.

Resource characteristics

ICS has adopted a variant of Barney's (1991) resource descriptions. In practice, the influences of the resource characteristics in creating value are not uniform. For some types of resource such as intellectual property, inimitability, non-substitutability may be of much greater importance than other characteristics whereas for human resources, inimitability is often impossible to attain and is therefore not an important issue. This means that two measures of goodness for each of the resource characteristics must be found. These are: how important is each characteristic and how does the resource perform against a reasonable test of goodness. ICS takes a weighted average of the results to illustrate results but retains the more complete data.

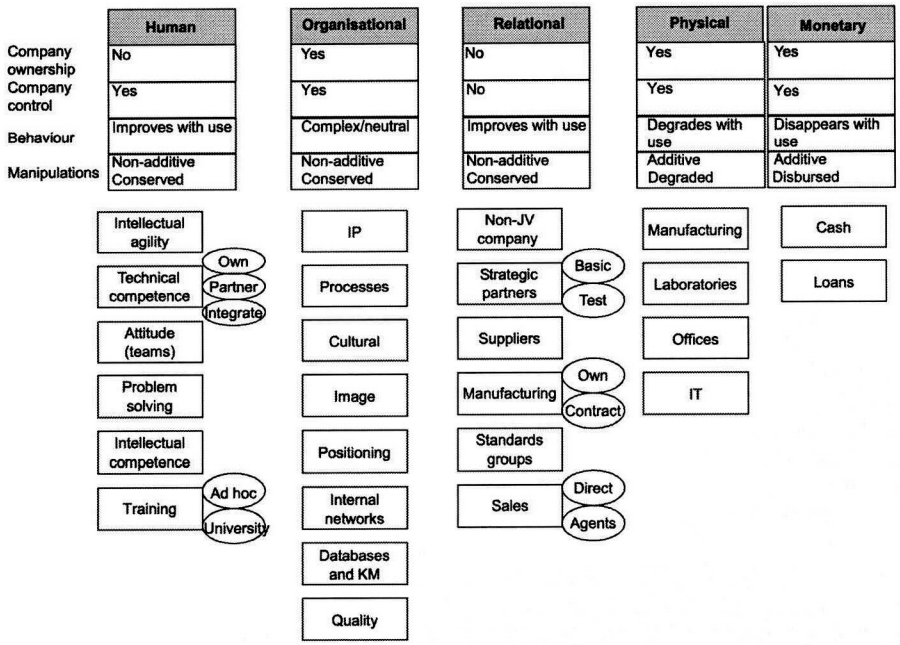

Figure 1.
Resources and their characteristics for a telecom company

Resource deployment

As stated by Penrose (1959) and noted above, it is the combinations and use of resources that generates value through the creation of other saleable resources or services. It is important to realize that there is no correlation between the amount of a given resource that the organization has at its disposal and the value that the organization can create as the efficiency of deployment and the quality of the resources, not to mention the actions of competitors, are all factors which will affect the generation of value.

All resources in an organization are interconnected in some way or other and value is created through the transformation of one resource into another, for example, products to money, creativity to new processes, relationships to reduced search costs, brands to increased revenues and so on. The requirement in the analysis of a firm is to identify and evaluate the firm's unique transformations structure. However, there are two problems that are encountered:

(1) Few of the firm's resources are additive in the way they are "used". For example, doubling the number of people does not double the human resource value. This means that the relationship between the amounts of resources involved in a transformation and the amount of the resource(s) produced is complex.

(2) Outwardly similar transformations may actually be rather different in detail. For example, parallel and similar production lines may be dependent on resource quality to very different degrees. This makes backward interpretations of aggregated results problematical and small volume transformations may be missed altogether even though they are important.

The conclusion is that it is easier and safer to avoid an attempt at a full explanation of value creating processes in firms but rather to confine the analysis to the principles of what is occurring, that is, to look for what is important rather than attempting an exhaustive numerical illustration. Experience shows that a wealth of informative results can be obtained by analysing what is important rather than undertaking a detailed analysis. The issue of inadvertently ignoring small volume but high importance transformations because they seem insignificant beside high volume, low importance activities (like repetitive production) is obviously fundamental and is avoided.

The Intellectual Capital Navigator (ICN) is a numerical and visual representation of how management views the deployment of resources to create value in the organization. The ICN is about identifying transformations from one resource into another. It is important to remember that all transformations are possible although in a given organization, they are not all relevant. Based on our experience, in an analysis of a firm which has been described by 25 resources, for example, only a few, possibly less than 20 of the 625 possible transformations will be important.

Figure 2 shows a simple and generalized transformation matrix at "level 1" with examples of all 25 possible transformations. The matrix is turned into a numerical representation of the firm in a two-step process. The first step is to consider resources with managers with broad experience of the form and seek their views on the relative importance of the resources in creating value for the firm. This is necessarily a top-level appreciation but serves to weight the lower level and more detailed views of

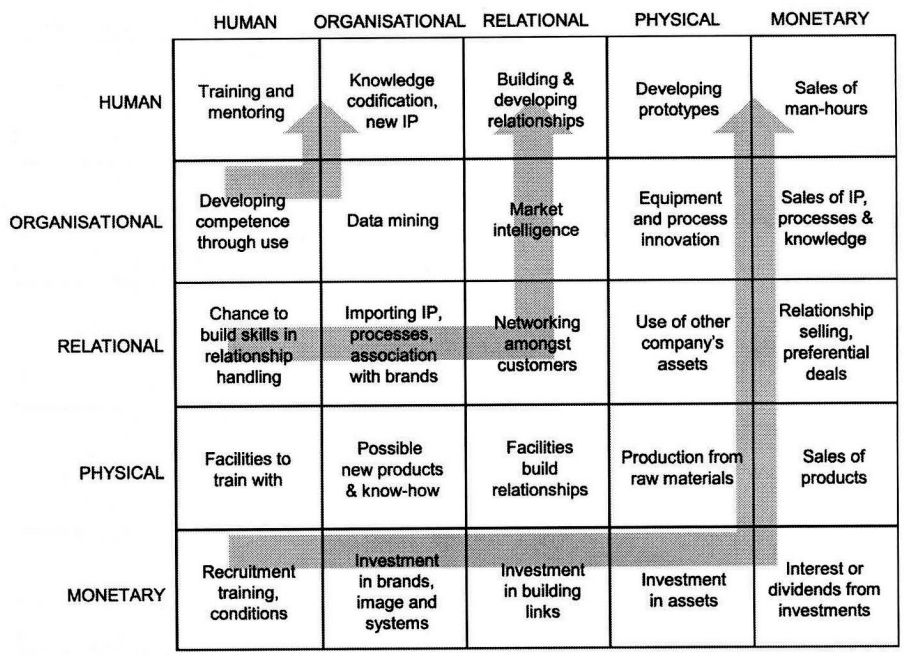

Figure 2.
Generic resource transformations at "level 1"

functional managers. The second stage is to consider resource utilization with functional managers possessing a localized but deep knowledge of parts of the firm. In this way a numerical matrix with numbers representing the importance of resources in creating value is developed. The matrices developed in this way are frequently sparse as many of the possible transformations are irrelevant or impossible in a given firm. Figure 3 shows a numerical ICN at "level 1". The figures were taken from the analysis of the research department of a pharmaceutical company and it is clearly obvious how important human resource (laboratory competence) and organizational resources (protected intellectual property) are in the creation of value.

Navigators can be presented at any level of granularity and with any level of filtering. Filtering of the results is undertaken to remove clutter from the picture by excluding transformations relatively unimportant to company managers. When the navigator is drawn, analysis is then possible. Several features can be seen in navigators but perhaps the most obvious and interesting is the adherence or otherwise to the recognized forms of firm value creating architecture (Stabell and Fjeldstad 1998). Stabell and Fjeldstad (1998) postulate three basic firm architectures: the (Porterian) value shop typical of production orientated companies, the value shop typical of professional service companies and the value network typical of market facilitating companies. Production orientated companies are typified by important physical to physical transformations supported by human and organizational to physical influences. Professional service companies exhibit a triangular structure involving human, organizational and relational resources, that is, a learning process. Market facilitating companies can either be physically based (such as the physical resources of a telecom firm) or organizationally based (such as the software and processes of an

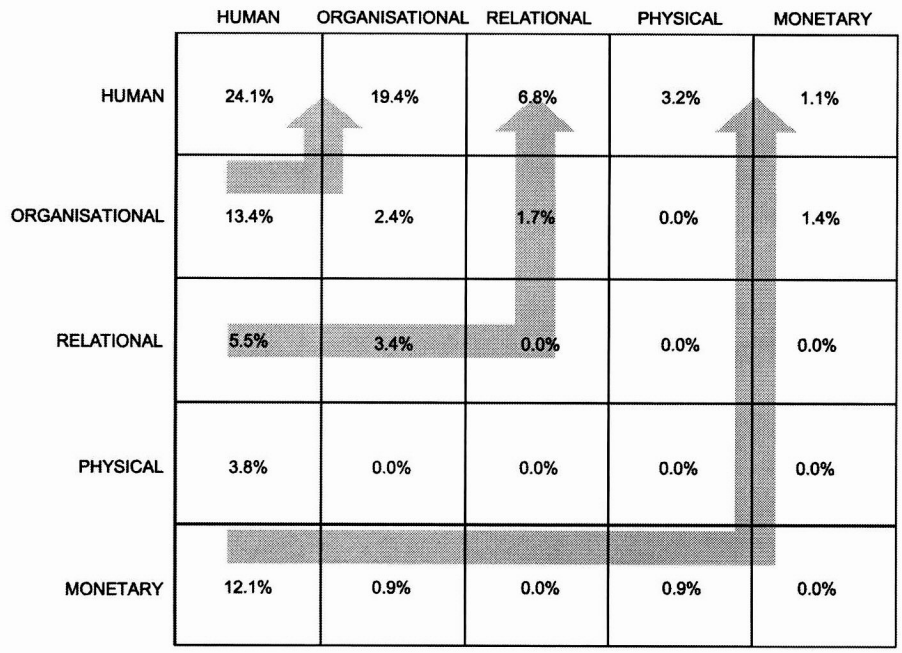

Figure 3.
Numerical navigator of the research department of a pharmaceutical company

on-line market place). While the underlying structure is variable, all market facilitating companies have a strong relational to relational transformation representing transactions with relational to monetary and relational to human links representing earning and feed-back respectively.

Of course, the degree, balance and completeness of these basic structural forms are a measure of how effectively the company is following its chosen operating form. Figure 4 shows the "level 1" navigator from the pharmaceutical company and the triangular pattern involving human, organizational and relational resources is at once evident although the involvement of the relational resources is weak suggesting that research direction is exercized by managerial whim rather than by market force. In the figure, the size of the circles represents the importance of the resource. The arrows represent the transformations and the thickness of the lines represents the importance of the transformations.

Further analyses based on the navigator matrix can be carried out. One of the most revealing is to inspect the balance between how influential a resource is in a firm and the extent to which it is influenced by other resources. Resources with a ratio greater than unity are sources of value since they influence more than they are influenced. Resources with a ratio less than unity are termed sinks of value. The ratios for all resources (usually expressed as the logarithm of the ratio) can be plotted against the absolute importance of the resources in what is known as an "effector plot". Figure 5 shows the effector plot for the pharmaceutical company at "level 2". The ratio is on the vertical axis and the absolute importance is on the horizontal axis. The grey zones are zones which together (arbitrarily) occupy 25 per cent of the plot area and concern the more important resources. The upper triangle represents resources which are

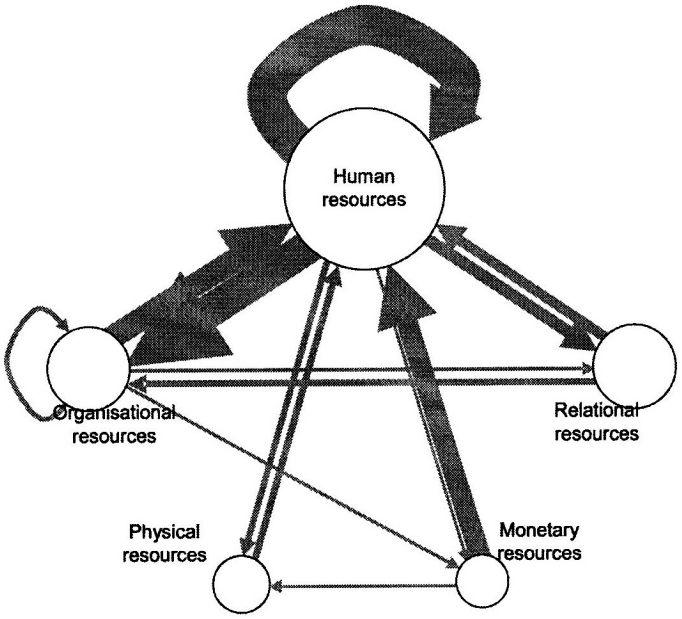

Figure 4.
Level 1 navigator for the pharmaceutical company R&D department

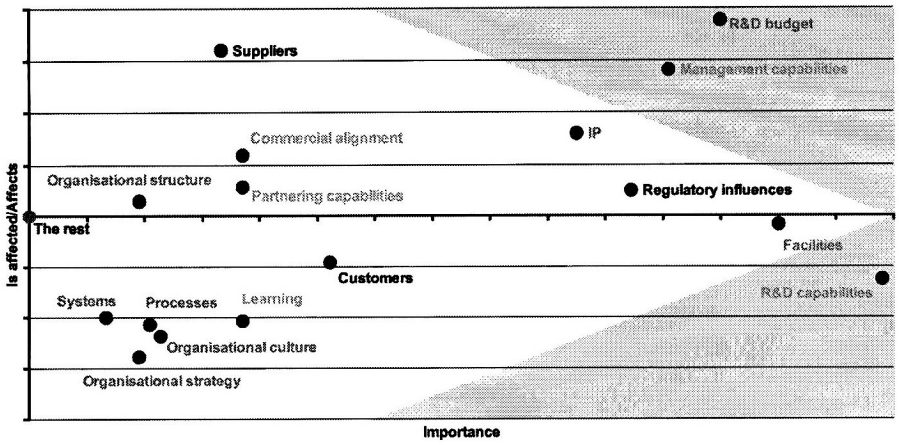

Figure 5.
The "level 2" "effector" plot for the pharma R&D department

important and a great source of value while in the lower triangle they are important but are significant sinks of value.

Resources in the grey zones are worth of further analysis and our analysis is as follows: The appearance of resources in the lower grey zone is an important question since it points to major areas of inefficiency in the firm. Important resources (as they

appear to the right) are not generating value. In the top grey zone the issues are completely different since an effective firm is one that derives value from its important resources. It is intuitively obvious that average or trend of the placement of the resources on this plot should be from bottom-left to top-right although actual dispositions are always going to deviate away from this "ideal". What is important for resources in the top-right triangle is that they are robust and truly are the source of sustainable competitive advantage that is required. It is here that the analysis of resource characteristics can be overlaid with the navigator matrix data to yield a modified "effector" plot which is referred to as a "hot-spot" plot. Resources which are not robust require rapid management action to ensure sustainable competitive advantage.

Figure 6 shows a hot-spot plot. In this plot, only the more important resources only have been highlighted and the plot now contains markers with black, grey or white points. Black points represent resources whose weighted average robustness was 0.333 or less. Grey resource points have a robustness score greater than 0.333 but less than 0.666 and white resource points have robustness scores of greater than 0.666. Clearly this company has issues with the robustness of the R&D budget and their managers. Finances are perennial favourites for scrutiny but with the managers it was found that there was an unacceptably large turnover rate and, given their mode of influence in the firm, became a priority area for detailed analysis and improvement.

So far, the intellectual capital analysis of the firm has taken the form of a snap-shot view with no consideration of the strategic intent of the company. Earlier in the paper it was noted that the resource-based view of the firm encompassed a number of issues, one of these was the strategic nature of the approach. In order to set targets and elucidate development pathways a forward-look is required, that is, a management view of what is intended for the future (which may involve divestment, organic growth, acquisitions, mergers or combinations of some or all of them).

To accommodate the strategic intent, a second navigator matrix representing the desired end state can be constructed and analyzed in parallel with the current position. Targets and measures will be considered in the next section but the link between the two states can be visualized using a second variant of the "effector" plot. In this case,

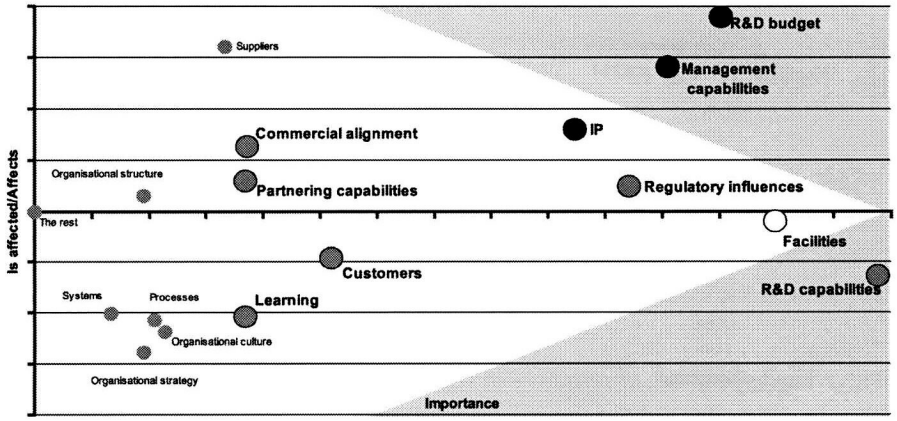

Figure 6.
Hot-spot plot for the pharma R&D department

the current and target positions can be plotted together with any number of intermediate conditions which will arise in time as the firm transitions along its chosen path from the current to the end position. The crucial feature of the analysis is to ensure that at no time is there any serious and unintentional incursion into the grey zones on the effector plot. In effect, a trajectory for each resource is drawn. Assuming there are no problems with trajectories, the ICS methodology continues by addressing measurement. This is carried out in one of two ways depending on whether simple "rough" internal targets are sufficient or whether an accurate appraisal is needed, possibly up to the standard required for disclosure.

Measurement and reporting

Over the last 10-15 years, a great number of systems have been devised to help managers with business performance and with a special emphasis on non-financial measures. According to Luthy (1998) and Williams (2000), methodologies may be categorized into four groups. These are:

(1) Direct intellectual capital methods (DIC).

(2) Market capitalization methods (MCM).

(3) Return on assets methods (ROA).

(4) Scorecard methods (SC).

Sveiby (2004) uses this classification system, but without the distinction of a proper measurement group, or MS group, and has generated a list of methodologies. MS is an approach that aims at completeness and reliability with an explicit treatment of all aspects of intangible value. Of the others, the MCM and ROA approaches have an element of rigour in that they rely on financial figures which, if not perfect, are auditable. DIC, and to a lesser extent SC methods, offer the potential to create a more comprehensive picture of an organization's health than financial metrics, since they can be easily applied at any level of an organization. This is because they are directly aimed at management support and DIC is intended to be holistic.

Unfortunately, none of these approaches complies with measurement theory (Pike and Roos, 2004) and can at best be indicator systems.

ICS employs two approaches to measurement, one is an indicator system belonging roughly to the DIC category and the second is a system known as CVH (Conjoint Value Hierarchy) which is a fully compliant measurement system (MS category) used to measure the value contribution of intangible resources.

The CVH is based upon relational measurement theory in which an empirical system is developed to model the intellectual capital in the company and then a numerical isomorph is produced to calculate the results. Figure 7 shows the empirical relation system for a fast-food company operating through franchized restaurants. This structure was developed according to the methodology described above and converted into an operational numerical system. In this case, the weightings used were provided by a group of external stakeholders; a group of market analysts. Thus the stakeholder group as would normally be defined by Agle *et al.* (1999) was incomplete. It should also be noted that the structure shown in Figure 7 contains few attributes described using the language found in Figure 1. This is especially true in the instrumental group above the uppermost black line. The reason for this is that in most

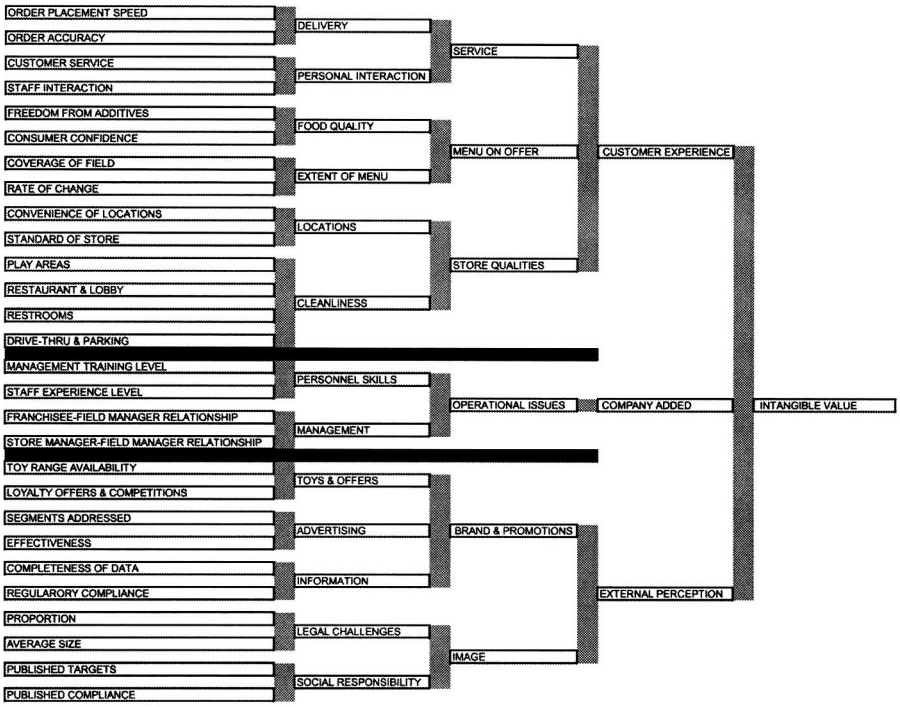

Figure 7.
CVH measurement structure for a fast food company

cases, the value of an intangible resource stems not from its ownership or control but from its use. Thus what is measured is the value created as an outcome of normal firm activities. To see the intellectual capital resources at work required the inspection of the underlying navigator. However, it should be noted that in a study concerning what investors wanted to know about a firm carried out by Mavrinac and Siesfeld (1997), no immediately recognizable intellectual capital resource appeared in the top 10 items investors wanted disclosed.

The CVH methodology was applied in a case study of a fast food company with the objective of determining the value of the company in question, taking only the perspective of the (share price) market makers. The purpose of this example is to demonstrate measurement of intangible resources and the predictive capabilities of the CVH in strategic issues. In the case study, the company was subjected to three possible futures in order to determine the robustness of its present configuration. In addition to the possible futures, a "do nothing" base run was carried out as a comparator. The four runs were as follows:

(1) A base run in which no parameters were altered.

(2) Scenario 1 in which advertising was cut by 15 per cent

(3) Scenario 2 in which there was a 40 per cent cut in advertising and 62.5 per cent of this saving devoted to improving human resources through training.

(4) Scenario 3 in which in addition to the changes in Scenario 2, there was a one-off spend of 37.5 per cent of the saved money applied to organizational capital in the form of market research in the second year of the simulation and then that 37.5 per cent saving is returned to shareholders in the third year and thereafter.

These four runs constituted a logical comparable series. This means that the results from the three scenario runs could be compared against each other and also against the base run. In particular, it allows for direct comparison of the cost of the options and the value benefits gained. This is a true calculation of value for money involving intellectual capital assets. The value for money plots for the firm are shown in Figure 8. The plots show combinations of the financial output with the output from the CVH at the top level.

The top graph in each group shows the change in value for the scenario compared with the base run. The middle graph shows the total revenue change between the base run and the scenario in billions of dollars on the left-hand y-axis while the net saving for each scenario in millions of dollars is shown on the right-hand axis of the top graph. The lower graph of each scenario trio shows the quotient of the value change and the spending change:

- *Scenario 1.* From the left-hand column of plots, it can be seen that there is an initial slight fall in value followed by a recovery. There is also a modest growth in income over the period of the simulation coupled with an overall discretionary spend saving over the period. Over the same period, as described above, there is a very slight value change leading to a near level value for money change.
- *Scenario 2.* The second column of graphs shows the results for Scenario 2 and show the loss of top-line benefit compared to Scenario 1 stemming from the loss of brand presence. This is compounded by worse value results leading to a negative value for money across the time period. Clearly this is a poor option.
- *Scenario 3.* The third column shows stronger top-line growth and a positive value for money change making this the best value for money option of the three scenarios.

Figure 8 shows that the CVH can differentiate between strategic options for real companies and express the results with meaningful calculations of value and value for money. In the example, the company would clearly not consider Scenario 2 further due to the negative value for money outcome and Scenario 1 is probably too mild to make the meaningful improvement required. Scenario 3 would be investigated in further detail and with other changes to optimize the value for money outcome and to establish the robustness of the scenario.

Given that the CVH fulfills the requirements of reliability and repeatability, it is also a viable method to use in reporting intangible resources. It can supply standardized information within market sectors and permit comparison while at the same time protecting data that are sensitive to the company (Pike *et al.*, 2003).

Reflections on ICS's approach

The paper has demonstrated the development of ICS's approach and its theoretical foundations. In common with all IC approaches, the IC Navigator[5] (Fernström *et al.*, 2005) and the indicator system used with it known as the IC Index are strategic

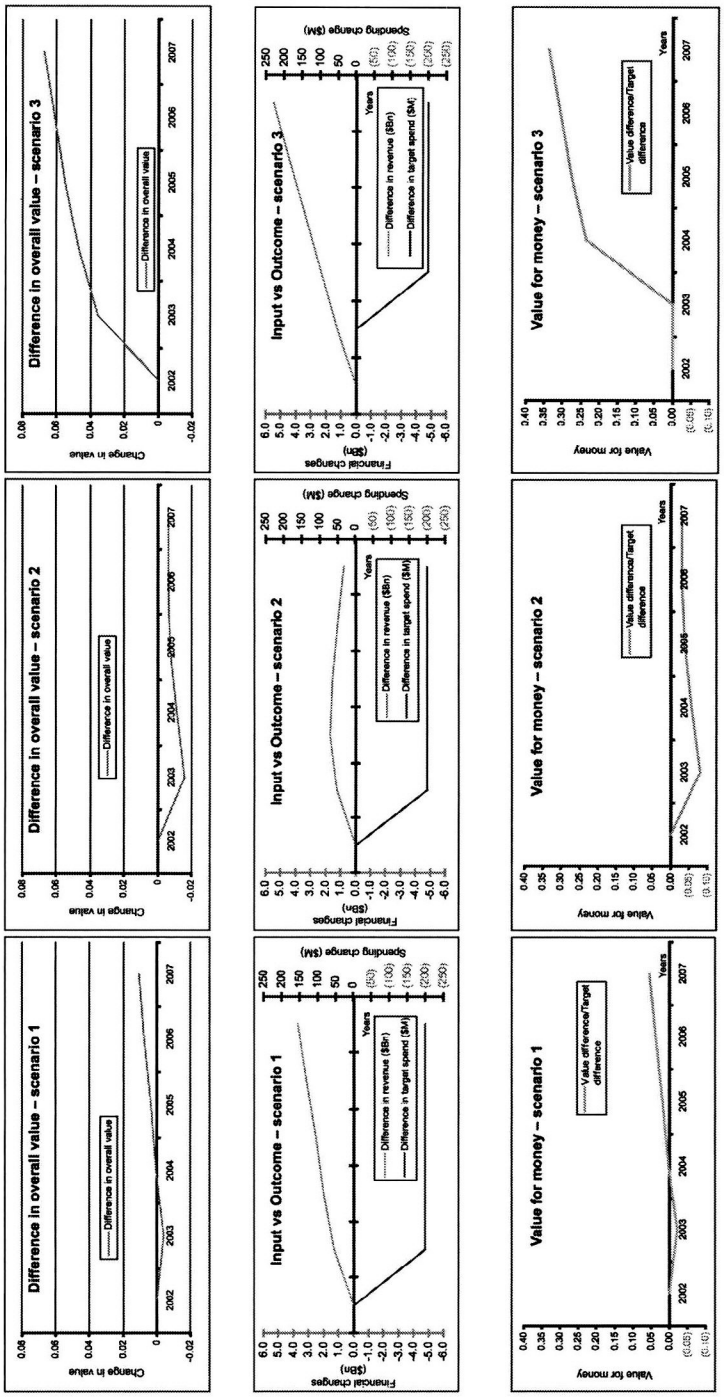

Figure 8.
Value for money of thethree scenarios compared to the base run

approaches rather then specific measurement approaches. The CVH, originating from measurement theory and axiology is a high-precision measurement approach. As a consequence the applications of these approaches are different since they address different issues.

ICS often encounters concerns client expectations about what they can do with the approaches and the results that each gives. Table II compares some of the things that the approaches can and cannot do.

The future of intellectual capital

Although we have seen that the roots of intellectual capital stretch back over 70 years to the economists of the 1930s, for most people the awakening to intellectual capital came with Stewart's article in 1994 (Stewart, 1994). Intellectual capital was born with a wealth of literature and learning behind it. The fields of economics, strategy theory, decision making, philosophy and mathematics were all well developed and available to support serious thought about the management and measurement of firms using the new intellectual capital approach.

In the ten years that have passed since Stewart's article it may fairly be claimed that progress has been slow at best. The evidence for this is that the number of firms using intellectual capital methodologies world-wide is very low and those disclosing intellectual capital in reports is even lower.

It would be unrealistic to pretend that the methodologies developed in ICS are the final word in intellectual capital methodologies. From our consulting experience, we believe that the challenges that beset the intellectual capital movement are just two in number but are of such importance that they have contributed significantly to the poor take-up of intellectual capital as a management approach.

The first is the dire situation regarding taxonomies. For the last ten years and even now, many papers and presentations involving intellectual capital contain sections devoted to defining the terms being used. Even at the coarsest level ("level 1") there are many different categorisations of resources, for example customer capital versus

What it can do	What it cannot do
IC Navigator/IC Index	
Provide a simple, clear and useful appreciation of how business work and could work (Navigator) thereby provide input into any strategic discussion	Measurement since the IC-Index is indicator based
Provide simple and clear sets of targets for managers (Index)	Integrate directly with financial measures
Be applied to parts or all of a company	
Be applied to any organization whether profit driven or not	
CVH	
Provides a detailed and accurate appreciation of the value of a company	Be extended simply so that unplanned and radical alternatives can be assessed
Provide multiple stakeholder views	
Integrate with any other model	
Used for disclosure purposes	
Be applied to all or parts of a company or an industry	
Measure things other than companies.	

Table II.
Applications of the ICS methodologies

relational capital, organizational capital versus structural capital and so on. To an extent, this might be considered a presentational issue since "level 1" is not a working level, however, there is little agreement at "level 2" on terminology amongst the DIC or SC type methodologies. If firms are to embrace intellectual capital in larger numbers, generally understood definitions will be needed and the process of standardization must include business schools as well as firms. Furthermore, if firms are to disclose elements of their intellectual capital resources and their usage in the future then the need for agreement on the definitions of terms (avoiding lacunae or overlaps in meaning) is even stronger.

The second challenge stems from the introductory section of this paper. That is that there is a broad field of contributory disciplines embodied in intellectual capital even as it stands today. What is certain is that the development path for intellectual capital will include at least all of these and probably more and this is especially true in the area of measurement. The solutions to the challenges facing the intellectual capital movement will be found by bringing in techniques from other disciplines. The task is not an easy one, many hypotheses involving external contributions will have to be attempted before anything like a complete and secure transit of Bacon's scientific pathway of inductive reasoning is completed. But completed it will have to be if intellectual capital is not to fade.

Notes

1. Intellectual Capital Services Ltd is a consulting company and think-tank with business offerings in, amongst others, the areas of strategic management. In common with other small companies, it has sought intellectual excellence and rigour as a distinct feature. Thus the methodologies ICS Ltd develops stand on sound academic footings.
2. The term "intellectual capital" was first used by John Galbraith (Canada) in 1969, in a letter to Michael Kalecki, although the meaning intended by Galbraith was undoubtedly different from that in use today.
3. They called it the Konrad Group because they first met on 12 November 1987 and 12 November is Konrad Day in the Swedish calendar.
4. For those interested in a more detailed outline of these approaches and how to apply them using numerous real life cases we refer the reader to the book entitled *Managing Intellectual Capital in Practice* by Roos *et al.* (2005).
5. The IC Index is an indicator system based on IC Navigator analyses at the present time and at some key point in the future. The IC Index system identifies the key resources and transformations that must be measured to ensure they follow the desired trajectory between the present and the future. Results are produced at several levels of detail.

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