

Intellectual Capital: Accumulation and Appropriation*

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Abstract

This paper seeks to develop a literature-based perspective on intellectual property from the standpoint of business strategy and strategic human resource management.

Distinctive competitive advantage is increasingly built on a firm's knowledge, one of the principal ingredients of intellectual capital. Competitive capability is strongly influenced by the organisation's ability to develop, differentiate, appropriate and disseminate its knowledge base. Section 2 identifies the principal characteristics of knowledge assets and explores the means of extracting and protecting the value of those assets, e.g., through R&D, patents and trademarks, licensing and human capital investment. Section 3 reviews the significance of knowledge as a strategic asset and reflects on its growing importance vis-a vis physical capital. However, where knowledge is embodied in people as part of their personal intellectual capital, questions of ownership and appropriability arise in ways that are absent with physical capital. This is discussed in Section 4.

Section 5 focuses on the human resource management issues arising from the disputability of ownership of knowledge, especially embodied or intrinsic knowledge. Attention is paid to problems of 'stickiness' of knowledge transfer and diffusion, and employer expropriation of value.

Section 6 presents conclusions, including reference to the role of governmental agencies concerned with the public interest in the protection of property rights and the social benefit to be derived from advances in knowledge.

An appendix briefly surveys three main approaches to the valuation of intangible capital and observes some of the problems posed in the development of effective measures of intangible assets, particularly where these are embodied in people.

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1. Aims and coverage

The purpose of this paper is to develop a framework, based on a survey of the literature, for the analysis of intellectual capital from the perspective of business strategy and human resource management. It is intended to be complementary to other reviews from the standpoint of economics and law, though in places the boundaries are likely to be blurred. A principal underlying purpose is to contribute to the understanding of competitive behaviour among innovative, intellectual capital-intensive firms, with a view to assisting IP Australia (IPA) to assess how developments in this area might affect the scale and scope of its activity. Firms innovate in order to gain advantage over competitors, and will be anxious to protect their investments, where possible. Traditionally, with the production of physical or tangible goods, businesses have been able to do this through patents, trademarks, business secrets and the like. But with the growth of the service economy, and the growing volume of trading in intangible goods and services, it is much less clear that traditional means of protection will suffice.

Services now comprise nearly 40 per cent of US GDP, while market services plus intangible goods are estimated to account for two-thirds of US GDP.(Blair and Wallman, 2001). Property rights over products through patents, copyright on processes, and trademarks for brands and reputation, give formal protection for products that are discrete, observable and controllable. Protection comes at a cost, which will be worthwhile so long as the return in terms of competitive advantage is judged worthwhile, or until the patent or other protection runs out. But corporate behaviour with regard to patenting, and possibly also trademarking, varies considerably among industrial sectors, with major differences, for example, between chemicals and pharmaceuticals on the one hand, and electronics on the other. What underlies

these differences is likely to be important not only for an understanding of the role protection plays in competitive behaviour, but also for better analysis of future trends in the demand for protection.

With the relative expansion of services, and the growth of knowledge-intensive goods and services, these issues increase in importance. Intangibles present three kinds of problem:

- Some intangible assets can be ‘owned’ and sold, i.e. considered as property, with property rights, if they are able to be codified and articulated: patents, trademarks and copyright are examples:
- Some intangible assets can be ‘owned’ and controlled but not separated out and taken to market: R&D in progress, business secrets, reputational capital, proprietary management systems and business processes are difficult to measure and separate out from other intangibles, and difficult to convey to other parties in a discrete way;
- Some intangibles may not be wholly owned by the firm, or ownership may be contested: examples include human capital, organisational and relational or social capital, which do not meet the tests for professional accounting of assets: discreteness, observability and control (through unequivocal ownership). (Blair and Wallman 2001)

Intellectual capital is a complex concept, the importance of which has been reinforced by current tendencies towards the development of knowledge and knowledge workers as the basis for increased competitive capability on the part of firms and economies. This phenomenon owes its existence in no small measure to the development of new technologies, especially in the information and communication technology (ICT) fields. One effect of these has been to accelerate the pace of innovation, in terms both of new products and new means of production, leading to the blurring of former distinctions between products, and to the formation of new markets where no markets were previously feasible. While in some sense there has always been a market for knowledge, the scope of this market – or more properly now a series of inter-related markets – has expanded, and its importance in the competitive process has become increasingly recognised.

The effect of this development has been to heighten the importance for organisations of

- learning to identify where critical knowledge exists in the organisation

- assessing the extent to which knowledge is already appropriated or capable of becoming so
- developing knowledge that will add to the net value of the firm or organisation, and
- devising an appropriate management approach to the knowledge systems and knowledge intensive staff in the organisation.

As we shall see, the issues underlying these various tasks are by no means straightforward. Even in the better-charted areas of the field, such as patents and trademarks, there are many differences in practice among countries and organisations, and both the theoretical and the empirical literature are relatively under-developed.

A particular feature of knowledge in the generic sense, and intellectual capital, is the often-ambiguous nature of ownership. Intellectual capital can be defined as comprising ‘all immaterial resources that could be considered as assets with some kind of assignable capitalized value’ (Granstrand, 1999,18). As a form of capital, ownership and property rights are highly important. Yet for economics and for law, the analysis of physical assets or physical property is much further advanced, and until comparatively recently many of the ambiguities and complexities associated with intellectual capital have been relegated to the periphery of these disciplines. ‘IP notions have also evolved in a marginalized manner very much in the backwaters of law, economics and politics’ (Grandstrand, 1999, 50). In the last twenty years this has begun to change. Much of the impetus stemmed from developments in the United States in the 1980s, which moved the US from an anti-patent policy framework (based on the view of patents as a source of monopoly acting against the public interest), to a pro-patent approach. Part of the rationale for this was concern at a political level that Japan was infringing patents and, through the advances in its own technology, making inroads on American competitiveness (Grandstrand, 1999, 38-40). American efforts to improve protection of IP in turn had more global effects as other countries responded, with the result

that over the last two decades most countries have adopted a more pro-patent stance (Teece, 2000).

This thrust has been given further impetus by the growing appreciation of the ‘knowledge economy’, in which knowledge is seen as an increasingly important competitive capability, as information and communication technologies helped to equalize other more traditional sources of competitiveness. As John Kay has expressed it,

‘the balance between the knowledge component and the resource component [of output] has changed dramatically and with it has changed the source of distinctive capabilities. In the past the capabilities have rested on things like market dominance and organisation of large-scale manufacturing processes. Today comparative advantage lies in brands and reputation, patents and standards, relations with employees, suppliers and customers’ (Kay 2000, p.48.: parenthesis added).

These latter sources of competitive advantage are all forms of intellectual capital, which can give rise to enormous differences between the value of a firm as measured by its physical assets and its market value inclusive of non-physical capital. Striking examples include Coca-Cola, Intel, Sony, Canon and Microsoft, all with large non-physical to physical capital ratios. The indications are that the knowledge intensive sector is increasing its share of economic activity. Probably the best-known work along these lines is that of the OECD. This identifies a knowledge based sector comprising:

- a. high technology industries (aerospace, computer and office equipment, communications equipment and pharmaceuticals) and
- b. knowledge based services (telecoms, computer and information services, finance and insurance, education and health).

According to this source, the knowledge based sector in the mid-1990s accounted for more than 50% of OECD wide business sector value added – up from 45% in the mid-1980s

(quoted in Philpott, 2000, p5). This sectoral approach is, however, questionable in its assumptions that all employees in the above-designated industries are knowledge workers and that there are no knowledge workers in the non-designated industries. Even so, there can be little doubt either about the relative scale of the knowledge sector, or about its growth.

An alternative approach is suggested by Quah (2001) who develops the argument that the new economy is 'not only or even primarily a change in cost conditions on the supply side, affecting the rest of the economy that uses that technology. Instead, it is the change in the nature of goods and services to become increasingly like knowledge' (Quah, 2001, 16). These goods and services are defined as 'knowledge products' to include:

1. information and communications technology, including the internet;
2. intellectual assets;
3. electronic libraries and databases;
4. biotechnology, i.e. carbon-based libraries and databases.

A further consequence of these various developments is that the formerly clear-cut parameters of different forms of IP have become fuzzy. Teece (2000) observes that as economies increasingly move from markets focused on physical products to markets that are products of 'know-how' and IP, the conditions for effective functioning of markets are less often fulfilled: the number of buyers and sellers is more limited, the property at issue is less well defined and the writing, execution and enforcement of contracts is more problematical. But at the same time, new markets are evolving:

'The development of many types of new markets has made know-how increasingly salient as a differentiator, and therefore as a source of competitive advantage to firms. This can be expected to remain so until know-how becomes more commodity like; and this may happen soon for some components of Intellectual Property'.(Teece 1998, 62)

From the viewpoint of patent offices and other governmental agencies concerned with protection of IP rights, this both opens up new opportunities and poses threats, as new markets emerge in which intellectual capital and IP rights can be traded and familiar areas of jurisdiction decline in importance. To develop a better understanding of this set of developments, we need first to explore the structure and characteristics of knowledge, including intellectual property such as patents and trademarks (Section 2). In Section 3 we examine the place of knowledge and intellectual capital in the business strategy of the firm: this will seek to establish the significance of knowledge and IC as a competitive asset with invaluable properties in the present competitive environment. Section 4 considers the issue of property rights, the resolution of which is essential for firms that wish to improve their economic performance through application and development of IC. In Section 5, we will review the implications of the knowledge factor and its associated property right issues, from the standpoint of business management, particularly that part of management that is concerned with the human resources. Section 6 provides some conclusions and identifies some of the key questions for the future development of this area of activity.

2. Structure and Characteristics of Knowledge

The competitive business, if it has to harness the benefits of its knowledge and IC, needs to go beyond recognising the importance of its knowledge resource. It needs to recognise the variety of different forms of knowledge and understand their properties. It needs to know how and where it resides in the organisation and how management can derive value from it in ways that are not easily replicated by competitors. It needs to understand the means by which knowledge can be diffused.

There are three main competing paradigms relating to the satisfaction of these needs. (See Scarbrough and Carter, 2000 for a useful review of the complexities of the knowledge management field.)

- One sees knowledge management (KM) as essentially *technological*, being very largely about information systems, databases, measurement instruments, recording and communication tools. This leads in turn to perception of KM as a technical matter (hardware, software preferences, systems management, often with little discussion of the social implications). (Earl, 1996; Carayannis, 1999, Ciborra, 1993). Knowledge here is a cognitive phenomenon in the sense that it is possible to deal in apparently pragmatic terms with concepts such as ‘extracting, releasing and transferring’ knowledge. Such approaches fit awkwardly with the longstanding theme of socio-technical systems theory, that the effective integration of the social and technical parts of operations is the key to high performance.
- A second approach is that of the *organisational* school, which sees knowledge as a socially constructed phenomenon, embedded in people and social relationships, and influenced by organisational structures and culture. In this paradigm, knowledge cannot be extracted or secreted but is enacted and held between individuals. (Brown and Duguid, 1991, Nonaka, 1991) This may lead towards some form of community of interest or community networking model in which knowledge is continually recreated through interaction and social networking. (e.g. Swan, Newell, Scarbrough & Hislop, 1999).

A third approach is the business strategy school, where the knowledge factor is viewed as a critical resource in the context of a resource based view of the firm (RBV). The knowledge

inherent in organisations provides a resource on which firms can build and sustain a distinctive capability, which, if they can appropriate it, will enable them to survive and prosper in the competitive world. Some, like Grant (1996), Spender (1996) and Liebeskind (1996) have sought to develop a knowledge-based theory of the firm, deriving from the seminal work of Coase (1937), Penrose (1959), Barney (1991) and others. Although more socially sophisticated than the technological approach, the RBV also tends to treat knowledge as a cognitive factor, in the form of an asset that can be measured, captured and transferred – a view and a terminology rejected by the organisational school with its emphasis on the socially constructed character of knowledge.

This paradigmatic segregation is unhelpful, since there seems to be little meeting of minds across the divides and little attempt to build an integrated model. Many organisations seem to have adopted a pragmatic approach¹, opting for the technological approach, with a focus on knowledge recording, processing and standardisation, and the development of knowledge management systems. In effect, this is a solution designed to create knowledge repositories and improve access to certain types of information and structured knowledge. But it does not necessarily do much for enhancement of the knowledge environment, nor does it get to grips with the *processes* by which knowledge is generated or integrated into productive activity. In many cases it confuses information with knowledge or at least fails to differentiate between different types of knowledge with different managerial implications. The application of information systems technology is undoubtedly an important facilitating step, but may be counter-productive unless there is actually a demand for the knowledge so codified *and* a motivation to apply it. The key to that lies in the management of the human resource and its interaction with the knowledge based systems. Yet there often seems to be little substantive interaction between them. Many firms that embark on this type of ‘technical’ solution preserve the status quo in organisational practice and HR policies. But

unless there is a 'fit' between the knowledge management and organisational/HR environment, the expected gains in competitiveness may be dashed. Thus Savary (1999) observes that good knowledge management depends on good IT infrastructure (databases, computer networks, software) but also on the organisational infrastructure, such as appropriate incentive systems, organisational culture, involvement of critical teams and individuals in the sub-processes of KM, and the internal rules that govern these sub-processes.

Nevertheless, this leaves us with a problem in that there is no satisfactory, integrated theory to which we can refer. For the practical purpose of this paper, it is proposed that we adopt a hybrid model which draws on both the resource based theory of the firm and the socially constructed theory². The RBV theory lies closest to the economic paradigm, though with greater emphasis on exploring the management processes that lie within the black box of the neoclassical firm. But to disregard the view of knowledge as a socially constructed phenomenon is (as we will argue later) to rule out some of the key attributes of knowledge and IC that underlie the appropriation of value from intellectual property. Thus some meshing is essential, as suggested in the following definitional framework.

2.1. Concepts: Data, information and knowledge.

There are many types of knowledge relevant to the firm, some of which have particular relevance for management in its pursuit of the sources of value it can bring to the firm (Grant, 1996). Of particular importance is the need to separate the concepts of data, information, tacit knowledge and explicit knowledge (Nonaka and Takeuchi, 1995). There are many different approaches to the definition and interpretation of these concepts but we would propose the following, which would be understood by many practitioners. *Data* can be viewed as factual raw material or signals with no meaning. *Information* is data that has meaning and is refined

into a structured or functional form within a system; for example, customer and supplier databases (Spender, 2000). *Explicit* (or codified or articulated) knowledge relates to ‘knowing about’, can be written and easily transferred. Codification may include company manuals and specialised databases, but may also take the form of standardised techniques of investigation (as for consultants) or templates for design processes or operational reporting (to ensure consistency). *Tacit* knowledge is ‘knowing how’ or ‘understanding’ and cannot be directly transferred between individuals: rather it will be ‘revealed’ through application, practice and social interaction. In many traditional manual crafts, and in professional firms like law and accountancy this was traditionally developed through the master-apprentice relationship, through which observation, discussion and practice over a long period was expected to develop the apprentice’s ‘knowledge’ to an acceptable level of competence.

2.2 *Knowledge Characteristics*

From Grant (1996, 110-112) we further adopt and develop four significant characteristics of knowledge relating to value creation in the firm:

- a. Different kinds of knowledge have varying degrees of *transferability*, both between and within firms (c.f. 1 above). The tacit – explicit knowledge distinction is further complicated by the observation that each of these may exist in either individual or collective form (Morris and Empson, 1998). As well as the individual tacit knowledge ‘embodied in the experience and know-how of one person’ there can be a collective form in the shape of uncodified routines and in-house processes embedded in the social context of the firm. Where tacit KM is embedded in routines, it may be less liable to risk of loss through staff turnover.

b. Its capacity for *aggregation*, reflecting the ability of individuals (and teams) to absorb new knowledge and add it to existing knowledge. Knowledge derived from individual experience of working with customers and suppliers over time will be cumulative and may be added to knowledge obtained by other employees through their own contacts. This may also occur at the individual or the collective (e.g. team) level.

c. The issue of *appropriability* relates ‘to the ability of the owner of a resource to receive a return equal to the value created by that resource’. Since tacit knowledge cannot be directly transferred it is not directly appropriable, only through its application to production. Explicit knowledge, as a public good, can be sold on without losing it. (Grant, 1996). Because tacit knowledge is highly personal to the individual or team, its value to the firm will depend greatly on the individual’s willingness to apply it to serve the interests of the firm, or to assist in its conversion to codified form, which enables it to be used more readily by other firm members. Knowing that, the individual will recognise the power that gives him or her and will be aware that it is a form of personal property right that will not be given away lightly (French and Raven, 1959, Donkin, 2001)

d. Specialisation and coordination: given bounded rationality, efficient knowledge production requires individual or departmental specialisation, which in turn means there is a need for coordination and integration. (Grant, 1996) Efficient integration will *minimise* the time spent on knowledge transfer, with the focus on what is essential for complementarity.

2.3 *Knowledge transfer*

Nonaka (1990) defines four means of knowledge creation (SECI), which will be important for firms wishing to deepen their knowledge assets and extend their application:

Socialization, allowing tacit to tacit knowledge through direct shared experiences (e.g. master-apprentice relationship)

Externalisation, converting tacit to explicit knowledge, so that it can be used by others and become the basis of new knowledge: the use of dialogue, diagrams, analogies and prototypes are examples

Combination, explicit to explicit knowledge, involving the convergence of explicit knowledge into new systemic forms with new or better application potential: knowledge is re-organized through meetings, documentation and communication networks

Internalisation, involving explicit to implicit knowledge, embodies explicit knowledge which, when internalised, becomes part of individuals' personal know-how or mental models, extending opportunities for sharing and development: it is akin to learning by doing (Nonaka and Reinmoller, 2000)

While all these processes are important for the management of knowledge creation and growth, the development of tacit knowledge is more difficult to manage and its diffusion is likely to be slow, but it is also likely to have a higher probability of creating strategic value (Lane and Lubatkin, 1998): this is so because competitors find it difficult to imitate.

2.4 *Knowledge appropriation*

This can take a number of forms.

- Investment in patents, trademarks, copyright and design protection: note that all of these provide some tangible outcome;
- Investment in Research and Development (R&D), which may lead to a product or a process innovation, and may be on a minor ('run of the mill') scale or a major ('drastic') scale. (Nordhaus, 1969). Investment here is measurable but output may be problematic, certainly from the point of view of formal valuation.³
- Licensing arrangements: a firm may invest in licensing agreements, either where it is the originator and owner of IP, which other firms wish to use: or where the firm is licensee, effectively paying a commercial rent for the use of another firm's IP.
- Investment in human capital: investment in human capital may take the forms of recruiting new staff, or developing and training staff, in such a way as to enhance the worth of the human capital inputs to the firm's operations. Again, it is relatively easy to measure this investment as input, but more difficult to evaluate the effect on outputs through productivity or profitability enhancement. This aspect is also complicated by the mobility of human capital, increasing the riskiness of investment that may migrate from the firm before returns are obtained.
- Investment in intangible forms of IP: this is a matter to be developed further at a later stage, but for now we note that IP exists in special skills, experience and knowledge of individuals, in the performance of teams, and in organisational architecture and routines specific to particular workplaces or enterprises. These are all aspects of tacit knowledge. Some of this development may evolve through custom and practice, and be diffused by means of the organisational culture and associated behaviours. But part of it may also be nurtured (and equally degraded) by actions and decisions within the firm – such as the development of active teamworking arrangements.

This list provides a spectrum of investment opportunities, which range from the creation of quite tangible assets to the formation of intangible assets that are inherently difficult to value. Markets in all these areas tend to be incomplete and imperfect, but especially in the more intangible dimensions, where issues of over- and under-investment are increasingly likely.

2.5 *Knowledge management*

Knowledge-based forms of competition

Neo-classical economics operates largely under the assumption of diminishing returns. Firms share identical production functions (identical technologies) with increasing marginal costs. With many competitors, industry equilibrium will follow naturally. Economies of scale and scope will permit reductions in average cost, and advances in technology will lower the whole LRAC curve, usually by small amounts, occasionally by large amounts. These conditions have applied less frequently as economic development has moved firms from predominantly raw material processing and manufacturing to activities focused on information, processing and knowledge development, application and transfer. In these new real-life conditions, increasing returns have typically replaced diminishing returns (Teece, 2000). In a high technology industry, heavy set-up costs to produce the first unit of product are followed by virtually zero marginal costs. Emphasis is increasingly placed on high levels of research and development expenditure, since successful and timely innovation will bring major competitive advantage to the prime mover. Additional benefits are gained when the innovation sets the industry standard, and when customers face high switching costs, tying them to the innovator. Experience with the innovation may produce further cost advantages through learning, especially if the knowledge base is tacit and industrial secrets preserved, making it difficult for competitors to catch up.

This then is the context in which increasing numbers of firms now operate. Quah (2001) notes that ICT can be seen as a 'general purpose technology' with the ability to influence all sectors of the economy simultaneously. Further, ICT products behave like knowledge itself, in the sense that they have infinite expandability (being non-rival goods

with virtually zero marginal cost) and being aspatial, i.e. geography ceases to matter and the products can be transported quickly with no loss of quality.

Quah develops his analysis to investigate the problem of accounting for economic growth. Capital accumulation has been shown to account for a relatively small proportion of growth. The remainder was attributed originally to technology or total factor productivity (TFP), which may be defined to include the growth of human capital both as a producer of goods and services *and* as a contributor to improving technology through R&D-specific human capital. By analogy, at the level of the knowledge-based firm, growth will come from the combination of capital stock, access to technology (as a public good or a private good under licence), human capital employed in production, and human capital as a specialised input to R&D. In the competitive scenario, rival firms will have the same access to capital and technology but the competitive advantage will come increasingly from firm-specific human capital, particularly the human capital inputs that are tacit and difficult to replicate, e.g. in R&D, in learning from experience and in the organisational structures, routines and policies that mark the individual firm. Some managements may be better at achieving this than others – another aspect of the human capital contribution: i.e. they may be more successful both in growing and developing the human capital asset, and/or better at appropriating the value that is latent within it.

Under these circumstances, there is no longer an identical ‘black box’ within which a firm’s production programme is performed. Strategic decisions have to be taken, in which judgement and skill, luck and timing may all be critical. Management capability, including organisational and human resource management skills and competencies, will make a difference. These will in turn affect the outcome in terms of the firm’s TFP, reflecting its ability to leverage and extract value from the assets at its disposal. The effect of successful management of these assets is equivalent to a major innovation leading to a significant

downward shift in the LRAC curve that others cannot follow (because of the uniqueness deriving from deployment of tacit knowledge)

If that is so, it puts a premium on management capability with particular respect to the intangible assets of the firm – on the way IP is managed. It may be significant that Webster's (2002) review of the evidence suggests at best very limited effects of R&D expenditure on firm performance or market value. Bosworth et al (2000), in a study of 146 UK companies for the period 1990-94 found no influence on performance from R&D expenditure, patent publications, trade market application or any combination. However, differences in performance among firms appeared to be picked up by firm specific fixed effects, which acted as a summary measure of the stock of intangible assets and variation in firms' dynamic performance.

In one respect, this evidence makes explicit a serious problem in much of the work on the contribution of knowledge (and its components such as R&D) to the growth of corporate wealth. The problem is that there are many different intangibles that may be hypothesised to make a contribution, but there are difficulties in measuring both the intangibles themselves *and* the contribution they make, due to collinearity (for further discussion see Webster, 2002). Not surprisingly, much of the work that has been done focuses on those elements of knowledge that are easier to measure, such as patents, and R&D expenditure or staffing. (There is a question whether both patents and R&D should be included, since this is likely to involve a double-counting problem, see Webster, 2002, p 20). But there are problems even within those simpler approaches: the R&D measure is typically imprecise, and can be manipulated to suit tax regimes, leading to distortion; while lags in R&D outcomes may also produce misleading results.

Hierarchy and Organisational aspects

Granstrand (1999) observes that the IC firm is one with a high ratio of intangible to tangible capital (which can be assessed by reference to the market – to - book value of the company). That is, their tangible capital, comprising physical and financial assets, will be dominated by some composite of intellectual property (e.g. patents, trade marks, designs, software, copyrights etc.), goodwill and relationship power (e.g. with suppliers, consumers and employees), and human capital and competences.

In traditional firms, where the tangible capital element is dominant, transactions are

‘most economically governed by a hierarchical form of organisation in which management co-ordinates the gathering and processing of information from lower levels of the organisation and uses knowledge concentrated at higher levels of the organisation to make decisions based on this information’ (Applebaum & Berg, 2000, p.108).

There are few opportunities for ideas to flow upwards, and workers in the front line generally carry out routine tasks, under supervision. Management operates on a ‘command and control’ basis, acting as agents of the owners of the physical capital that provides workers with a source of higher productivity and earning power. Horizontal interactions are usually constrained by vertical control to avoid wasteful rent-seeking behaviour by workers. Remuneration is based on an arms length wage-effort bargain, often moderated by collective bargaining.

By contrast, the contemporary ‘lean’ organisation depends much more on extended involvement in decision-taking by front line workers and teams. This in turn modifies the importance of vertical co-ordination and replaces it by a drive to develop team-based activity and cross-team, cross- boundary communication and co-ordination, with an emphasis on self-management.⁴ This contemporary production industry scenario is very similar to that of the

IC firm (of which professional service firms will be a sub-category: Alvesson, 2000; Maister, 1993). Specialised expertise is developed both by enrichment of the individual's tacit knowledge through experience, observing others at work, coaching and monitoring by more experienced personnel; and by specialists developing a professional or technical reputation that brings them and their firm a flow of work that can be rewarding and challenging. Whereas it is still true that critical tacit knowledge is still concentrated in the higher reaches of the firm, from where it can flow out and down, it is important for the IC firm to recognise that new knowledge can also come from the bottom (Morris and Empson, 1998, pp 613-614): this potential needs to be nurtured.

This more widely dispersed source of value in the firm needs to be both (a) leveraged and (b) appropriated.

(a) Leverage: since not all the high level work of the firm requires top level expertise at all times, the firm will wish to leverage the knowledge capital of its more senior and experienced managers and experts by providing support from associates, less experienced staff and support staff, thus reducing the time spent by high cost specialists and, in the process, further developing the tacit knowledge base of the less experienced (Maister, 1993, Hitt et al, 2001). Firms can adopt different strategies of coordination, from high to low leverage, or through varying the mix of knowledge, knowledge support and technological resources (such as software, intranets) to suit the markets in which they operate. This underlines the point that knowledge is not a homogeneous resource but can be deployed strategically in different ways.

(b) Appropriation: It follows from Nonaka's SECI analysis (above) of knowledge and value creation that, while the IC firm can claim ownership and control of a range of intellectual property, legitimated by patent rights, copyright, trademarking and other

safeguards, much of the important knowledge and IC will be *embodied* either in the organisation itself or in the human capital it employs. The firm will obviously wish to obtain as much value as possible from this, but managing that process is fraught with difficulty. In part this is because ‘firms don’t know what they know’: they are unaware of, or unable to measure or monitor knowledge embodied in individuals, teams and organisational routines and cultures. Even where they are aware of this, there may be issues over ownership and ability to control or dispose, since they will be dependent on co-operation and compliance from individuals and teams. These are matters we return to in Section 4 and 5 below.

2.6 *Summary*

We can use the elements above as a framework of ideas that locate different types of knowledge within the firm, providing a business context for the following sections. Knowledge based firms have a variety of options for developing their knowledge base, ranging from more tangible forms with clear property fights, to less tangible forms where the property fights are less clear-cut. Not only that, but the management process in such firms has to take on board the nuances of the knowledge worker and the property rights question. Although this in now way discredits the technological approach which highlights the significance of Communications and IT hardware and systems, it points to the need for this to be harmonised with a ‘social’ and organisational approach that will enable some leverage to be exerted on the less tangible, but potentially highly valuable, forms of the knowledge asset. As knowledge based firms become more prominent. Innovation appears to be opening new opportunities for the exploitation of knowledge assets in ways that were formerly not possible. This in turn changes the future outlook not only for firms, but also for the regulatory agencies and Patent Offices. The context for management decisions about what should be

protected, and by what means (and at what cost with what benefits) is thus increasingly complex. This may well have a bearing on future trajectories of the propensity of firms to protect their knowledge assets through patenting, trademarks and other formal systems of protection.

3. Knowledge as a strategic asset

In this section we review some of the main approaches to business strategy in relation to the knowledge asset.

The long-term dominance of the neo-classical theory of the firm effectively precluded the need for economists to be concerned with business strategy. Firms were profit-maximisers, by assumption, and decisions were for the most part predicated on what the market would bear, which in turn depended on the structure of competition as a determinant of a firm's market power. With the work of writers like Penrose (1959) and the emergence of a behavioural theory of the firm, more attention was paid to what happened inside the 'black box' of the business organisation. In the subsequent period, economists like Porter (1985) used an economic framework to develop thinking about the strategic decision taking of firms, and a new range of economic concepts, such as transaction costs, agency theory, evolutionary economics and dynamic capabilities has emerged. At the same time, business strategy has developed as a core element of management theory, and in a sense two main streams of literature have evolved: one founded in economics, the other focusing on strategic planning and analysis, drawing on a range of other managerial sub-specialisms to provide an overarching perspective on the long term objectives and decision framework of the business enterprise. It is not possible here to encapsulate these two strands of literature: the alternative is to try to select some salient features of the development of thinking in ways that will inform the focus of the present paper, knowledge as a competitive asset.

Following on from dissatisfaction with the ‘Structure-Conduct-Performance’ paradigm⁵, Michael Porter (1985) developed an economic framework centring on competitive rivalry among producers. Within the conventional sources of competitive advantage, namely size, market share, market selection and market positioning, Porter focused especially on the positioning of the firm in the market, bringing in the bargaining power of customers and suppliers, and the threats of substitution by competitors and the entrance of new firms. In terms of available strategies, Porter offered two main generic alternatives: cost leadership and differentiation, the latter distinguishing between differentiation by quality and differentiation by innovation.

Whereas the positioning approach of the 1980s put emphasis on the external (market) relationships of the firm, the 1990s saw a move to stressing the importance of internal factors emerged from the work on core competencies and distinctive capabilities (Prahalad and Hamel, 1990). This prompted a switch to an increasingly ‘resource-based’ analysis of business strategy, with the insistence that size, market share, selection and positioning were effectively *signs* of competitive success rather than its causes. Instead, if the firm was to sustain its success in the face of competition and replication, it had to identify what it was better at than its competitors and build its strategy on that distinctive capability, which might be protected either by legal restrictions (e.g. patents) or by the non-replicability of the strategic process itself. From this derived the so-called resource-based theory of the firm (See Foss, 1997, for a representative collection of approaches). According to Kay (1993), the three primary *distinctive capabilities* comprise innovation, firm reputation and organisational architecture, defined as the ‘network of relational contracts within, or around, the firm’ (e.g. relationships with employees, suppliers and customers, and groups of firms constituting a network of firms engaged in related industries). ‘Architecture’ in this context needs some elaboration. Kay (1993) sees it as adding value to the firms through the creation of

organisational knowledge, the establishment of a cooperative ethic and the implementation of organisational routines, such as methods of production, hiring processes, communication techniques, etc.

These three distinctive capabilities, together with the capabilities of the firm's members (a basic strategic asset), are what add value to the firm in ways that are difficult for others to imitate or replicate. But although they provide some form of protection against rivals, they need to be constantly developed and updated. This recognition, in turn, has led to the emergence of the concept of 'dynamic capabilities' (Teece, Pisano and Shuen, 1997: Eisenhardt and Martin, 2000) – 'the ability to sense and then to seize new opportunities, and to reconfigure and protect knowledge assets, competences, and complementary assets and technologies' (Teece, 2000, 26). This ability will be path dependent, influenced by where the firm has been and how it organises its architecture and routines. It will also be affected by its ability to harness complementary assets and to be opportunistic when presented with windows of opportunity.

The significance of this for the present theme is that with the relative shrinking of the production economy and the enlargement of the service and knowledge-based economy, the sources of dynamic capability are no longer the ability to produce goods at less cost, but rather in the exploitation of technological know-how, intellectual property and brands through innovation and entrepreneurial behaviour. Information and communication technology provides a platform for removing some of the limitations imposed by bounded rationality *and* for enabling new forms of organisation, both internally and externally. To the extent that these possibilities open up new markets and new market linkages, they mean that current market dominance and optimal positioning are increasingly fragile advantages for firms. Market share and good positioning in a market are no comfort if the market itself is unstable through innovation and substitution. Much more significant for sustainable

advantage is a firm's ability to develop its capabilities on an ongoing basis and to find ways in which that potential value can be effectively appropriated. Management in that context is no longer just an administrative function, but much more strategic and entrepreneurial, combined with an ability to manage intangible assets effectively. In many ways it is much closer to a Schumpeterian (1942) model than a standard neo-classical approach. Organisational and human factors play a significantly increased role in determining competitive performance.

4. Property Rights

Teece (2000) compares the properties of tangible and intangible assets as follows:

Table 1 Differences between Intangible Assets and Tangible Assets

	Knowledge (intangible) assets	Physical (tangible) assets
Publicness	Use by one party need not prevent use by another	Use by one party prevents simultaneous use by another
Depreciation	Does not 'wear out': but usually depreciates rapidly	Wears out: may depreciate quickly or slowly
Transfer costs	Hard to calibrate (increase with the tacit portion)	Easier to calibrate (depends on transportation and related costs)
Property rights	Limited (patents, trade secrets, copyright, trademarks, etc.) and fuzzy, even in developed countries	Generally comprehensive and clearer, at least in developed countries
Enforcement of property rights	Relatively difficult	Relatively easy

Source: Teece (2000, 15)

Of particular importance for the present purpose are the transfer costs and the property rights issues. While there may be substantial costs in the transfer of physical property, at least one can measure the transfer. This is not so with knowledge assets. It may be very expensive to transfer knowledge, particularly where the tacit element is large, but more importantly, completion, in the sense of full understanding and absorption, depends on the capability of

the receiver. Where the tacit element is present, there is also a question about the willingness or incentive of the individual to release the knowledge without reservation. Thus there are uncertainties about transfer, both on the giving and receiving side of the relationship, which make for problems in contracting. We return to some of the implications of this later in this section.

A second point here is Teece's summary of the depreciation factor. There is general recognition in the literature that knowledge assets will typically be capable of appreciating in value. This may come about through a form of economies of scope, in which existing knowledge assets merge with new assets in complementary ways and find new applications; or simply through a form of learning effect in which continued usage generates improvements in application and process. Conversely, of course, if demand for a skill or knowledge asset declines, the arrival of obsolescence may be rapid.

4.1 Patenting and other forms of protection

In terms of property rights, patents provide the strongest form of protection, but these are time-limited and the degree of protection may be incomplete: in any case there is always the possibility of inventing around, and the evidence suggests that there is often only a marginal time-lag between finding an alternative when there is patent protection in place, and when there is not. (Levin et al, 1987). Patents are also found to be less effective at protecting both product and process innovations than advantages of being first-mover, learning curve advantages and sales and service networks (ibid.). There is also considerable variability in the propensity of different countries to adopt patent protection, and also of different industries in the same country.⁶ These factors may in the longer term prompt some movement towards rationalisation of the intellectual property rights system, both nationally (to deal with the frictions existing among different forms of protection, for example between the domains of

science and academia, industry and technology, military and governmental, and cultural and artistic); and internationally (to harmonise different national approaches that complicate the making of decisions on forms and scope of protection).

We noted in Section 1 that there is considerable evidence that both the relative and absolute importance of intangible assets is increasing, both for the firm and for the growth of international trade. This heightened importance has placed renewed emphasis on the ownership rights attaching to the various forms of intellectual property, which has a long history running back to Plato and Aristotle. In the early stages of European development, the determination of property rights was essentially a matter of state regulation, in the interests of the medieval city or nation (McSherry, 2001, 46). But gradually both authors (for copyright purposes) and inventors (for patents) became the focus of attention, and initial privileges became converted to property rights, with consequences for the respective interests of the creator as a private persona and the public as potential beneficiaries of new ideas and inventions. The public domain interest was in part preserved in terms of scientific knowledge, rather than in its application to manufacturing through technology. Scientists were deemed to be pursuing eternal truths in the form of natural laws, which could not be regarded as personal property. But inventors were different, since their role was to develop new products and manufacturing processes, which would bring economic advantage to the public. As such, invention was to be encouraged, and patents provided a means of granting a temporary monopoly to the inventor, as an incentive to keep on producing, while protecting the interest of the public domain. In more modern times, the universities have become the primary locus of scientific progress, accompanied with the claim to academic freedom and an expectation that original work will enter the public domain. But as universities have come under greater pressure to become 'useful', as funding problems for universities have increased, and as professional education has become one of the mainstays of academic provision, the tensions

between private and public domains have once again been raised. Wherein lies the ownership of new ideas when the inventor is an employee of a university anxious to capitalise on intellectual property developed under its jurisdiction? What happens to academic integrity and independence when research is funded by commercial organisations interested in the application of new knowledge to new industrial products and processes? The boundaries between private and public, and the allocation of property rights (and their policing and enforcement) are once again blurred and a matter of contention. (See McSherry (2001) for a developed analysis of this issue.)

The prevailing intellectual property right system is central to the regulation of these rights. The present day problem is that as technology advances, and given some of the specific directions of technological change, the continued capability of the system comes increasingly into question. Examples include software and biology, but Granstrand (1999, 334) also mentions new surgical methods, new teaching methods and athletic techniques. The IP system may be capable of evolving to tackle these issues, but there is little doubt that it *will* have to evolve. Already there are increasing ranges of products, which depend on multiple technologies, with new and old combining in ever-changing ways, and specific technologies giving rise to a range of products. The potential dependence of firms on patents and the width of impact or particular patents are increasing, and this may put increasing strains on the ability of the patent system to provide the protection its customers want.

Already there are signs that companies are no longer seeking protection through a single mechanism such as the patent system. Instead, they are seeking multiple forms of cover for intellectual property through a combination of patents, copyright, business secrecy, coding and encryption. Innovations are being ‘bundled’ in ways that combine traditional forms of property with newer forms, and the decisions about the form and degree of protection are becoming increasingly strategic.

Central to these strategic decisions is the issue of property rights, though ownership is less important than ‘how private parties (firms, individuals) can control (manage) the rent streams derivable from immaterial resources, and turn these streams into intellectual capital. The separation of ownership and control issues is thus important to consider.’ (Granstrand, 1999, 338). The case of patents brings this out effectively. Firms by no means always put their patent rights into production on their own account, perhaps because of limited complementary assets or access to capital facilities. In such circumstances, they may opt for a strategic use of licensing, from which they can derive royalty payments and hence recoup on their innovation, while still protecting the value of their IP. Much depends on the appropriability of the innovation: if strong, the licensor has greater control over application, enabling higher royalty payments to be charged – though the control over protected technology may also enhance the profitability of application by the licensee. In strong positions, patent-only licences may be used to give licensees the right to use the innovation without infringement but know-how and trade secrets are not part of the transfer.

In practice, some industries experience multiple sources of invention, with overlapping technologies being developed by different firms operating independently. Especially where technology is developing rapidly and where product life cycles are short, the practice of cross-licensing is adopted to avoid multiple transaction costs. Companies often enter into cross-licensing agreements (typically 5 years), involving an exchange of rights to use technology without incurring infringement claims. Balancing payments are made from licensees with less valuable portfolios, but in the meantime the licensees have freedom to pursue their own R&D activity. As Williamson (1985) has described it, cross-licensing amounts to ‘an exchange of hostages’ which allows firms to progress their innovations without being too hung up on what others have done or are currently developing. This is likely to be particularly important in industries like electronics⁷ where technological

development is cumulative ‘where one innovation builds on another and products draw on several related technologies. As a result, the ‘state of the art’ of the technology tends to be covered by a large number of patents held by different firms’ (Teece, 2000, 195).

Both licensing and cross-licensing arrangements have important implications for business strategy, and are not used only for their royalty generating capacity. The (relative) freedom of access they provide can give rise to market advantages including efficient commercialisation, technology exchange and benchmarking and enhancement of the markets in which the parties operate (Teece, 2000, Chapter 8). They may of course also be used as a basis for alliances, partnerships and joint ventures, again opening up strategic opportunities for growth and development.

4.2 *Human capital*

The other main issue here is that of the transferability of intellectual capital embodied in individuals and teams, introduced at the start of this section. In particular, as observed here and in Section 2, there is a formidable problem of appropriating rent streams from tacit knowledge. Because employees are not ‘owned’ by their employing firms, they provide a flow of labour services for which the firm pays a rent in the form of a wage or salary, but the capital continues to reside in the individual. This gives rise to the familiar agency theory problem and the existence of implicit contracts. Work tasks that are able to be clearly measured by input or output, or monitored by supervision and inspection, are problem enough: costs are incurred to control shirking, opportunistic behaviour and quality defects. But when the tasks are knowledge based, the implicit element in the contract is more significant and the issues of measurement, monitoring and reward are more pronounced.

These problems are not of course new. Knowledge-based work is certainly as old as the professions and the older crafts, where knowledge transfer was eased by quantitative controls

on entrance to the profession or craft, and by a master/ apprentice form of tacit-to-tacit experiential learning over an extensive time-period. In this way both the interests of the incumbents and the demands of the public (clients) for integrity and quality were largely protected. More recently the notion of public service ethos has provided a discipline of propriety and a willingness to share knowledge for the benefit of the public. However, professional work has become subject to increasingly business-like pressures through competition, much craft work has been made redundant through technological change, and public service standards have been threatened, if not eroded, by efficiency demands from the governments as paymasters. At the same time, both the demand for and the supply of knowledge intensive workers have grown enormously, and the spread of knowledge-based work through the economy has increased.

There are two aspects of this development to be noted. First, for firms to maintain competitiveness, they have to seek distinctive (or dynamic) capabilities that require new ways of organising the firms' resources, relationships and activities. This means that they have to be able to combine a capability for integrating external knowledge (i.e. knowledge available to a range of firms from the external environment, such as ABS or airbag technology in automobile manufacture) into the activities of the firm *and* a capability of handling this flexibly and innovatively in ways that will make it specific to the individual firm and add distinctiveness (Andreu and Sieber, 2001). This, secondly, means that the firm has to encourage and develop these capabilities among its employees (including management). In the professional services firm⁸, knowledge (as input) draws on individual know-how and collective routines to provide the basis for service provision to clients. This corpus of knowledge and knowledge processes can be bundled in different ways (as output) to meet the needs of different clients, to attract new business and to develop directly into new product offerings (Hitt et al, 2001, p 16). In part, this experience is built upon the formal education

and continuing professional development programmes of the professional (codified knowledge), in part on the cumulative experience of working with clients and more experienced professionals in the firm (tacit knowledge). In other areas of business, very similar processes are required to attract, develop and retain employees who can contribute to this capability, by developing their own tacit knowledge and enabling it to be applied more widely in the firm's interests by sharing it with colleagues or converted to codifiable form. (C.f. Section 2.3 above.)

But this returns us to the fundamental property rights issue relating to human capital, the fact that it will not necessarily be in the best private interests of the individual worker either to share tacit knowledge or to allow the firm to expropriate the value of that knowledge. Conversely, the employer might reasonably expect to be able to command the benefits flowing from the intellectual capital of its employees, especially where they have contributed to that IC by supporting education, training and intrinsic learning opportunities. This then opens up a wider field relating to the management of the human resource and the intellectual capital embodied in employees. This matter is taken up in the following Section.

5. Human Resource Management and Intellectual Capital

There are four aspects that need to be considered here.

Appropriation

Stickiness in transfer

Labour market issues

HRM strategy

5.1 Appropriation

In the traditional hierarchical firm, management will seek to ensure efficiency in productive performance by means of control systems, monitoring and supervision, and perhaps some form of incentive payment. Bargaining over pay and conditions may of course take place, as employees (or their trade union representatives) negotiate to secure a 'fair' distribution of the value of net output between labour and capital. In the knowledge based firm, control systems are more difficult to implement, and management needs to find ways in which workers will perform effectively under looser supervision arrangements, with more personal flexibility and more unobservable job activities (such as thinking, problem solving and creative adaptations of professional or disciplinary principles). If this is to be delivered, the employees have to be in some sense 'committed' to the organisation as employer in such a way that they will be comfortable with the effort bargain implied in the employment contract (including the implicit elements).

This notion of commitment features significantly in the HRM literature of the last two decades, under the general heading of high performance work systems, dividing into high involvement (focusing on participation and decision-taking opportunities for individuals) and high commitment (emphasising the affective aspect which will produce positive support for company objectives work systems). Effectively, these methods involve 'management ceding a degree of control to employees and introducing a range of progressive methods which increase employee welfare' (Ramsay et al, 2000, 502). The progressive measures include employee involvement programmes, team-based work, intensive training and development, and incentive elements in the remuneration package. These employee centred initiatives are generally understood to provide motivation for workers which in turn feed through to

organisational performance, and US management research has virtually come to take this causal link to exist without question (Ramsay et al, 503).

In fact there are reasons to be cautious in this assumption, but at least the principle of commitment as a condition of employee performance can be taken as a starting point. In terms of the knowledge worker, it is a natural enough follow-through to expect that committed employees will be more likely to share the benefits of their knowledge for the commercial advantage of the firm, will co-operate in the organisational routines, and work positively in terms of the corporate culture. That being so, management has to devise suitable packages or 'bundles' of involvement or commitment features that will elicit the maximum release and application of knowledge.

Therein lies one central area of debate among analysts. While there are those who argue for a contingency approach in which the bundles of features vary by industrial sector and business strategy (Arthur, 1994; MacDuffie, 1995, Youndt et al, 1996, Applebaum et al, 2000), a majority appear to follow Huselid (1995) who argues for a universalist approach: that is, it does not matter much what the features are, but generally the more the better (Becker and Huselid, 1998). For the moment we need only observe that this debate exists, rather than attempt to resolve it (but see below under Human Resource Strategy, p32)

5.2 *Stickiness in transfer*

As noted earlier, different kinds of knowledge are susceptible to varying degrees of transferability. Much attention focuses on the processes affecting the tacit-to tacit transfer of knowledge. But firms will also be concerned to implement effective transfer and internalisation mechanisms for *all* types of knowledge, since these are ways of spreading and embedding best practice modes of operation throughout the organisation. If an individual, team or department develops a more effective routine or practice than comparators, it will be

important for the firm to substitute it for the less effective routines: benchmarking exercises typically reveal considerable variation in the performance of comparable units in the firm, attributable to variations in practice.

Arrow (1969) and Teece (1977) have observed the difficulties in effecting the transfer of technical knowledge, and the associated costs. Von Hippel (1994) introduced the notion of sticky information, implying incremental costs of information transfer. Ruggles (1998) reports that in a study of over 400 US and European organisations, senior management believed that the biggest impediments to knowledge transfer were organisational culture (54%) and top management's failure to signal the importance of knowledge transfer (32%). Szulanski (1996) develops an eclectic model defining four sets of factors affecting the process of internal knowledge transfer:

Characteristics of the knowledge transferred

Causal ambiguity (when the reasons for success or failure in replication cannot be determined, e.g. due to its degree of tacit knowledge)

Absence of experience of successful transfer

Characteristics of the source of knowledge

Lack of motivation (fear of losing ownership or lack of motivation)

Not perceived as reliable (lack of trust in the source)

Characteristics of the recipient of knowledge

Lack of motivation (not invented here syndrome)

Lack of absorptive capacity

Lack of retentive capacity

Characteristics of the context

Barren organisational context (one that proves infertile for transfer due to organisational or behavioural factors)

Arduous relationship (especially with strongly tacit components, individual exchanges may be hampered by social frictions and/or distance of relationship).

Szulanski (1996) reports an empirical study of 271 observations of 122 best practice transfers in eight large companies. His conclusion is that the most important barriers to transfer are the lack of capacity of the recipient, causal ambiguity and arduous relationship. These findings contrast with common speculation that it is motivational factors that act as the main barrier (Porter, 1985; Goold et al, 1994). The significance of this is not that managements should ignore the motivational factors, which are undoubtedly important: but many firms have already recognised this and taken steps to address it. As Szulanski observes, his findings suggest that *in addition to the motivational factors*, managements should consider developing the learning capacity of organisational units, fostering closer relationships between them and devoting more resources to understanding and communicating individual practices to overcome the causal ambiguity problem.

Webster (2001) draws conclusions consistent with Szulanski's capacity factor, in a study of occupational progression among 3700 Australian workers. Workers in high knowledge jobs (termed 'asset style jobs') tend to have started off higher up on the occupational ladder (after allowing for the effects of educational attainment). This finding is consistent with the view that employers of highly skilled labour selectively recruit and promote people according to how successful they have been in acquiring relevant knowledge

and skills. Path dependency may therefore play a part in enabling workers to reach high knowledge job levels in which knowledge transfer and absorption are relatively assured.

5.3 *Retention of knowledge intensive workers*

If the knowledge based firm wishes to acquire, develop and retain its sources of knowledge, and to appropriate value from them, it needs to have a clear view of how it proposes to operate in the external labour market, and provide compensation packages sufficient both to attract and to retain the kinds of knowledge intensive workers it requires. We have also underlined the importance of the commitment factor in encouraging application and transfer of knowledge.

Ricart and Portales (2001) identify five different types of employment system:

- Transactional, where firms buy the labour they require on the open market, through an arms-length transaction: job characteristics tend to be narrowly defined, training is limited, social ties are weak and pay is market determined
- Relational, where the familiar characteristics of the internal labour market apply: labour is largely acquired at entry levels, career paths are identified and supported by training and personal development, social ties are strong and employees have a stronger sense of empowerment through familiarity with the organisation's values and culture: pay is designed to be internally consistent and to provide motivation through advancement. A high degree of employment security is implied.
- Balanced systems, blending elements of transactional and relational approaches
- Market employability, in which jobs are available on the expectation that they will be of limited duration, but offering good pay, interesting work and job challenge. The short term duration makes intensive training and development unlikely but learning on the job and the interest of the work itself are presented as opportunities for individuals to improve their general skills and experience which can in future be re-marketed: social ties are weak and the individual has responsibility for development.

- Organisational employability, in which the firm seeks to develop the general skills of its employees through internal training and development, seeing the need for flexibility as the competitive and technological environment evolves. The difference between this and the relational contract is that although social ties and continuity of employment are important, the organisational structure is much more shallow, flexibility and adaptability are at a premium, and jobs are characterised by a high degree of empowerment and decision making power. Job security is not ‘guaranteed’ but the opportunity for developing personally and in career terms is viewed as a means of retaining staff, in their own interests.

The two latter forms of employment system have evolved relatively recently as firms have attempted to cope with the demands of increasing competition in product markets, which the more traditional systems have found it difficult to deliver. As Cappelli (1995, 2001) has pointed out, the internal labour market (relational contract) approach has broken down in many organisations in recent years, due to the fashionability of downsizing and the introduction of various forms of ‘flexibility’ (numerical, functional and financial), putting paid to the implicit job security of the relational contract. These measures are of course related to the perceived need by firms for greater economy in labour costs, and have been associated with increasing decentralisation and ‘de-layering’. Herein, of course, lies the problem, for such measures effectively remove the sense of employment security that is likely to be most strongly associated with employee commitment:

‘teamwork and related changes in work organization create idiosyncratic skills that both demand training and are difficult to replace. The assumption has been that such situations demand greater employee attachment and tenure in order to make these firm-specific investments pay off, but instead, attachment seems to be weakening’ (Cappelli, 1995, 591).

For the knowledge-based firm this poses a real dilemma. If its ‘core competencies’ depend on the knowledge of its employees and the developed set of routines that are embedded in the social relationships of the organisation, it has to depend on the commitment factor, which will

be significantly diminished by signals that employment security is at risk. The kinds of competence required are unlikely to be found readily on the external labour market (though the 'market employability' option would suggest that paying a wage premium might enable a poaching strategy to work). Outsourcing complete functions offers another route, but that too may be difficult to sustain if the skills and knowledge required are truly core competencies.

5.4 *HRM Strategy*

The challenge to the HRM function to deliver the knowledge-based firms requirements is thus formidable. For the firm that wants to manage its embodied intellectual capital effectively, there are four main options in the formulation of its HR strategy:

Increasing the quantity or quality of recruitment, thus building human capital potential as a basis for more extensive or more intensive application of knowledge; and following this up with a programme of human capital development in the shape of training and education programmes, career development, etc.

Leveraging knowledge more effectively (by varying the mix of staff working with codified and uncodified knowledge, by deskilling activities and commoditising certain types of product, or by investing in information and articulated knowledge systems such as intranets and extranet linkages to customers and suppliers)

Deepening knowledge by nurturing the social processes and social interactions through which tacit knowledge is demonstrated and integrated into production

Diffusing knowledge within the firm by seeking to convert tacit into articulated knowledge.

Options 1 and 2 can be regarded as methods of achieving *human capital advantage* while options 3 and 4 may be regarded as sources of *human process advantage* (Boxall, 1996: Boxall and Steenveld, 1999, Hunter et al (2002)). These are not mutually exclusive alternatives: indeed, there appears to be considerable advantage in pursuing them in combination, as they have different objectives.

5.5 *Human Capital Advantage*

The conventional mainline functions of the Human Resource Management function in a firm are: selection of suitable candidates for engagement, appraisal of employee performance, development through training and experiential learning, and remuneration. Building human capital advantage through the acquisition and development of human capital is, then very much the normal working territory of the HR professional. The question is whether an orientation to knowledge based employees makes any significant difference to the scope or direction of these activities.

In principle, the answer appears to be negative, though it will be important that the particular needs of the knowledge-based firm are kept in mind. To the extent that the firm is likely to be a 'learning organisation' with an organisational culture that promotes creativity and organisational and individual development, all these activities from selection onwards will need to be aimed at acquiring and developing the kinds of individual capable of benefiting from this experience and contributing to sustaining competitive capability. This will mean recruiting able individuals, many of whom will be required to operate as team players in a co-operative game, and capable of fitting in with the culture and values of the organisation. This would tend to suggest the likelihood of a relational contract approach to the choice of employment system, or perhaps more likely, the organisational employability model. In either of these cases, the strategy for remuneration will be critical.

It is also worth noting that in the knowledge firm, there is an increasing tendency to build human capital to enter new market areas by hiring key executives at the most senior level, often recruiting a whole team, which has the advantage that it brings a whole new stock of expertise into the firm, complete with its own tacit knowledge and routines.

Quinn et al (1996) emphasise the desirability of building this form of human capital (termed 'professional intellect'): by recruiting the best, forcing intensive early development, constantly increasing professional challenges, and evaluating and weeding. One consequence is that comparatively few will have a real chance of making it to the top of the organisation. In professional organisations the weeding process takes the form of an 'up or out' strategy, akin to a form of tournament. Rebitzer and Taylor (1999) and others (Baden-Fuller and Bateson, 1991) argue that partnership (in professional firms) can be seen as the prize in a tournament in which the winners forego immediate returns to the value of their knowledge, in order to reap the gains of property rights in the firm in the longer term. The risk is that those with confidence in the value of their knowledge may 'grab and go', taking with them key skills and knowledge – and potentially some of the firm's customers or clients.

The second aspect of building human capital advantage is to ensure adequate *leverage* of the most valuable skills and knowledge repositories in the firm: those who are recognised as the key problem solvers, who bring in the vital business contracts, and provide leadership and innovative thinking. If these capabilities are to be effectively used, they should not be diverted into lower grade tasks. Options for the firm then include using a high gearing between key and supporting staff, redesigning work to standardise operations to take advantage of codified knowledge, developing policies that encourage the key personnel to share knowledge (through, for example, personal coaching and mentoring programmes), and avoiding bureaucratic styles of management, which can 'strangle' initiative and knowledge transfer (Teece, 1998).

This may be seen as part of a wider process of leverage (Cohen, 1998) who notes the experience of Petrash, Global Director of Intellectual Assets and Knowledge Management at Dow Chemicals, who was asked to leverage Dow's intellectual assets for greater value. Petrash's group screened Dow's 29,000 patents to determine which should be exploited, which could be licensed and which should be abandoned. The outcome of this generated \$125m in licensing income and \$40m in savings over ten years. In the same way as much of this released value had been 'locked up' or rendered redundant, so in human capital terms there is often considerable hidden value in the intellectual property of individuals and teams.

Quinn et al (1996) provide a neat link to the desirable meshing of human capital potential and the IT contribution, by observing the leverage that can be got through capturing knowledge and analysis from high level experts and cascading that intellectual contribution down through broader layers of the organisation (e.g. brokers) and hence delivered in customised form to the public at large: Merrill Lynch is cited as an example of this leverage. (See also Huseman & Goodman, 1999, Chapter 7: Wensley and O'Sullivan (2000).

5.6 Human Process Advantage

The issue of human process advantage takes us back into the softer, social aspects of knowledge embedded in individuals, teams and organisational routines. As argued earlier, these will be more difficult for competitor firms to replicate, but they are also more difficult for the firm to manage effectively, though more valuable because of their lack of imitability, and hence their sustainability. In part this is about the processes that are involved in deepening the knowledge of employees, which will derive both from learning from the environment and external contacts, and from the internal transmission of knowledge. In part it is about the conversion of the more tacit forms of knowledge to more openly accessible

forms, which can be codified and readily used by others in the firm. (c.f. the SECI model outlined in section 2.3 above).

The deepening and transfer processes will depend partly on the capability of the human resource (its ability both to express knowledge and to absorb it, c.f. Szulanski above) and hence the outcome of earlier recruitment and selection procedures; training and development. It will also depend on the organisational context, which may be described in terms of organisational culture or 'social architecture' (Mueller, 1996, 774). This area is not explored further for the present purpose. There is a large array of literature on organisational culture and the problems of cultural change, much of it written in a semi-academic manner with plentiful illustrations from corporate experience. There is a large range of more serious attempts to develop classificatory models of knowledge creation, organisation and management, which develop particular approaches to context, organisational structure, the concept of community and the importance of 'ba' or '*place*', defined as space for dynamic knowledge conversion and emerging relationship (Nonaka, 1998: see Despres and Chauvel 1999, Chapter 3 for a useful summary account of the main contemporary models). The decision not to pursue these developments further here is not to deny their possible importance in developing both better tools and better organisational devices for the handling of knowledge, innovation and the management of intellectual capital; but they would take us into areas that are more remote from the current lines of inquiry.

The standard literature on HRM strategy postulates that the 'problem' for HR strategy is to discover a suitable 'fit' or alignment between the business strategy and the 'bundle' of HR policies to be pursued. (MacDuffie, 1995, Pil and MacDuffie, 1996,: see Wood,1999 for an excellent overview and evaluation). We noted earlier (p. 25) the continuing debate about whether this can be a universalist fit, or whether it needs to be adapted on a contingency basis, to take account of industrial and market characteristics. Quite apart from this, there are

problems in knowing what ‘bundles of practices’ should be included (Wood, 1995, 1999; Guest and Hoque, 1996; Purcell, 1999, Godard, 2001). From the standpoint of the knowledge based firm, it is hard to find justification for the view that the structure and coverage of these ‘bundles’ does not matter, especially given the British study by Ramsay et al (2000), which fails to establish the posited causal relationship between HR practices, worker motivation and organisational performance. In any event we cannot overlook the need for these policies to meet employee needs and aspirations (Boxall and Steeneveld, 1999, p 446). Although the matter of remuneration and its form (e.g. financial participation schemes) cannot be ignored, there is evidence that workers are increasingly concerned about non-pay aspects of the employment relationship, such as hours of work and life work balance, job prospects and training (Taylor 2002).

Of relevance here is the growing body of work on the importance of the psychological contract, which is increasingly developing a better-structured understanding of the concept (Guest, 1998: Coyle-Shapiro and Kessler, 2000:). Guest notes that different definitions suggest the contract may be about ‘perceptions, expectations, beliefs, promises and obligations’ each implying different levels of psychological engagement (op.cit. 651). The notion of contract implies a reciprocal relationship, but since it is unwritten, there is scope for asymmetry in the understandings of the implicit effort bargain between the parties. Guest points out that the new emphasis on the psychological contract is in line with the spirit of the times, with fewer workers enjoying protection from trade unions, and job security being more fragile. In the hierarchical, managerial control model of the firm, the perceptions and expectations mattered less than in the newer, commitment models of the lean organisation and the high performance work system, which imply the need for a positive psychological contract. That argument would seem to be particularly relevant to the case of firms concerned to maximise the value of their intellectual capital. Changes in the employee’s *perception* of

the employer's behaviour and signalling of objectives and values (e.g. through appraisal and promotion criteria) will prompt employees to re-evaluate their side of the bargain, and negative evaluations will tend to erode commitment features like knowledge sharing, teamwork participation, cross-boundary transactions and other discretionary behaviour likely to create value for the firm. Significantly, Coyle-Shapiro and Kessler (2000), in a study of a British local authority, found that a majority of employees had experienced employment breach, confirmed by managers, with consequential reductions in commitment and willingness to engage in organisational citizenship behaviour. Although local authorities have perhaps been particularly constrained by financial pressures, their experience is broadly mirrored in many private sector firms, where downsizing, cutbacks in training and development expenditure, rationalisation programmes and the like have provided opportunities for psychological contract re-evaluations. Perhaps not surprisingly, Taylor (2002) reports on findings from the 'Working in Britain in 2000' survey as follows:

'employees' satisfaction since 1992 has declined in every facet of their job...(including) a greater shift towards a feeling of less satisfaction took place over pay, job prospects, and training...(and) significant deterioration among workers in having any sense of a personal commitment to the company that employs them' (pp 9-11)

All this suggests that there is growing evidence of a mismatch between the requirements of a growing proportion of firms for employee commitment and participation in knowledge deepening and transfer activities, and the prevailing drift of employment systems away from the provision of the conditions that would build and sustain a positive psychological contract. That positive valuation may be particularly difficult to achieve if the demands of the new business culture run counter to the expectations of the knowledge worker with respect to autonomy, self-determined standards of achievement, life-work balance and career expectations.

The present state of debate among HRM academics in this whole area of employee commitment and performance is very unsatisfactory, on three grounds. First, with few exceptions, 'hard' testing of the universalist *versus* contingency readings of the commitment–performance relationship is virtually absent. Both concepts are subject to a range of measurements and definitions, and in addition, the relationship is subject to so many other influences, external or internal to organisations, that the search for a satisfactory test of the alternatives may be a chimera. Second, empirical work observes what firms do, not what academics think they ought to be doing. What firms do is normally bound by some assessment of the costs of alternative policies and the expected benefit to be derived from them. In the literature at large, there is virtually no discussion or measurement of the costs of the range of policies and practices that are commended – and hence the relationship between costs and returns is passed over. Third, it would seem a reasonable expectation that firms acting rationally would differ in their approaches to employment policies and practice, depending on what they perceived to be the optimal employment system for their strategic objectives, technology, product market competition, etc. We might expect to find that knowledge intensive firms would choose employment systems that were differentiated from those where knowledge plays a small role, since the kind of contribution they need from employees is likely to be very different. Evidence to support even such a broad differentiation is hard to find. There is, therefore, a need for more work on these themes to produce a clearer picture both of what firms are doing and what they need to do to improve employee performance.

To the extent that these conclusions can be generalised to other developed economies, there is clearly scope for major re-consideration of the policy and strategy framework governing the management of the knowledge worker.

6. Conclusions and the Future

6.1 Summary

The purpose of this review has been to provide a structure for analysis of the issues that arise from the emergence of the ‘knowledge economy’ and the growing importance for business organisations of intangible capital, particularly intellectual capital. In an environment in which competition has been heightened for many industries and firms, often at a global level, the ability of firms to differentiate their competitive performance through the application and exploitation of its intangible capital has become increasingly important, as other traditional sources of differentiation have diminished. This new focus on intangible capital has implications for business organisations and for agencies and other bodies charged with managing the protection systems that cover intellectual capital and the associated property rights. For business firms, intellectual capital is a competitive asset that requires to be managed, and because of its properties it throws up a number of new considerations for strategy formulation and implementation. For supervisory agencies, it changes the landscape, potentially threatening some traditional areas of jurisdiction and opening up new opportunities and challenges to take account of the new domains that are being opened up.

Within the scope of intellectual capital, we distinguish between some forms that have fairly tangible attributes (e.g. patents, trademarks, design licences and other licensing arrangements) and those that are less tangible such as human capital, tacit knowledge and organisational architecture and routines. Whereas the property rights associated with the more tangible forms have been well established through patent, trademark, and copyright legislation and protection, there is much more ambiguity in relation to human capital and the various forms of knowledge that are embedded in people or the way they are organised to undertake work tasks in their employing organisations.

This leads to a consideration of the different forms of knowledge, with differentiating properties in terms of their ability to be shared or transferred. There is much emphasis in some strands of the literature on the social character of exchanges that are critical to knowledge creation and diffusion, which underline the problems that managements will face if they seek to treat knowledge as a reified and homogeneous entity. Yet if firms are to create new knowledge assets as a condition of continued competitiveness, they need to provide conditions that are favourable for creativity, facilitate the transfer and sharing of knowledge within the firm, and ensure that the associated value is appropriated. These all become significant considerations in the development of firms' business strategy, a fact that the corporate strategy literature has begun to take on board through the emerging resource based theory of the firm, and a recognition of the importance of dynamic capabilities in establishing and sustaining competitive advantage.

Competitive advantage will not be achieved or sustained if there is no means of protection for the innovations: this is so particularly in knowledge products such as online materials, and innovations that stem from blurring of formerly distinct technological boundaries. In parallel, the contributions of human capital in its own right, and of special expertise in tacit knowledge form and organisational structures and routines, also need to be built and sustained. The management and employment systems that served well enough in the heyday of the traditional hierarchical firm do not appear to provide support for these sorts of development. New models are emerging but there are formidable barriers in the way of developing the strong employee commitment to the employing organisation that seems to be necessary. Not least among these hurdles is the trend in much of the business world to intensify the working effort of employees (perhaps especially the critical knowledge workers and sources of professional experience and expertise) and reduce the sense of security and continuity on which commitment seems likely to depend. The resolution of this will depend

on a better understanding of the psychological contract between employees and employer in the flatter, flexible firm of today.

The resulting issues for management are substantial. The overall management of intangible assets and intellectual capital in all its guises are more complex than the management of physical capital employed with labour managed under a 'command' system. The balance between the search for new ways to deploy research and development effort and steer it into channels that will be productive, appropriable and protectable, and the search for new employment and human resource management systems and practices that will create and appropriate new knowledge, are matters that will have to involve top level general managers as well as specialist functional managers such as employment and HR. Likewise, it is probable that there will be a need for more comprehensive and more accurate accounting procedures to bring the growing significance of the intangible assets and intellectual capital into the realm of financial and asset management.

6.2. *Future Considerations*⁹

The OECD study of the 'new economy' (2000) observes that the relationship between technological progress, innovation and growth has changed in the 1990s. 'The ways in which organisations interact in an economy have been affected, with networking, co-operation and the fluid flow of knowledge within and across national borders gaining in importance' (p.8). Among the effects has been a substantial growth in R&D in the service sector (from 5% to 15% of OECD R&D expenditure between 1980-1995). Developments in information communication and technology have facilitated these trends, breaking down monopolies and speeding up information and knowledge transfer processes. This opening up of R&D activity and of communication means that firms increasingly acknowledge the need for more awareness of what is happening in the external environment and more co-operation with

others in pursuing knowledge development and application. As we have argued, much of the new knowledge is coming from new sources, especially in the ICT field, but also from the fusion of different bodies of scientific and technological knowledge, such as in the biotechnology field. Geographical boundaries become less restrictive, and in some cases the drive for knowledge is generated by the requirement that there should be international standards governing systems that have to operate on a global basis (e.g. financial and airline/air control systems networks).

These developments inevitably have implications for the future of IPR and the associated regulatory systems. The main rationale for public support of a patent system is to stimulate technological innovation and diffusion, but this is only one of a number of forms of protection for IPR. Different IP regimes (science and the academic world: industry and technology: government and defence; and arts and culture) have different needs and different problems in providing protection. (McSherry, 2001). But the evidence suggests that the dividing lines between these regimes are becoming more fluid, with information communication technologies playing a significant role. One consequence is that firms, conscious both of the costs of innovatory work and the need to preserve exclusive ownership for as long as they can, are adopting multiple forms of protection to strengthen their IPR. Part of the problem is that scientific and technological development is evolving more rapidly than the legal framework, which has traditionally been responsive. Many of the latest developments seem to challenge fundamental concepts in the IP system, for example:

New products often depend on the combination of different technologies

Generic technologies are giving rise to a wide range of products

The technologies and the emerging range of products are often cross-linked

Multi-national companies and international alliances of business are producing cross-border ownership of IPR, while the IP regimes are essentially national in character, embedded in their own countries' legal systems

As firms seek ways to increase their market power through increasing their ability to exclude competitors, much effort is going into finding new ways of bundling material and immaterial resources, which in turn tends to generate new markets. (Granstrand, 1999)

The implication is that the patent and related IPR systems will have to respond if market imperfections and market failure are not to proliferate, with the consequence that innovation and diffusion would be retarded. While it may be argued that national differences in approach are helpful to diversity, there would seem to be arguments for closer alignment or harmonisation of different systems, and indeed there are some efforts being made in this direction. Clearly, then, there are major challenges here for patent and other IPR agencies, as well as for governmental policies, which will want to ensure a national pay-off from scientific and technological development – some of which will have been funded through public funds.

While this inevitably means that these agencies will have to keep a watchful eye on the wider national and international scene, it is also arguable that they need to maintain a good understanding of how firms themselves are addressing the problems of intellectual capital, and how they are managing the many different facets discussed in earlier sections of this paper, such as their success in handling knowledge and knowledge workers within their own organisations. How well they achieve that, and how they are doing so, will have repercussions on the level and structure of industry's demand for IP protection.

Appendix: Some notes on the valuation of intellectual capital and intangible assets

It is well documented that the value of many businesses in conventional accounting terms varies considerably from their worth as evaluated for acquisition or merger purposes, or as valued by stock market prices. The difference lies, to a large extent, in the valuation of intangible assets, including intellectual capital (IC). The evidence also indicates that there is an increasing ration of intangible to tangible capital (Webster, 1999, Lev and Zarowin, 1999).

At least three different kinds of approach to the problem can be identified:

1. econometric work on the valuation of intangible assets, stemming from the work of Griliches (1981)
2. developments in accounting techniques designed to complement the conventional analysis of essentially physical assets through valuation of intangible assets
3. developments at corporate level, in which a few companies have recognised the importance of intangible assets and IC in particular, leading them to develop measures (generally company specific) that will shed some light on the components of intangible values.

We comment briefly on each of these.

Econometric work

This area is fully covered in the companion paper by Webster (2002), who observes three different approaches to the estimation of private returns to investment in IC:

- Rate of return approaches
- Production function approaches
- Market valuation approaches

Three problems seem to stand out. First, there are difficulties in finding unequivocal proxies for the level of intangible capital in the firm, and considerable risk of double counting when both R&D and patents and designs are included in the equation. Second, there are issues

about causality in the relation between firm performance and R&D – and studies in any case vary in the extent to which they emerge with findings of a positive relationship between market values and intangible capital proxies. From the present point of view, the most serious objection is that, as Webster (2002) points out, remarkably few studies ‘have estimated enterprise returns to investment in worker skills, organisational change and marketing’ (p16). If we extend this criticism, and observe that most of the econometric studies focus on the more measurable effects of R&D expenditure and patents, designs and trademarks, there must be a serious concern that virtually all of this work is under specified, in that it fails to capture the individual and social knowledge embodied in the workforce and management, and in the organisational practices and routines that we have argued are a prime source of value and competitive advantage in the modern enterprise. It may however be unfair to be too critical of the econometricians in this respect, since it is not easy to see how values can be attributed to many of the factors likely to play a part, given that most companies do not record data that would be necessary, and accounting procedures likewise focus on other measures.

Accounting approaches

Many financial analysts have increasingly become critical of conventional accounting measures on the ground that the standard financial reporting procedures are less and less useful as sources of information to investors. Lev and Zarowin (1998) argue that this is due to the accounting measures failing to capture the effects of change on the operation and profitability of firms. Change is associated with restructuring costs, R&D and other investments that are immediately expensed, though the benefits of such changes are observed in subsequent periods. There is therefore a distortion of reporting investments and returns, ‘which adversely affects the informativeness of financial information’ (Lev and Zarowin, 1998, p 3). Change comes from innovation, reflected in investment in intangible assets, including R&D but also information technology, brands and human resources. It is these intangibles that are most inadequately picked up in the conventional financial report. In a steady state situation, this may not matter too much: the immediate expensing of R&D expenditure, for example, will result in the same earnings as those based on R&D capitalisation. This there is no loss of information. This is not so, however, when there is significant change in R&D investment, or in other factors within the intangible investment portfolio. Lev and Zarowin go on to propose changes in accounting practice that would

capitalise intangibles once they have passed some pre-specified technological feasibility tests: this, it is argued, would permit investors to have improved information. While this might help with intangibles in the form of R&D and other quasi tangible investments, the authors recognise that there are other changes (such as corporate re-structuring or industry deregulation) that would not be amenable to such tests, given the inherent uncertainty of outcomes. They thus propose a procedure whereby past financial reports would be *systematically restated* over a period to reflect the capitalisation of the restructuring or other changes (much as estimates of GDP are revised and re-benchmarked at intervals)

This brief discussion is sufficient for the present purpose. It demonstrates the concern of accounting and financial professionals about the effects of intangible investment, and especially changes in that investment, on the quality of financial reporting, from the point of view of the investor. The discussion certainly edges into the area that is our concern in the main paper, though it does not fully address the measurement problems of tacit knowledge. These measurement problems have been considered by a number of companies, who have also recognised the significance of knowledge and knowledge management in their own management information systems, and it is to these that we now turn.

Corporate measurement of intangibles

A few companies, most notably Skandia, the Swedish financial services firm, have begun to develop a set of metrics that aim to capture indicative information on the location and development of intellectual capital. Such information they regard as important from a management point of view, particularly where (as with Skandia) they recognise that their critical competitive assets lie not in physical capital, equipment and inventory, but in talent, competence and industry relationships. Three main stores of knowledge in the firm are identified: customer capital, structural capital and human capital.

Customer capital is the value bound up in its ongoing relationship with customers and clients.¹ Market share, customer retention rates and profitability per customer are common measures of customer capital and will be familiar measures to many managers. These measures, however, do not capture the changing relationship between many companies and their customers, which demands an increasingly close interaction and information flow designed to meet customised requirements rather than mass consumption standards. Edvinsson and Malone describe five indicators of customer capital:

Customer type (profile of present and future customer base)

Customer duration (degree of loyalty)

Customer role (customer's place in the value chain)

Customer support (how company ensures customer satisfaction)

Customer success (how products and services help the customer achieve aims)

In Skandia, there is an array of metrics designed to capture measures of these aspects of customer capital (for detail, see Skandia, 1995, 1996).

Structural capital can be defined as the set of processes, systems and routines that characterise a company's mode of business operation. It includes a concept of *process* in the sense that it relates to the company-specific way of doing things, and may therefore reflect to some extent the company's organisational culture. The metrics used will be influenced by the nature of the company's business and what it sees as its distinctive attributes.

Human Capital (or resource) accounting.

This made a brief appearance in the 1960s but suffered from an adverse image (treating people as assets) and an over-narrow view of what comprised human capital. The range of

¹ Arguably this should be broadened to a concept of relational capital, including not just customers but also suppliers and perhaps also employees as stakeholders in the value of the total assets of the enterprise.

measures developed by Skandia for its own purposes include not only the conventional measures like employment, training, turnover, service length and age, but also measures of motivation, empowerment and knowledge sharing. (Skandia, 1996)

Such approaches raise as many questions as they answer. The use of proxies, the grouping of attributes to provide an indication of strength or weakness, and the true relationship between the measures and the company's performance are all problematic. And if companies really need to decide what measures are most appropriate to their own organisation and industry, the prospects of any generalist approach seem remote. What can be said is that companies that work at this on a consistent basis at least have some opportunity to measure development and change, and can begin to relate these to performance or targets. Skandia is not alone in this effort, though it is the most-cited example: others include Dow Chemicals.

Towards a conceptual framework

It is clear from this short discussion that there are formidable problems in progressing our understanding of the value of intellectual capital. In particular, there are difficulties in giving meaningful expression to the least tangible assets, those embodied in organisation, people and corporate processes. At the very least, progress would seem to depend on (1) a clear understanding why valuation is desired and (2) what are the components of IC in its widest form. It will also be important to recognise that the components will be differently valued according to the purpose for which the analysis is required. We deal with these points below.

Perspectives on IC valuation

From the viewpoint of the firm there will be three ways of considering the value of IC:

As a stock of assets that comprise part of the value of the firm (along with physical capital) that would be reflected in its sale price or its stock market valuation

As a source of income or profit through time

As an asset capable of being developed through actions and behaviour, such that the stock value of the firm will be sustained in the face of change, or enhanced by increases in competitive advantage.

(2) Structure of Intellectual Capital

The value will be the sum of a number of different elements that define the structure of the Intellectual Capital. As a first approximation, consider the following structure

$$IC = IP + PID + K1 + K2 \quad (1)$$

where

IP = Intellectual property (e.g. patents, trademarks, copyright, licences, etc.)

PID = property in the development stage (R&D)

K1 = articulated knowledge (e.g. company specific organisation systems, templates and operating procedures)

K2 = tacit knowledge (e.g. know-how embodied in individuals, teams or organisations).

This definition regards IC as the generic form of intellectual or knowledge assets, comprising a series of elements:

1. Intellectual property (IP) here is regarded as property that conveys some form of legally protected rights for the owner. This implies codification or 'hard' forms of capital, developed into unique separable assets in the form of patents and trademarks that will be measurable across firms and for different time periods. There is evidence that firms (and indeed industrial

sectors) adopt different strategies with regard to patents and trademarks: fashions may have some influence here, including the extent of resort to professional advisers such as law firms specialising in patent and trade mark rights.

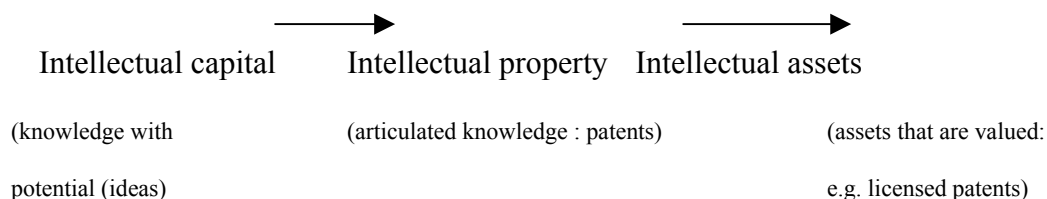
2. R&D is a set of activities designed to produce new goods or processes which will create new net value for the firm: for most countries R&D is not evaluated for accounting purposes as part of the company's assets, except as work in progress (Blair and Wallman, 2001). There is an extensive literature on the contribution of R&D to economic growth, as well as on the paths chosen by firms to develop and organise their R&D effort.

As we have noted in the main paper, (Section 2), many types of knowledge are relevant to the firm, some of which have particular relevance for management in its pursuit of the sources of value it can bring to the firm. Of particular importance is the need to separate the concepts of data, information, tacit knowledge and explicit knowledge).

Viewed from the standpoint of company accounts, IC as an asset would include only IP and a possible shadow valuation for R&D (dependent on national accounting conventions: in many cases it would simply be expensed). K1 and K2 would not appear. But as a source of income or profit (or competitiveness) the potential value of R&D, plus the value of K1 and K2 may be substantial, and one would expect them to be reflected in, say, stock market or sale valuation of a company's worth. This valuation would include not only the 'hard' sources of value, but the less tangible elements also. From the standpoint of growing the value of the company, each of the 'asset' elements has one or more counterparts reflecting the investment needed to achieve enhanced value. Investments in protection and in R&D are straightforward. Potentially just as important in the knowledge-based firm are investments in technology and organisational features that will facilitate the 'capture' and sharing of

knowledge. And finally, as a means of building K2, the acquisition and development of human capital through human resource management policies will be a critical feature of the knowledge-based firm.

There are, inevitably, many different ways in which the structure of IC can be analysed. Dow Chemicals, for example, have adopted the following set of distinctions:



This brings out the importance for the company of the distinction between potential value, property with ownership rights, and assets that can be formally valued in accounting terms. The key factor underlying this distinction is the fact even when articulated, knowledge property is not necessarily saleable and separable – in which case, although it may be a source of value to the firm, it is excluded from conventional accounting analysis.

This sort of separation is not formally made in Equation (1) above, and consideration might be given to an alternative that makes the point more directly:

$$IC = K(a) + K(b) + K(t) + / - L \quad (2)$$

where K(a) is articulated knowledge assets, clearly owned, separable and saleable, e.g. patents, trademarks:

K(b) is articulated knowledge assets but not separable and saleable in their own right, e.g. R&D in progress, business secrets, proprietary business systems and processes

K(t) is tacit, embodied knowledge e.g. personal know-how

L is the value of the sale or purchase of licensing arrangements with other companies, e.g. where a firm decides not to exercise the full monopoly right of a patent in its own right, but rather to derive an income flow from licensing – or where it buys these rights from another firm.

(3) Valuation issues from different perspectives

See Table 1 for an illustration of the differences in the approach to valuation that would seem to be implied by the different perspectives.

Table 2: alternative approaches to valuation

	Intellectual capital as asset	Intellectual capital as source of income, profit	Means of growing Intellectual capital
K(a)	Intellectual property (patents and trademarks)	Monopoly rents derived	Investment in patent and trademark protection
K(b)	Property in development: R&D valuation	Work in progress?	R&D expenditure, optimal mgt. of R&D
	Articulated knowledge (K1) Systems, procedures, organizational routines: codified knowledge	Shared knowledge: intranet: knowledge and information diffusion mechanisms	Technological and organizational investments designed to 'capture' and share knowledge
K(t)	Tacit knowledge (K2) Labour skills, competences, experience Management skills: Entrepreneurship, Innovation, Organizing skills	Ricardian rent from scarce skills: and monopolistic rent from differentiation ? marginal in monop. comp. but potentially significant in oligopoly	Labour hires/ selection Training and development expenditure Attraction and retention costs (reward systems) Commitment costs (HR bundles of policy)
L	Owned licences	Net Income from licences	Increasing licensing agreements, alliances

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¹ From discussions with companies, but also revealed by job descriptions in appointments advertisements.

² This model is also used in Hunter et al (2002), from which some of the following framework derives.

³ Conventions on valuing R&D vary across countries, but mainly this expenditure is valued only as work in progress. The United States is an exception, where outputs close to their final stages may be given a commercial value.

⁴ Ghoshal and Barnett (2000), for example, emphasise the importance of horizontal communication and knowledge transfers.

⁵ In its mainstream form, this argued for a one-way causative relationship from market structure, determining the conduct of firms and hence their performance in the market

⁶ See Granstrand, 1999 for an interesting analysis of patenting propensities in Europe, USA and Japan: also Teece, 2000, for the variability of propensity to patent across industries.

⁷ In chemicals and pharmaceuticals, which have extensive patenting, there is less overlap between individual technology paths, and cross-licensing is used there more to accommodate broad product lines rather than technological paths.

⁸ For discussion of law firm experience, see Hunter et al (2002).

⁹ For a useful discussion of many of the issues here, see Granstrand (1999) Chapter 10.

