

Knowledge Management and Management Theory: An analysis of Sullivan's conceptualisation of knowledge within organisations

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Abstract: Sullivan's model presents an opportunity to explore the management of intellectual property (IP) as a specialised activity in the discipline of knowledge management. The model is analysed in terms of strengths and weaknesses to gain a better understanding of the relationship between knowledge, the demands of the new economy and the role of intellectual property in organisations. The analysis focuses on the central importance of managers as key agents in the creation and delivery of value through the commercialisation of IP.

Keywords: Commercialisation, human capital, intellectual property, knowledge economy, knowledge management.

1. Introduction

Knowledge management is an important theme within management theory, because the processes of knowledge management are exercised when managers are required to manage intellectual property. This paper examines theoretical models of the management of intellectual property collaborative structures. The role of new knowledge within organisations suggests that, while managers have always been involved in managing explicit knowledge, there are new demands upon managers that require new competencies. These competencies include the ability to lever knowledge strategically and competitively, especially by managers who work in the specialized activities of research and development. An examination of the models for managing intellectual property, offers an opportunity for research to discover relevant management competencies needed by managers, when they attempt to be strategic with knowledge. In the future, a detailed understanding of these competencies may influence the effective development and application of intellectual property, often directed by these managers who are involved in meeting the challenges of working collaboratively.

This paper examines the main themes in the management literature, to highlight the theoretical gaps in this literature with respect to knowledge management. This analysis draws from management theory those conceptual relationships that are important in theorising knowledge management. The paper focuses on the contribution of human capital to knowledge management by exploring the management of intellectual property.

Each period in the development of management theory has a literature that contains the contributions to our understanding of knowledge management. The connections between these literatures provide an historical path of theoretical development concerning knowledge within organizations. The issues emerging from this analysis assists in understanding the role

of human capital in developing knowledge within organisations. This theoretical analysis is important for understanding the broader relationship between knowledge, the new economy, and the role of intellectual property in contemporary organisations. The paper examines five main stages of management theory in analysing Sullivan's model of human capital and the formation of knowledge within organisations. The paper provides a critique of Sullivan's theoretical conceptualisations of knowledge management.

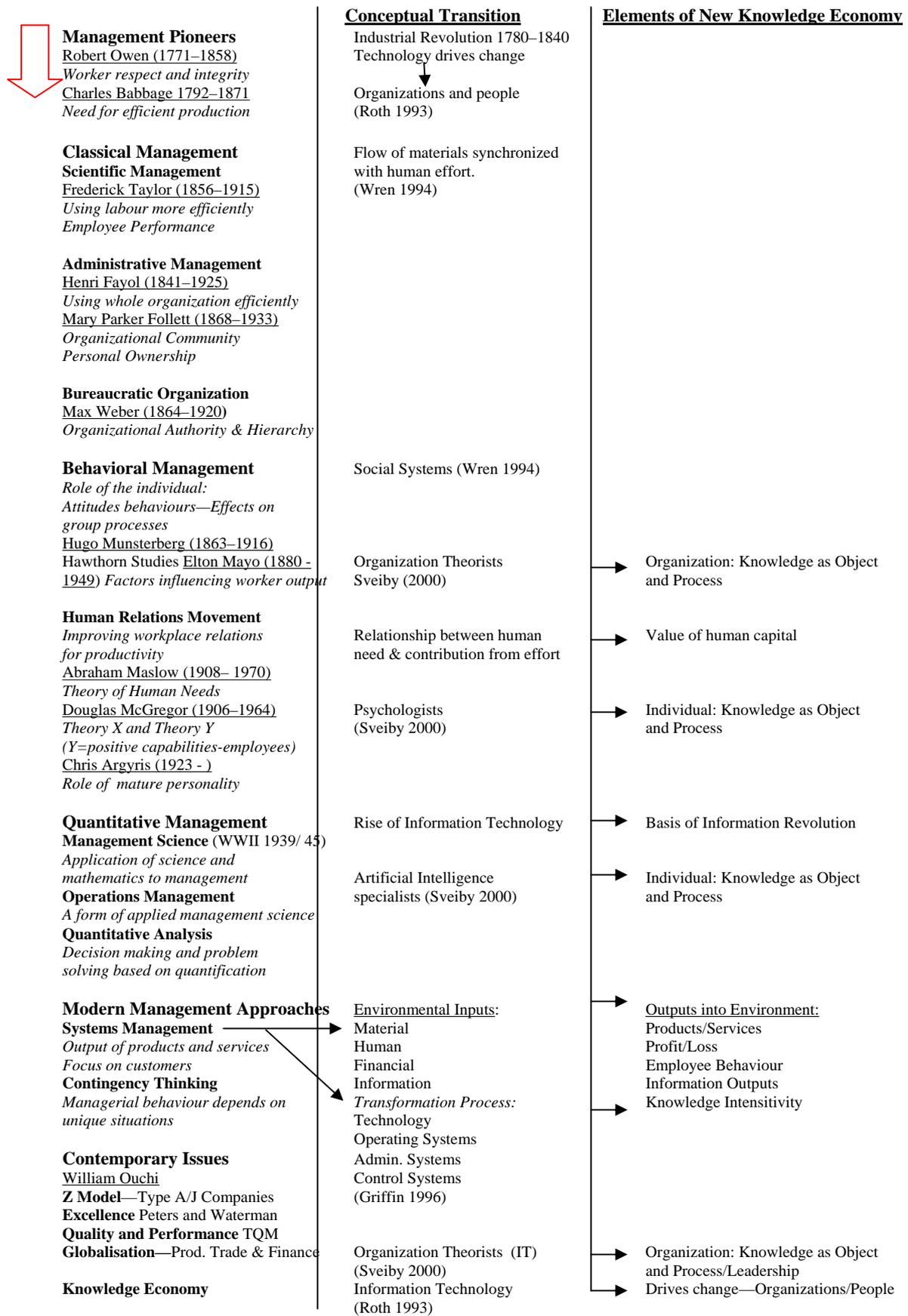
2. Themes in management literature and knowledge management

Throughout the development of management theory there appears to have been an incremental rise in the influence of knowledge, allowing it to assume a more central position of importance. This rising prominence of knowledge coincides with the evolution of the knowledge economy. As presented in Figure.1, the dynamics of the knowledge economy reflect the theoretical development of traditional management theory. These theoretical features need to be understood in terms of their increasing alliance with knowledge principles, as business operations have adjusted to maintain relevance to the knowledge economy. The emergence of the view of knowledge as an 'object' or a 'process' appears to be initially identified around the time of the Behavioural School and extends to the recent period of discussion surrounding Globalisation.

By describing and analysing the embodiment of knowledge in organizations and individuals as objects, information and processes, Sveiby (2000) has reflected the unique combination that exists between tangible and intangible assets. The roles of human capital and organizations are central in transforming that knowledge. Organizations and people are agents of intellectual assets, irrespective of whether these assets are tangible or intangible in nature, or a mix of both.

The increasing emphasis on the strategic use of intellectual capital by organizations as the reason for having strong knowledge management procedures is shown by Scarbrough's (2002) summary of the theoretical history. This summary compares, within the broader historical analysis, common elements and dimensions of management theory incorporating keys for success, key resources and key technologies relevant to periods of time. The historical elements indicating a shift toward the knowledge economy include the machine age, the computer age and knowledge management. The dimensions define business outcomes in terms of success, types of capital and stages of technology development. The relationships between these elements and dimensions are described in Figure 2.

Figure 1: Knowledge Management in the History of Management Theory



Main Sources: Adapted from Griffin, R 2002, *Management*, Houghton Mifflin Company, Boston, pp. 36-59, and Schermerhorn, J, 2001, *Management*, John Wiley & Sons, New York, pp. 72–86.

Figure 2: Knowledge Management and the Innovation Process

<i>Elements</i> 	Machine Age Management	Computer Age Management	Knowledge Management
Success Criterion	Efficiency	Flexibility	Innovation
Key Resource	Physical Capital	Structural Capital	Intellectual Capital
Key Technology	Machine Systems	Information Systems	Conversations
		 <i>Nine Dimensions</i>	

Source: Adapted from Scarbrough, H., 2002, *Knowledge Management and the Innovation Process*, Keynote presentation to The Sixth International Research Conference on Quality, Innovation and Knowledge Management, Kuala Lumpur, Malaysia, 17-20 February, 2002.

An analysis of Scarbrough’s (2002) view of the historical development of management themes shows that the rise of technology corresponds with the rise of knowledge. As the technology-knowledge complex becomes more dominant in management terms, there is a shift in the way that success is understood. The shift is away from the predictability and control of earlier management paradigms marked by efficiency, to adopt a stance of greater risk-taking, preparing to achieve more flexible business outcomes, and higher competencies through individual and organizational innovation. The progression of Scarbrough’s (2002) concept of key resources through the three historical periods indicates the changing composition and growing sophistication of knowledge with the passing of time.

With the development of business systems and the increasingly complex nature of management through the period of the post-industrial economy into the computer age, the importance of organizational resources and knowledge became apparent. This was a period when management knowledge grew rapidly and became important in such areas as manufacturing methods and distribution systems, expectations, rewards, relationships with customers and suppliers and in the use of brands and trademarks (CCH 2003).

There is consistency of purpose about the growth of knowledge and the rising intentionality of knowledge. This is evident when comparing the overall historical periods of the development of knowledge as providing a basis for industrial success in society with the more specific role of intellectual capital in business as a key resource for firms to achieve success in competitive knowledge markets. This consistency exists across historical periods and instances of organizational experience because the formation of intellectual capital and any attending processes of innovation depend on knowledge growth that consistently drives knowledge to new points of application. These processes of innovation, based on the ascending importance of knowledge, are achieved by having an appropriate strategic alignment of human resources with the functions of formal and informal networks as expounded in Scarbrough’s (2002) theory of knowledge management in innovation. Thus, it can be ably demonstrated that the development of systems and contingency thinking, parallel developments in the knowledge revolution.

2.1 From management theory to human capital

In more recent management literature, the role of human capital has taken some primacy in relation to knowledge management. Granstrand's (1999) theory on intellectual capitalism relates technologies and knowledge with the role of human capital in order to bring about economically strong performance in the market. Mincer (1993) shows that 'at the macro-economic level the social stock of human capital and its growth are central to the process of economic growth'. Sengupta (1998) also explains, using Romer's (1990) model of endogenous technological change, 'that an economy with a larger stock of human capital will experience faster growth'. This endogenous concept of technological change requires human capital to make intentional investment decisions in technology (Sengupta 1998). The tendency to faster growth may easily result in technology spillovers which, in turn, result in higher rates of economic growth between countries (Sengupta 1998).

Cohen (2003) adds to this literature by showing that the era of financial capital has given way to a new ways of thinking whereby the firm consists of capital, workers and technology. Here, there is an enrichment of the role of human capital for producing and commercializing technology. These dynamics between intellectual capital, the role of human capital and technology markets characterise the new era of human capital (Cohen 2003).

Both commercializable intellectual assets and supporting intellectual assets have their origin in human capital. Sullivan (2000) depicts this foundational role of human capital in his model of intellectual asset formation for intellectual property. However, he fails to explain a theory of the firm that entails a relationship between capital, workers and technology (Sullivan 2000). While the model shows a direct relationship between the knowledge attributes of human capital and the formation of commercializable intellectual assets, the role of human capital in this process, through to the establishment of intellectual property, needs further development. It is a role that involves managerial methods, operational methods, customer capital and organizational structure, however, once again, the actual contributions of human capital are not explained. The importance of the role of managers is confirmed by Huseman and Goodman (1999) who explain that the performance of management functions is a primary role of human capital in the new knowledge industries. Within this role there needs to be a focus on the strategic leadership of knowledge within the organization (Huseman & Goodman 1999).

The need to address factors about the effects of managerial roles and decision making in the formation and use of intellectual assets, especially in an organizational context of research and development, is an important component of understanding knowledge within organisations. Although there are some gaps in Sullivan's (2000) model, the model provides a good starting point for developing a framework for understanding intellectual property and knowledge management within organisations. The following analysis of the strengths and weaknesses of Sullivan's model adds to our understanding of the management of knowledge and intellectual property.

3. Sullivan's model

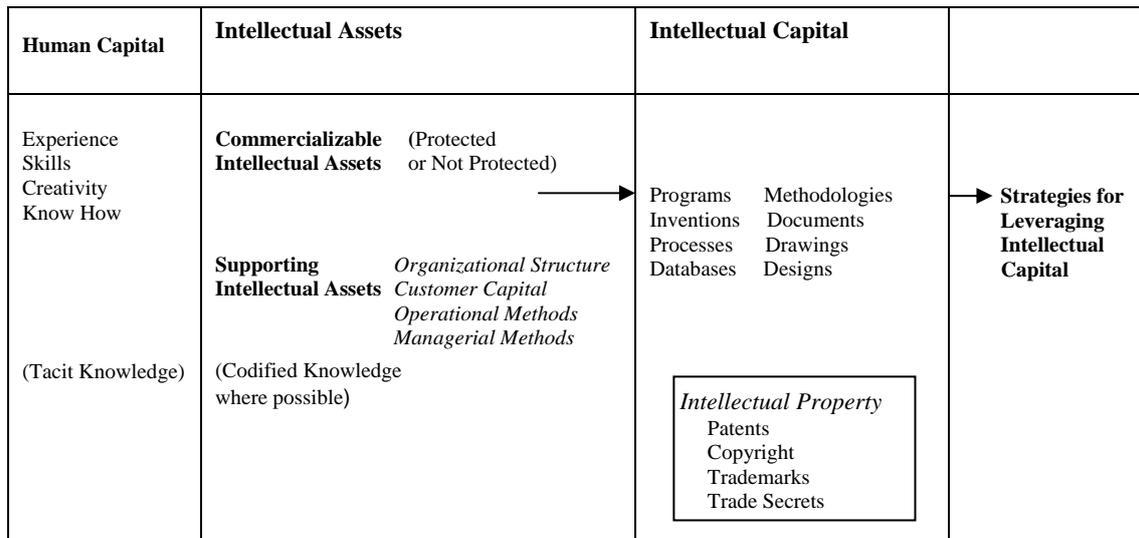
A key strength in Sullivan's (2000) model is the role afforded to human capital and knowledge in the formation of intellectual assets and intellectual property. This relationship implies the evolution of capitalism, based on knowledge and intellect. The development of technology, and other forms of knowledge, includes significant contributions from employees. A second strength of his model is that it recognises that contributions from

managerial practices are the actual basis for the development and commercialization of knowledge in the form of intellectual property. The model explains the conceptual basis of commercializable intellectual assets or IP to be supporting intellectual assets.

Sullivan (2000) explains four dimensions of human capital that input to the development of commercializable intellectual assets as well as supporting intellectual assets. These dimensions are identified in Figure 3. Explicit knowledge, which is a central part of Sullivan's (2000) model has to do with the enactment of competence through organization-based competency strategies, responsible for the first level of generating knowledge. These competencies are enabled by human capital within organisations (Baets 1998). The model also incorporates capacity, which are those resources required for competence and capability (Hitt, Ireland & Hoskisson 2003).

Sullivan suggests that without the four dimensions of human involvement, it would be difficult for companies to create and deliver value (Sullivan 2000). The importance of these human qualities is supported by Huseman and Goodman (1999). Meso and Smith (2000) also support the important role of human capital, by showing that, in a strategically innovative knowledge management environment, the role of people should include explicit processes of 'know-what' and 'know-why' as contributions within a rising hierarchy of intellectual value. Within the processes, creativity is a quality that arises as a part of this higher intellectual value chain. Skills and experience become human knowledge assets of a regulatory nature over the strategic performance of intellectual property mechanisms including patenting (Meso & Smith 2000, p. 226).

Figure 3: Human Capital in Intellectual Asset Formation



Source: Adapted from Sullivan, P 2000, *Value Driven Intellectual Capital: How To Convert Intangible Corporate Assets Into Market Value*. John Wiley & Sons, Brisbane. Adapted from Exhibit 9.2, Intellectual Assets, p. 158, Exhibit 9.4, Intellectual Assets Component of Intellectual Capital, p. 162, and Exhibit 8.3, The Intellectual Capital of the Firm, p. 229.

The specific relationship between tacit and explicit knowledge as represented at the bottom of Sullivan’s (2000) model in line with supporting intellectual assets are important mutual components in the management of intellectual property. This is because the potential meanings of ‘know what’ and ‘know why’ are conveyed through the actual execution of issues surrounding the three main dimensions of the model: *intellectual capital*; *intellectual property*; and *strategies for leveraging the IP outputs of R&D*. The human capital components are ubiquitous across the model and are expressed through both tacit and explicit forms according to the dispositions of managers. It is these tacit and explicit dispositions that are framing the treatment of issues about managing IP and which are becoming the consolidated knowledge about how intellectual property is to be managed in conjunction with other involved parties.

This analysis raises the first main area of weakness in the model. Sullivan (2000) has not defined these dimensions in any meaningful detail, but has suggested that the dimension of ‘know-how’ needs to be understood and applied as a managerial construct. This particular theoretical disclosure by Sullivan warrants special consideration as a gap in the model. It is also arguable that the dimensions of ‘experience’ and ‘skill’, which are also not adequately defined as aspects of managerial practice, form parts of the dimension of know-how and that a non-recognition of this overlap presents another weakness in the model.

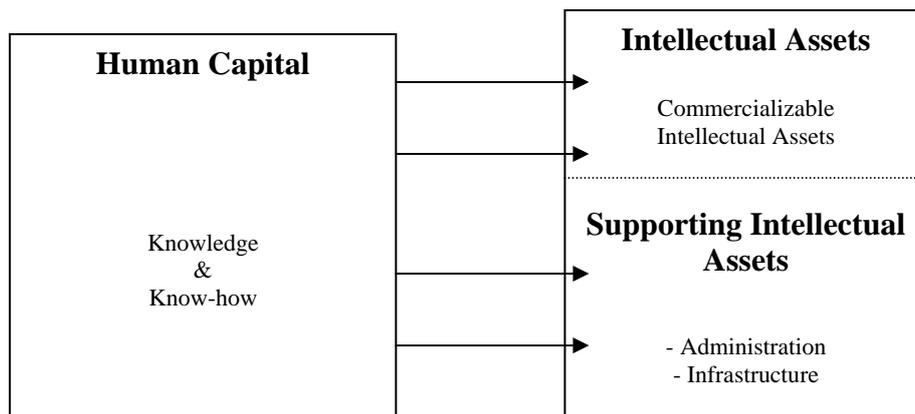
3.1 The argument for management ‘know-how’

Lerner and Merges (1997) refer to the common meaning of ‘know-how’ as unpatented intellectual property or unpatented core technology. While the concept of know-how is usually referred to as tacit or codified knowledge, it is evident that the literature also suggests the need for a wider application of the term to apply to aspects of supporting intellectual assets. The recognition of the need to explore the concept of know-how more universally, while retaining the concept of the unprotected technical aspects of the actual outputs of research and development, are mentioned throughout the earlier work of Sullivan (1998).

Sullivan (2000) further extends this point by specifically referring to the need to investigate the dimension of know-how as a component of supporting intellectual assets. The relevance of the relationship between know-how and supporting intellectual assets is shown from Sullivan's theory in Figure 4.

The supporting intellectual assets referred to by Sullivan (2000) consist of: organization and structure, customer capital, operational methods and procedures, managerial methods and analyses, and collective assets 'typically involving know-how and knowledge relating to culture, values, and the firm's collective know-how' (Sullivan 1998).

Figure 4: Contribution of Know-How to Supporting Intellectual Assets



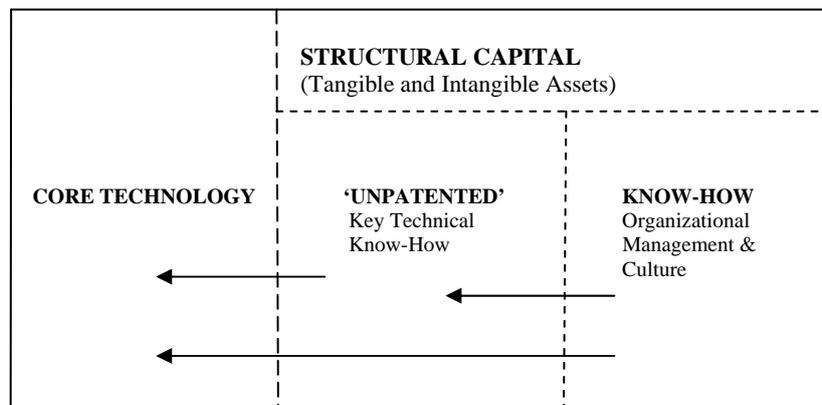
Source: Adapted from Sullivan, Patrick H 2000, *Value-Driven Intellectual Capital*. John Wiley & Sons, Brisbane. p. 158.

In support of a broader conceptualisation of know-how, Sullivan's (1998) earlier theoretical work shows that, through the concepts of knowledge and know-how, firms want to capture the collections of understandings that reside with human capital, which may be composed of:

1. Values and culture
2. Mission, vision, objectives, and strategy
3. Customer relationships and know how about customers
4. Technical knowledge and know-how
 - a. Commercializable innovations
 - (1) Strategic innovations (part of the firm's strategic thrust)
 - (2) Non-strategic (available for out-licensing or other value-capturing process)
 - b. Other innovations bringing value to the firm
 - (1) Innovations for internal operations (production/production processes)
 - (2) Innovations protecting commercializable innovations
5. Organization and structure
6. Managerial methods
 - a. Decision processes
 - b. Databases
 - c. Procedures
7. Work methods
8. Information providing access to company know-how and capabilities

There appear to be three possible levels of interpretation to the concept of know-how. There is the knowledge contained in core technology, that is protected as intellectual property. This is a component of commercializable intellectual assets. There is tacit or codified key technical know-how, that is often unpatented. In relation to the core technology, this key technical know-how is also a lever for gaining competitive advantage (Sullivan 1998). At a third level, there is structural capital know-how that is specifically derived from organizational management, structure, administrative procedure, decision processes, work methods, competence, ethos, and collective assets. This latter category is the know-how context that this research is concerned with. The intellectual property management issues that this last category of know-how addresses may in fact relate to key technical know-how in the second category, or it may directly relate to the core protected technology, indeed it may relate to both. The relationship between the three categories of know-how is illustrated in Figure 5.

Figure 5: Categories of Knowledge and Know-How



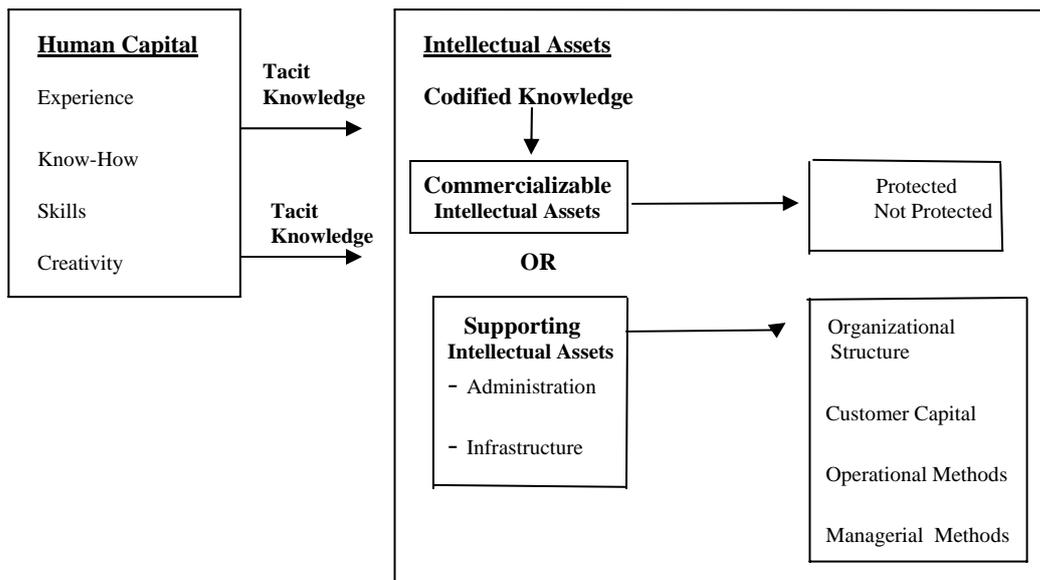
The construction of this concept of know-how is important to investigate further because of the foundational contribution made to managerial processes that form the dynamics of collaboration and the ability to realise goal achievement in the whole R&D mission. This is a conceptual understanding that is different to the know-how developments made in the actual arena of technology. In order to better prepare a critique of this concept in Sullivan's (2000) model, a closer examination and analysis of the principles and assumptions of supporting intellectual assets is also necessary.

3.2 Supporting intellectual assets

Sullivan (2000) presents the supporting intellectual asset component of the model to reflect the importance of business strategies and processes being based on knowledge which serves the objective of commercializing the outputs of R&D. This makes management strategy and process subordinate to economic objectives. Thus, the model includes business and administrative processes, knowledge flows between infrastructure and organizational structure, as well as collections and compositions of customer capital. Operational methods and managerial methods are understood to serve the objective of achieving an effective commercialization of IP. This makes the model suitable for exploring the nature and effect of management process suitable for functioning in the knowledge economy.

The model highlights the importance of having an appropriate theoretical connection between management knowledge for knowledge management in the area of intellectual property so that the management knowledge fits the demands of the knowledge economy. The ways in which supporting intellectual assets become structured and utilised will depend upon a number of factors including both organizational and human. There will be interaction between the factors that will influence managerial decisions. Figure 6 shows the juxtaposition of these organizational and human factors as components of supporting intellectual assets.

Figure 6: Human Capital and Knowledge Development in Intellectual Assets

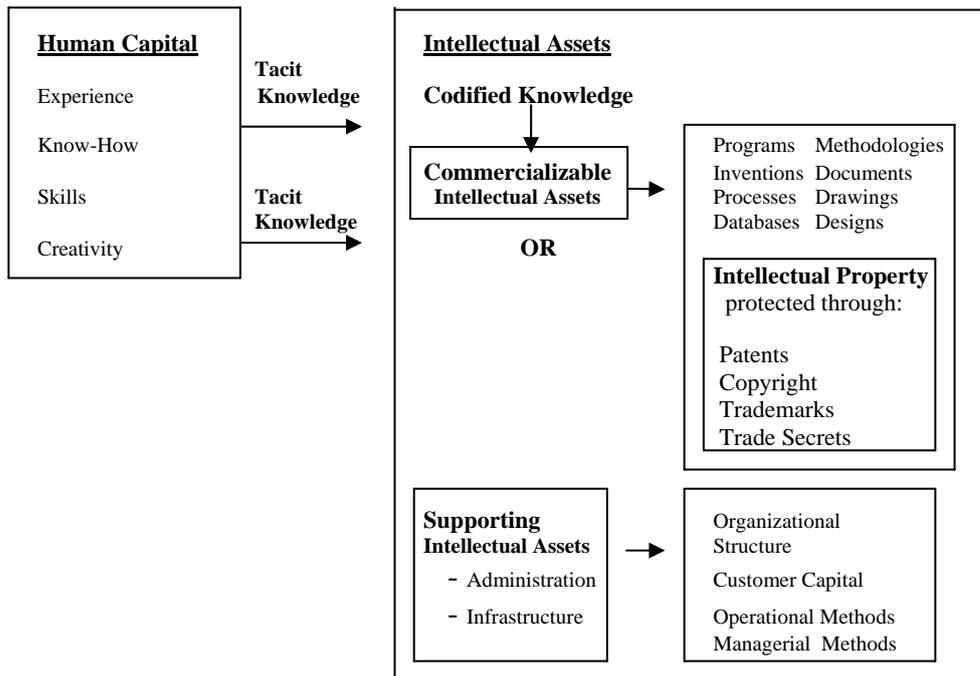


Source: Adapted from Sullivan, Patrick H, 2000, *Value-Driven Intellectual Capital*. John Wiley & Sons, Brisbane. pp. 162 & 229.

A main weakness in the model, however, is that it does not recognise the rising prominence of collaboration as a structural feature of the organization of R&D activities. It is within this collaborative structure that decisions by R&D managers are exercised. The model shows that this decision making is in the context of supporting the process of commercializing IP. In the relationship between human capital, specific human interactions involving decision-making, communication and control, issues of intellectual property will arise. This interactivity will also involve issues about organizational cultures and positions that need to be negotiated, adopted or moderated between the R&D collaborators. All such interactions are ultimately responsible for the full success or limited success of IP commercialization strategies because human know-how functions as an economic agent in these economic objectives. The model does recognise the complexities of structural collaboration facing managers or employees and does not suggest any substantive issues, which need sound management among collaborators to ensure the best economic return for their joint efforts.

The effective transformation of intellectual assets to intellectual property through the contributions of human capital know-how and its related inputs, as the transformation is undergirded by managerial methods, further illustrates the suitability of Sullivan’s (2000) model for explaining the study. The relationship of managerial methods to the commercialization of intellectual property is shown in Figure 7.

Figure 7: Transformation of Intellectual Assets as Intellectual Property



Source: Adapted from Sullivan, Patrick H, 2000, *Value-Driven Intellectual Capital*. John Wiley & Sons, Brisbane. pp. 162 & 229.

A strength of Sullivan’s model (2000) is that it also recognises that ‘structural capital’ is the basis for the composition of supporting intellectual assets. While this is not a different proposition to mainstream human capital theory, the model presents credibility on the basis that it acknowledges the value added contributions of managerial knowledge as part of structural capital. Sullivan (2000) recognises that structural capital consists of the ‘infrastructure that firms provide to their human capital including both direct and indirect support involving both physical and intangible elements’.

From a management perspective the direct support of structural capital includes intangible elements such as strategic plans, payroll systems, cost structures, and supplier relationships (Sullivan 2000). This is an important aspect of the model from the perspective of the current study because of the challenge to investigate and understand issues involved in planning, negotiating and measuring the performance of joint projects. The study highlights the need for understanding the strength of knowledge capabilities among collaborators in the areas of research, finance, management and manufacturing. Specifically in relation to the model, Sullivan (2000) includes the importance of understanding the contributions of complementary assets in the form of ‘manufacturing facilities, distribution networks, customer lists and relationships, supplier networks, service forces, complementary technologies, trademarks, and organization capabilities’. Complementary assets are those which specifically ‘process innovations toward the customer’ and therefore their successful commercialization in the market (Sullivan 2000). The part of the model being tested in this study is ‘organizational capabilities’, specifically in supporting intellectual assets as this capability involves the management of IP issues just as much as it involves the capabilities of the actual IP itself, such as its existence in the form of a trademark (Sullivan 2000).

The weakness in this part of the model is that the broad category of complementary assets supporting commercialization have not been explored in any detail. This gap in the knowledge includes issues relating to the management of licensing issues. Indeed, these issues have not been explored in any form (Teece 1986; Edvinsson & Sullivan 1996; Petrash 1996; Stewart 1991; Sveiby 1997). The model consistently displays recognition of the main building blocks for examining the managed process toward the development and commercialization of intellectual property, but provides neither a rationale nor a starting point for exploring the IP related issues.

Another aspect of broad suitability about the model for guiding the present study is its recognition of the uniqueness of IP that is produced by individual research enterprises. This aspect of the model refers to a subset of complementary assets described by Sullivan (2000) as 'unique or firm-specific complementary assets'. These assets differentiate a firm because of its unique ways of applying knowledge in order to produce innovation through the efforts of the organization's human capital.

An example of this uniqueness can be seen where a firm that is manufacturing a unique product, also possesses a unique technology or product design that is not able to be imitated by another firm. The product and attending processes are unique in that they have the power to create and realise value in the market. These products and processes which are unique, or firm-specific, complementary assets are often subject to a method of formal protection such as a patent. The patent forms the basis for managing a licensing strategy. All of the management processes leading the development and licensing of innovation are situated in the supporting intellectual assets component of the model and are founded on decision making, principally by managers. This may be the case even though forms of innovation may widely vary from one enterprise to another (Sullivan 2000). Once again in the case of 'unique or firm specific complementary assets', the importance of management methods including decision making is evident as being an important support to licensing IP, however, the actual nature of the IP issues involved has not been investigated. Even though innovation enterprises may be unique in their processes and products, there may also be some commonalities or trends of practice among types of issues that the model is currently insufficient to discuss. The potential that exists for common practices among managers needs to be explored and analysed.

Conclusions

The theoretical question posed in this paper is: 'How adequate is Sullivan's model of intellectual capital in assisting understanding of intellectual property and knowledge management?' This paper has focussed on two aspects of Sullivan's model: know-how and supporting intellectual assets. Sullivan's model is possibly the best theoretical framework available for understanding knowledge within organisations, but this paper has sought to advance this model by improving those components relating to know-how and intellectual assets. In particular, the paper has argued that the concept of know-how needs to be explored more universally. Importantly, the model appears to be silent on the value of joint-partnership and collaboration as an intellectual asset. Future theoretical analysis might relate to the assumptions of the model with respect to the social foundation of knowledge. The purpose of this debate is to develop a model capable of both explaining and managing knowledge within organisations.

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