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**Knowledge Management:
What Can Organizational Economics Contribute?**

by

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Abstract

Knowledge management has emerged as a very successful organization practice and has been extensively treated in a large body of academic work. Surprisingly, however, organizational economics (i.e., transaction cost economics, agency theory, team theory and property rights theory) has played no role in the development of knowledge management. We argue that organizational economics insights can further the theory and practice of knowledge management in several ways. Specifically, we apply notions of contracting, team production, complementaries, hold-up, etc. to knowledge management issues (i.e., creating and integration knowledge, rewarding knowledge workers, etc.) , and derive refutable implications that are novel to the knowledge management field from our discussion.

Key words: Transaction costs, organizational economics

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1. Knowledge Management: Perils and Promises

During the last decade or so, knowledge management — a set of management activities, aimed at designing and influencing processes of knowledge creation and integration including processes of sharing knowledge (henceforth, “KM”) — has emerged as one of the most influential new organizational practices. Numerous companies have experimented with KM initiatives in order to improve their performance. At the same time, the literature on KM has virtually exploded (e.g., Nonaka and Takeuchi, 1995; Choo, 1998; Boisot, 1998; Krogh, Ochiyo, Nonaka, 2000; Easterby-Smith, Crossan and Nicolini, 2000).

KM would thus seem to be one of those areas, where managerial practice and the academic literature develop simultaneously and perhaps even co-evolve. Here KM is not much different from many other management fads of the recent decades, such as business process reengineering or total quality management that also promise to contribute to competitive advantage — although this is asserted rather than carefully demonstrated. The analogy goes further, for KM is also akin to these fads in that there is no clear disciplinary foundation of KM. Indeed, the underpinnings of KM are a mixed bag, ranging from Eastern philosophical traditions over ideas from organizational behavior to notions from information science. Strikingly (to us, at least), organizational economics plays no role in the disciplinary base of KM. However, the KM literature neglects organizational economics at its peril.

Organizational economics looks inside the firm by examining the tasks of motivating and coordinating human activity. It is taken up with explaining the nature of efficient organizational arrangements, and the determinants of such arrangements. Efficiency is understood in the sense of maximizing the joint surplus from productive activities, including processes of creating, sharing and exploiting knowledge. A basic proposition is that the costs and the benefits of productive activities — and therefore joint surplus — is influenced by the incentives, property rights and ways of disseminating and processing information that structure productive activities. Perhaps as a result of organizational economics playing at best a small role in the evolution of KM, there is seldom any sustained attention to the *cost* of KM activities. For example, when Krogh, Ichijo and Nonaka (2000) in a major survey of the KM literature mention cost, they devote 4 pages (out of more than 250) to it, and then only treat costs of searching for knowledge, a category of cost that is only one among a multitude of relevant costs of KM.¹ This neglect of organizational costs is quite

representative of the whole KM literature. Moreover, we would argue that even the potential *benefits* of alternative ways of organizing KM are ill-understood in the literature. On the managerial level, something similar may be observed. This is, perhaps, best expressed in the words of a knowledge manager, who recently stated to us that

... [t]he concept of KM for mutual benefit seems self-evident for the enthusiasts, which only increases their puzzlement when others in their organization show apathy or even negative interest in the concept. If there is no offsetting benefit for sharing knowledge in terms of money and recognition, or the process by which one does so is arcane or bureaucratic, or it is difficult to find the right fora, then organizational costs rise and participation drops proportionally.

Because neither the relevant costs of alternative ways of organizing knowledge in organizations, nor their benefits are addressed in any systematic manner in the KM literature, the attendant trade-offs, and how these may be influenced by managerial action also remain ill-understood. The result is that the literature does not allow propositions about *optimal* KM strategies, and how these vary with changes in the relevant parameters, to be made. In other words, in its present manifestation, the KM literature does not constitute a managerially relevant contingency framework; it may supply inspiration (and entertainment) for managers, but not much in the nature of firm guidance.

Lest this be taken as a wholesale condemnation of KM, let us state immediately that the KM literature contains numerous salient observations on knowledge processes, that is, processes of creating, sharing and exploiting knowledge (e.g. Lyles and Schwenk, 1992; Nonaka and Takeuchi, 1995; von Krogh, Ochiyo, Nonaka, 2000). In addition, the literature does much to identify key characteristics of knowledge-structures that surround knowledge processes in terms of knowledge-type, knowledge-distribution, complexity and relatedness (e.g. Lyles and Schwenk, 1992; Weick and Roberts, 1993; Galunic and Rodan, 1998). In the present paper, we take some of these ideas as grist for a theoretical mill consisting of organizational economics. In particular, we focus on the *coordination* and *incentive* problems that processes of creating, sharing and exploiting knowledge inside firms may give rise to, and how various aspects of governance may be understood as a response to such problems. We thus take steps towards meeting the challenge contained in the recent observation that "... the time is ripe to start addressing learning and knowing in the light of inherent conflicts between shareholders' goals, economic pressure, institutionalized professional interest and political agendas" (Easterby-Smith, Crossan and Nicolini, 2000: 793).

The remainder of this paper is structured as follows. First, we highlight key insights from organizational economics, and briefly sketch general implications for the understanding of KM practices (2. “*Organizational Economics: A Novel Perspective on Knowledge Management*”). Second, we show that novel propositions about KM may be derived from organizational economics. We also address from an organizational economics perspective a number of central phenomena (e.g. firm specific learning, teamwork, communities of practice, knowledge-integration) that have been discussed in the KM literature (2. “*Knowledge Management: Organizational Economics Insights*” and Section IV. Conclusions follow. A final reservation. Our chosen subject in this paper is a vast one. Considerable narrowing of the issues is necessary for space reasons. Thus, in the following we disregard KM issues that relate to the issue of the boundaries of the firm (e.g., make-or-buy decisions, joint ventures, networks, etc), and focus solely on KM as it pertains to internal organization.ⁱⁱ

2. Organizational Economics: A Novel Perspective in Knowledge Management

2.1. Overall

Although organizational economics began as a theory of the existence and optimal scope of the firm (Coase 1937; Williamson 1975), during the last twenty years or so it has increasingly been applied to internal organization issues. In particular, organizational economics has directed attention to the coordination and incentive problems that are caused by the pathologies that unavoidably accompany an internal division of labor, such as asymmetric information, diluted performance incentives, measurement difficulties, bargaining problems, moral hazard, duplicative (redundant) efforts, etc. In turn, organizational economists have explained how a host of organizational arrangements, such as various kinds of authority, payment schemes, delegation of decision rights, etc., serve to alleviate the severity of such problems.

Beginning our brief sampling of organizational economics perspectives, *agency theory perspectives* have predominantly addressed issues related to payment schemes (Holmström 1979, 1982; delegation of decision rights (Fama and Jensen 1983; Jensen and Meckling 1992; Aghion and Tirole 1997), multitasking (Holmström and Milgrom 1991), and managerial commitment (Baker, Gibbons, and Murphy 1999) under assumptions of moral hazard and asymmetric information. *Transaction cost economics* (Williamson 1985, 1996), and *property rights insights* (Hart 1995) have been brought to bear on issues related to allocation of rights and design of

contracts when investments in human capital are firm-specific, agents may behave in an opportunistic manner, and contracts are incomplete. *Team theory* (Marschak and Radner, 1972; Casson, 1994; Carter, 1995) has addressed the optimal design of organizational structures, given the bounded rationality of individuals (but absent conflicts of interest). Finally, work on *complementarities* between organizational elements (e.g., payment schemes, delegation of rights, supervision methods, etc.) (Milgrom and Roberts, 1990, 1995) has lend strong formal support to the traditional notion that there are stable, discrete governance structures that combine organizational elements in predictable ways (Thompson, 1967; Williamson, 1996). It is fair to say that the empirical base of organizational economics, in terms of the number of corroborations of predictions of these theories, is fairly strong (Shelanski and Klein, 1995; Prendergast, 1999).

Although organizational economics is constituted by a number of different theories, nevertheless there are a number of common threads in the literature (cf. Foss, 2000). On the method level, all of organizational economics is unabashedly *individualistic* in the sense that all organizational phenomena should be explained as the outcome of the choice behavior of individual agents. At the theoretical base, the whole literature is concerned with *efficiency*, that is to say, how resources are allocated so that they yield the maximum possible value. Two closely related implications follow immediately. First, the organizational economics perspective is intimately taken up with value-creation; as noted, maximizing the value that can be created is the meaning of economic efficiency. Second, since the allocation of resources is (also) a matter of how the relevant resources are governed and organized and since value-creation is dependent upon governance and organization, it follows that an efficiency perspective allows one to discriminate between alternative forms of economic organization in terms of efficiency. Rational actors will choose those organizational forms, contracts and governance structures that maximize their joint surplus and will find ways to split this surplus among them.

In turn, the influence of alternative organizational arrangements on value-creation may be analyzed in terms of motivation, knowledge, information, and complementarity — and how alternative arrangements embody different ways of influencing these variables (cf. also Buckley and Carter, 1996). Motivation, etc. are all in different ways related to those *transaction costs* that (in various guises) are central in all organizational economics theories, and whose size influences the value that may be created from organizing and governing scarce resources in particular ways. The value that can be created, in the presence of transaction costs, fall short of what may be created in a world with no problems of motivation, etc. (a “first-best” situation), and, hence, no transaction

costs. While such a world may be imagined, it is not the world of managers and other inhabitants of organizations. However, motivation, etc. may be manipulated so that the organization approaches it. We discuss motivation, knowledge and information, and the coordination of complementary actions *seriatim* in the following.

2.2. Motivation

The motivational assumptions of organizational economics have been subject to a good deal of scrutiny and critical discussion. Many scholars in, for example, organizational behavior, have been critical of the seemingly cynical assumptions with respect to human nature that drives much of organizational economics analysis. To these critics, opportunism (“self-interest seeking with guile,” Williamson, 1996) and moral hazard (i.e. using asymmetric information to one’s advantage and the other party’s disadvantage after a contract has been concluded) are not descriptively accurate. They may furthermore be “bad for practice” to the extent that managerial action based on prescriptions from these theories may, by treating people as would-be opportunists, lead to self-fulfilling prophecies (Goshal and Moran, 1996). However, such motivational assumptions fundamentally serve to highlight the — presumably undisputed — fact that actors often have very different interests; opportunism and similar assumptions are stark ways of highlighting this. Moreover, the motivational assumptions serve to emphasize that economic organization need to be designed with an eye to the possibility that some (by no means all) actors may act in a morally hazardous or opportunistic manner.

In the context of internal organization, the largest effort so far may well have been devoted to exploring how various aspects of internal organization — from accounting principles over payment methods to the nature and function of hierarchy itself — may be explained as efficient responses to various principal-agent problems. Thus, particular attention has been paid to differences between input and output-based payment, and how the choice between these is determined by the observability of effort and states of nature; the role of monitoring and of subjective and objective performance measurement (Prendergast, 1999); and of how a hierarchical structure may constrain “rent-seeking,” that is, attempts to influence superiors to one’s own advantage (Milgrom, 1988).

One perspective on all this is that various aspects of internal organization arise to curb the resource costs of agents pursuing their own interests in a way that is harmful to the organization. Under an organizational division of labor, management (and the owners of the firm) delegate some rights to employees, ranging from the trivial (the right to work with the company’s vacuum cleaner) to the

all-important (the right to make decisions on major investment projects). Management wishes these delegated rights to be exercised in an optimal manner. However, since the right holders cannot be constantly monitored, and since performance pay schemes trade-off incentives and risk, some losses (compared to a full-information situation) are usually unavoidable. Internal organization arises as a trade-off between these losses and the costs of designing monitoring schemes, incentive contracts, etc.

A particular set of incentive problems is caused by problems of managerial commitment. For example, often employees wish to specialize their human capital to the firm, thus becoming more productive and hoping to capture some of the marginal productivity created. In other words, they expect to be compensated for their investment. However, by specializing in this way, employees become subject to a potential hold-up problem (Williamson, 1985, 1996; Hart, 1995). To be sure, the possession of specialized knowledge may be a strong bargaining lever. However, there is another strong party to the bargain situation, namely the firm to which the employee specializes. The implication is that employees cannot expect to capture all or even most of the quasi-rent from their specialized human capital investments, which harms incentives to undertake the investments (Hart, 1995). Strong and credible managerial commitment to not using the hold-up option may solve the problem (Kreps, 1994). Another way of solving the problem is to allocate (more) decision rights to employees who undertake human capital investments (Rajan and Zingales, 1998). Thus, in professional service firms, often employees with a long tenure and good demonstrated performance become partners. A final managerial problem has to do with managerial interference in the business of agents to whom the same management have delegated rights (e.g., to run their own projects). This “problem of selective intervention” (Williamson, 1985) arises because it is often hard for management to commit to not interfere. For example, it is not possible to make a court enforceable contract to prevent managerial interference once decision rights have been delegated. However, arbitrary intervention, the breaking of promises to not intervene, etc., all of which will often be very tempting for management, are very destructive for motivation (Baker, Gibbons, and Murphy, 1999; Foss, 2001a).

These incentive problems are clearly relevant to the understanding of the costs of KM practices. To the extent that agents’ human capital investments consist in the gathering and building-up of specialized knowledge and skills, they are not likely to be willing to share the relevant knowledge and skills with other agents, unless they are properly compensated. They are not going to give up a strong bargaining lever without compensation. However, it is often difficult to contract over knowledge and skills. Moreover, there is a fundamental problem of managerial commitment: Since

it is difficult to write and enforce contracts between those employees who possess important specialized knowledge and the firm on the sharing of the knowledge and the compensation to the employees, it is tempting for management to renege on the promise after the sharing of knowledge has actually taken place. Two implications of direct relevance for KM follow. First, forced KM initiatives may well be experienced as hold-ups by those agents inside the firm who control specialized knowledge and skills. Their future investment incentives are harmed accordingly. Second, unless these agents can expect to be compensated they are unlikely to share their knowledge at all. It is likely be that the best way to handle this (i.e., to invest in human capital *and* to share knowledge embodied in this capital) is by giving the relevant employees appropriate incentives, perhaps even making them partners through providing ownership rights.

2.3. Asymmetric Knowledge and Information

Even if agents can be motivated to take actions (i.e., exploit their decision rights) that are “incentive-compatible” with those of other agents or principals, there is still no guarantee that they also make optimal (i.e., value maximizing) choices. Willingness is not the same as ability. To some extent this is a problem of information transmission: Under an organizational division of labor, no agent inside the firm is likely to have all the information needed for making an optimal choice, and transmitting all of this information to him is prohibitively costly. Delegation may arise as a cost economizing response to this. However, it also a matter of the often fleeting, subjective and tacit character of knowledge — a favorite theme of the KM literature. As Hayek (1945: 77-78) famously argued:

The peculiar character of the problem of a rational economic order is determined precisely by the fact that the knowledge of the circumstances of which we must make use never exists in concentrated or integrated form but solely as the dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess. The economic problem of society is thus not merely a problem of how to allocate “given” resources – if “given” is taken to mean given to a single mind which deliberately solves the problem set by these “data”. It is rather a problem of how to secure the best use of resources known to any of the members of society, for ends whose relative importance only these individuals know. Or, to put it briefly, it is a problem of the utilization of knowledge which is not given to anyone in its totality.

Arguably, firms face this problem of dispersed knowledge to a smaller extent than societies do; however, it is still relevant to them. Firms may cope with the problem in different ways. Again, they may delegate decision rights so that these rights are co-aligned with those who possess the relevant knowledge, balancing the attendant benefits with the agency costs that are caused by delegation (Jensen and Meckling, 1992). However, knowledge sharing is an alternative to this. Thus, rather than delegating decisions rights in order to better utilize local knowledge, the existing rights structure (i.e., existing authority relations, payment schemes, organizational structures, etc.) remains unchanged and the relevant knowledge is gathered and shared among those who can make profitable use of this knowledge. Such knowledge sharing is, of course, a key focus of KM.

However, in the KM literature, knowledge sharing is often discussed and endorsed without any examination of the *alternative* of delegating rights so that knowledge is better utilized in this way. An organizational economics perspective not only identifies the relevant (organizational) alternatives, but also allows us to say something about the costs and benefits of these alternatives. Thus, one obvious advantage of the knowledge-sharing alternative is that it does not necessarily involve any delegation of decision rights. Knowledge sharing, as portrayed in the KM literature, may therefore impose smaller agency costs on an organization than the alternative of delegating decision rights. However, there are *other* costs to consider when the choice has to be made between the two alternative of knowledge sharing and delegating decision rights. For whereas knowledge sharing that takes place within an existing organizational structure may not impose the same agency costs as delegating decision rights does, knowledge sharing is likely to impose higher costs of communicating, storing, retrieving, etc. knowledge than the delegation alternative. The point is not here that specialized IT systems have to be set up in order to reach the goal of knowledge sharing. Rather, the point is that knowledge sharing may introduce costs that are caused by the bounded rationality of individuals, that is, their limited ability to identify, absorb, process, remember, etc. knowledge. And, of course, there are costs associated with trying to transform knowledge that only exists in tacit form into an articulate form. As Hayek (1945) argued, decentralization economizes on these costs. In firms, delegation may be an attractive means of economizing on the costs associated with bounded rationality and tacit knowledge (Jensen and Meckling, 1992). The bottomline is that a full assessment of what alternative is superior in a specific situation — the improved utilization of knowledge by means of knowledge sharing or by means of delegation of decision rights — turns on a number of costs that have to be

balanced against the relevant benefits. In its present manifestation, the KM literature does identify neither the relevant alternatives, nor the relevant net benefits.

2.4. The Coordination of Complementary Actions

Even if agents can be motivated to take incentive-compatible actions and even if they possess the right information or knowledge (because they are specialists or because this information or knowledge is somehow transmitted to them), there is still a problem of coordinating actions inside the firm. In particular, the more complementary actions are, the more closely they need to be coordinated. Through the use of the price mechanism, markets cope well with the coordination problem (Hayek, 1945). However, the more complementary actions are, the more necessary is it to supplement the use of the price mechanism with other mechanisms, such as communication (Richardson, 1972). Firms have only limited access to the price mechanism, but they may have privileged access to the mechanism of communication (relative to markets). In this perspective, one advantage of KM may actually be that it assists the coordination of complementary actions by spreading knowledge, effectively bringing about common knowledge conditions (see Foss, 2001b for such an argument). KM thus reduces what Koopmans (1957: 162-163), referred to as “secondary uncertainty”:

In a rough and intuitive judgment the secondary uncertainty arising from a lack of communication, that is, from one decision maker having no way of finding out the concurrent decisions and plans made by others ... is quantitatively at least as important as the primary uncertainty arising from random acts of nature and unpredictable changes in consumers' preferences.

When the acquisition (creation, sourcing) of knowledge in a firm is delegated to specialist knowledge workers, the firm is facing this kind of secondary uncertainty (cf. Buckley and Carter, 1999: 82). One possible function of KM is thus to reduce secondary uncertainty, although this is not one that is identified in the KM literature.

2.5. Summing Up: Organizational Economics Aspects of Knowledge Management

In the frictionless world that dominated microeconomics textbooks before the revolution in information, property rights and transaction costs economics about three decades ago, there are no problems of motivation, knowledge, information, and coordination. In this Nirvana, resources, including knowledge resources, are allocated in the best possible way (“first-best”). Contracts can

be written and enforced costlessly and information is free. Therefore, there are no losses from lacking motivation, defective or missing knowledge, or coordination that goes wrong. There are no problems of exchanging knowledge either, so that markets are as efficient for this purpose as firms are. However, in a more realistic world, contracts are imperfect, for example, so that it is hard and perhaps impossible to write contracts that compensate those who “give up” (i.e. share) valuable knowledge; commitment (including managerial commitment) may be broken; employees may be held-up by management so that their incentives to invest in and share knowledge are harmed, etc. Lest managers live in a Paradise or Nirvana, KM practices are subject to these incentive costs.

The argument so far is therefore that organizational economics is able to illuminate the practice of KM in important ways. In particular, by focusing on incentive compatibility problems, particularly as these relate to issues of investing in the production and sharing of knowledge, organizational economics identifies important, but hitherto neglected incentive costs and benefits of KM practices. This is the reason why organizational economics should be seen as an indispensable part of the disciplinary foundation of KM. In the following section we deal further with processes of knowledge creation and integration in an organizational economics perspective.

3. Knowledge Management: Organizational Economic Insights

In this section, we shall more concretely apply specific organizational economics insights to two clearly central aspects of KM: Knowledge creation and knowledge integration. The former category encompasses learning (by doing, using, being instructed, etc.) and innovation processes, while the latter refers to how to make best use of existing knowledge in the firm. We develop propositions based on organizational economics regarding how firms may stimulate investments by employees in firm specific knowledge, resolve incentive problems in knowledge creating teams, and make choices between alternative means in the integration of knowledge, including knowledge sharing.

3.1. Knowledge Creation

It is now almost an axiom that knowledge creation in firms lies at the heart of competitive advantage (Nonaka and Takeuchi, 1995; Krogh et. al, 2000). That “firms learn,” “firms know,”

etc. have become commonplace expressions in much of the strategy and KM literature.ⁱⁱⁱ However, it is not firms as such that learn, and firms themselves do not possess knowledge. So-called “firm knowledge” is composed of knowledge sets controlled by individual agents. We stress this admittedly basic methodological individualist point in order to emphasize the point that by focusing on the level of the individual agent, rather than the firm, organizational economics highlights questions that are neglected in the KM literature *because* much of this literature operates on the firm level and does not have an explicitly individualistic starting point.

In particular, an organizational economics perspective directs attention to the possible incentive conflicts that may arise in connection with issues such as, How can employees be induced to making their human capital firm specific when this puts them at a risk? What are the complications of knowledge creation in teams? Do individual incentives enable of impede knowledge creation in teams? Etc. Perhaps somewhat contrary to intuition, such questions are central to successful KM in practice and they are particularly prone to an organizational economics treatment. This is because processes of creating knowledge — for example, in the form of innovation projects — are typically risky, unpredictable (the knowledge-to-be-created can only be partly foreseen), often long-term, labor intensive, idiosyncratic (that is, hard to compare to other processes), and often require substantial human capital investments (Holmström, 1989: 309). A number of these characteristics are the basic stuff that contracting problems are made of.^{iv} In the following we discuss a number of ways in which firms may motivate employees to expend effort in the production of new knowledge. In this connection, we discuss how the return stream from such new knowledge is shared between the firm and the employee. Thus, the problems of motivating employees and capturing rents from new knowledge are two sides of the same coin.

We assume throughout that a asymmetric information setting obtains, and that incentive conflicts are present. To see why these assumptions are appropriate ones, consider a world where asymmetric information and incentive conflicts (agency problems, hold-up problems) are absent. Here, the interests of the various agents involved in the creation of new knowledge can be easily aligned. First, employees and employers would assess the value of new knowledge in the same way (because information about this is symmetric). Second, bargaining will take place immediately, because the symmetry of information means that there will be no strategic behavior. Third, the employee’s reward for any learning investments will be guaranteed, since the employer

will not attempt to hold-up the employee. In a Nirvana world where both employee and employer access the same information on the value of ideas and each others outside options, inducing optimal human capital investment can be achieved by writing complete contracts. If more realistic assumptions are introduced, an incentive perspective on knowledge creation is particularly appropriate, because it stresses not only that agents making learning investments must somehow share in the extra surplus from those investments to be properly motivated, but also that providing such motivation is no easy matter under asymmetric information, possibly incomplete contracts, and self-interested behavior.

3.1.1. Earning Rents from Knowledge Creation

The KM literature seldom makes clear exactly how the mechanism from knowledge creation to new rents works. However, the resource-based view in strategic management has gone some way towards clarifying this by identifying a set of criteria that resources must meet to be sources of (sustained) competitive advantages, such as being valuable, rare and costly to imitate (Barney 1991). Moreover, the relevant resources should not be fully mobile (Peteraf 1993). Knowledge assets, particularly newly created ones, are particularly likely to meet these criteria (Winter 1987). Given this, managers may wish to induce knowledge creation by means of providing incentives to employees to upgrade their own knowledge capital and by spending corporate resources on having employees do this (e.g., training, setting up incentives, etc.). From the perspective of the firm, earning rents from employee upgrading of knowledge is far from trivial. In particular, whether or not firms are likely to earn rents from employees' knowledge, depends on 1) the type of learning investment (e.g. firm specific or general knowledge); 2) the resolution of agency conflicts in firms (e.g. remuneration schemes, and promotion rules); and 3) transaction costs in labor markets (e.g. signaling and screening). We consider these *seriatim*.

3.1.2. Types of Learning Investments

Firms' investments in augmenting the knowledge of their employees may be of two kinds, namely general and firm-specific ones. Both may increase an employee's productivity, but they have different implications with respect to who is likely to appropriate the returns and who will carry the costs of the investment. General learning investments may increase an employee's productivity in a range of employment opportunities. Such general investments include the learning of languages and generic skills, such as learning word processing programs, etc. that are equally useful for

current and potential employers. Becker (1962) suggests that employees will pay for their general training, because in competitive markets they are the sole beneficiaries of the improvements of their productivity. A firm will not pay for an employee's learning of general knowledge, because of the weakness of its bargaining position after having made the investment. In contrast, the learning of firm-specific knowledge restricts an employee's possibility to capture returns on this knowledge outside of the firm that undertakes the investment. Becker (1962) argues that to the extent that an employee's productivity increase exceeds his wage increase after learning, the firm can earn rents even if it alone incurs the costs of firm specific learning investments. As far as such investments are concerned, the relative bargaining position of firms is strong because employees cannot credibly threaten to leave the firm to bargain for higher wages that reflect their productivity increase after specific learning investments. Thus, it is very likely that firms will appropriate a substantial part of the relevant rents. Of course, firms that undertake more specific learning investments will also create more rents, because the benefits (e.g., in terms of productivity or increased innovativeness) are larger to the firm in the case of specific than in general learning investments. Thus, the following refutable proposition may be put forward:

P1: *Firms with a high ratio of specific to general learning investments will earn and appropriate relatively more rents than firms with a low ratio.*

3.1.3 *Inducing firm specific learning: Incentive Conflicts and Their Resolution*

Consider next the situation from the perspective of employees. From their point of view, learning is an investment of effort for which they wish to be compensated. Firms will have to provide inducements for such investments. However, as we have seen, making firm-specific learning investments restricts an employee's outside employment options (and therefore his bargaining power), which will tend to reduce firm-specific learning investments below the optimal level. This is because of the incentive problem that undertaking these investments means becoming more vulnerable to managerial hold-ups. Resolving this problem turns on management's ability to credibly signal that it will not take advantage of employees who by making firm-specific learning investments have put themselves at risk. An organizational economics interpretation of (beneficial) corporate culture is that it is essentially an embodiment of such signals (Kreps, 1990). Thus, firms with corporate cultures that credibly signal that management is committed to a non-opportunistic approach in dealing with subordinates will induce higher learning investments on the part of employees. Such a corporate culture makes the provision of incentives credible, so that employees correctly believe that management will not renege on promises with respect to compensation.

With respect to the issue of providing incentives for employees' investment in firm specific knowledge, organizational economics suggests at least three possibilities: High powered incentives (i.e., making employees more of residual claimants), promotion rules, and conferring access to critical resources. Consider these in turn.

High-powered incentives: High-powered incentives — often represented as the contingent portion of pay — may be used to induce contributions through providing larger shares of quasi-rents to employees (Williamson, 1996). Firm specific learning investments may be induced by providing equity to employees (e.g. in the form of stock options or equity) or other high powered incentives, such as performance pay (Demsetz and Lehn, 1989; Williamson, 1985). However, offering such high-powered incentives may also lead to number of distortions. This is the case, for example, when the corresponding costs (e.g., of using the firms' assets) are not borne by those to whom high-powered incentives are offered (Holmström, 1989). Thus, as Williamson (1985) argues, this is exactly why incentives in firms are often comparatively low-powered. Another problem with high-powered incentives is that they expose employees to considerable risks. For example, performance (e.g. the value of stock options) may fluctuate for reasons beyond an employee's control. In addition, employees may be highly dependent on the fixed, risk free part of their income if they lack alternative sources of income. Risk-averse employees may therefore shy away from high-powered incentives. On the other hand, risk estimates may be in the eye of the beholder, and more highly skilled employees may judge risk differently from other employees. Moreover, for incentive pay to be effective, either observability of output or behavior must obtain. If behaviors or output for tasks cannot be specified as cause-effect relationships are not well understood, then high performance ambiguity poses a problem because neither behaviors nor outputs can be related to specific skill acquisition with any precision. Thus, the less output and behaviour can be pre-specified so as to reflect employees specific skill development, the less effective high-powered incentives become (Ouchi, 1980). Thus, the following refutable proposition may be put forward:

P2: *The use of high-powered incentives to induce firm specific learning will be more common in firms with higher skilled, wealthier employees, and pre-specified output*

Promotion rules: The design of promotion rules is an alternative way of inducing firm specific learning investments. Consider inducing investments in firm-specific knowledge by means of “up-or-stay” rules (e.g. the worker is either promoted or stays in the original job) relative to “up-or-out” rules (e.g. the worker is promoted or fired) (Prendergast, 1993; Kahn and Huberman, 1988;

Gibbons, 1998). Generally, when workers bear the costs of acquiring specific skills they will do so only if the wage (W^s) obtainable after skill acquisition minus their opportunity costs (C^s) exceeds current payment (W^{us}). The principal will pay the wage (W^s) only if the productivity difference ($P^s - P^{us}$) exceeds the difference that wage difference ($W^s - W^{us}$). With “up-or-stay” rules principals distinguish jobs and attach different wages to it. This promotion rule creates a tension between needing a large enough wage gap to induce the worker to invest and keeping the gap small enough so that the principal is willing to promote the worker after the worker has invested (Prendergast, 1993). Gibbons (1998: 126) illustrates this point:

For example, suppose that an untrained worker produces 10 in the easy job, that a trained worker produces 20 in the easy job and 30 in the difficult job, and that the opportunity cost of training is 15. Then training is efficient ($30 - 10 > 15$) but we cannot find wages that simultaneously induce the worker to invest (wage difference greater than opportunity cost, 15) and induce the firm to promote a trained worker (wage difference smaller than productivity difference, $30 - 20$). As a consequence, employees’ investment in firm-specific skills may be low, *although* such investments would be efficient. Kahn and Huberman (1988) suggest that “up-or-out rules” can solve this incentive problem. For example, with this rule the principal makes a commitment to promote the worker after a pre-specified time span or otherwise fire him (e.g. tenure in academic jobs, moving up career ladders in consultancies). Because of the resulting rat-race, this creates incentives for investments in firm-specific knowledge. To illustrate, consider the example above. As before, specific learning investments lead to firm rents only when they are efficient ($P^s - P^{us} > 15$). If a worker expects promotion, he will invest at any wage (W^*) which exceeds his opportunity costs plus best the alternative (e.g. $W^* > W^{ALT} + 15$). The principal promotes the worker if his productivity (P^s) exceeds his high wage ($P^s > W^*$). Although with up-or-out rules there is always a wage (W^*) that is low enough to induce the principal to promote the worker who has made sufficient investments in firm-specific capital, up-or-out rules come at a cost. Because it is not possible to keep the worker in the firm when the productivity after investment does not exceed his high salary, this up-or-out rule may waste investments in firm-specific skills. This is especially obvious when there are different layers where such up-or out rules apply and workers survive the first rounds but drop out at a higher level (cf. Gibbons, 1998).^v Thus, the following refutable proposition may be put forward:

P3: *Firms utilizing up-or-out rules will induce higher investments in firm specific human capital than firms using up-or-stay rules.*

Additionally, once employees have invested in firm specific capital, a firm also needs to tie employees long enough to the firm, so that firm specific human capital investments can be recouped. Turnover of key knowledge carriers is a major problem in this respect. Typically, to prevent turnover from happening firms use deferred rewards and pensions, which benefit employees only in the distant future (Milgrom and Roberts, 1992).

Providing access to assets: Firms may positively influence learning investments by conferring access to critical resources (Rajan and Zingales 1998), such as critical knowledge resources. Access may be defined as the ability to use or work with a critical resource including other human resources. It provides an opportunity for employees to specialize relative to these assets. We earlier analyzed this as giving rise to a potential hold-up problem, since the firm may hold-up the specialized employee. However, the other side of the coin is that specialization to a critical asset in combination with an employee's right to withdraw her, also critical, human capital gives her considerable bargaining power with respect to the sharing of the surplus from productive activities, that is, bargain for a higher salary. It can be shown that when investments are additive (i.e., the total surplus is dependent on the sum of the investments), granting access and, as it were, giving away bargaining power, may be a superior incentive mechanism to induce firm specific learning. In contrast, when investments are complementary (i.e., the marginal return of one investment rises in the level of the other investment), which is likely to take place in team-based firms, we are back to the familiar hold-up problem (Williamson 1985; Hart 1995). Not only will the employee directly influence the size of the surplus if she withdraws her human capital; she will also influence it indirectly, because her human capital investments are complementary to the human capital investments of other employees. In this situation, it will not be advantageous to grant the employee (too much) access (see Rajan and Zingales 1998 for details).

The three mechanisms above may be substitutes or complements, depending on the circumstances. Thus, tournaments in the form of up-or-out rules may substitute for performance pay when employees are sufficiently risk-averse. Access may substitute for incentives in the same situation. Promotion rules and incentives may substitute for access, when giving an employee access would be giving her too much bargaining power. On the other hand, all three mechanisms are often seen together; for example, in consultancies, partners have obtained their position through a tournament

that work according to certain promotion rules, they granted access to assets contingent on learning investments, and they are usually residual claimants. We may now put forward the following propositions:

P4: *Firms that resolve incentive conflicts in knowledge production by means of incentives, and/or promotion rules and/or deferred payment and/or access) will gain competitive advantage relative to firms that do not use these means.*

3.1.4. *Transaction costs in labor markets*

In the above analysis of firm-specific human capital has made the simplifying assumption that costs of concluding labor market transactions can be neglected. This is, of course, not the case, as such costs aggravate complications of inducing firm specific investments. Asymmetric information between current and potential employers is one source of switching costs in labor markets (Akerlof, 1970). Employees must search for new job opportunities and firms must search for fitting employees. In this search process, there may be several complications. For example, a current employer usually knows more about employees' human capital and learning ability than potential employers do (Spence, 1973, 1974). In wage negotiations employees will have to credibly signal to new employers their ability to perform. However, because some employees will overstate their ability in order to drive up wages, employers will not only incur costs of screening employees, but may also reduce wages offered to account for the risk of picking a wrong employee (i.e., a lemon). If this is the case, employees willing to switch from their current employer would find the wage offered by new employers unattractive. The higher transaction costs in labor markets are, the more difficult it is for employees to switch between employers. By implication, high transaction costs in labor markets lower incentives for employees to invest in firm specific knowledge without appropriate safeguarding and compensation. Thus, firms that operate in labor markets with high transaction costs will incur greater costs to induce employee's firm specific learning compared to firms that do not.

One particular interesting way to induce firm specific learning in such situations is to offer employees the possibility to engage in the acquisition of certified general knowledge such as management training, language and computer skills (Laing, 1994). Employees might face lower lock-in as a result, because the acquisition of certified general skills reduces labor market transaction costs such as screening and matching (Spence, 1974; Barzel, 1982). Nonetheless, a firm

offering such general training possibilities to its employees can benefit in several ways. First, investments in general skills can increase the productivity effects of firm-specific skill investments because common knowledge between employees facilitates the combination and blending of specific skills (Kogut and Zander, 1992; Foss, 2001). Second, sponsoring general training as a form of pay also signals the commitment of employers to their employees (Kreps, 1990) that their investments in firm-specific knowledge will not be opportunistically exploited. Thus, the following refutable proposition may be put forward:

P5: *Firms sponsoring certified acquisition of general skills as a form of merit pay will induce higher employee investments in firm specific human capital.*

3.1.5. *Complications of Providing Incentives for Knowledge Creation in Teams*

Many contributions to the KM literature recommend the use of teams in the form of work groups, inter-disciplinary and cross-functional teams to foster knowledge creation (e.g. Eisenhard and Brown, 1995, Meyer and deTore, 1999, Krogh et al., 2000). Teamwork may bring knowledge together that hitherto existed separately, resulting in “new combinations” (Schumpeter 1950), it may facilitate cross-functional communication, cross-fertilization of ideas and enhance worker involvement. Through the integration of knowledge of individual members, teams may not only blend knowledge and insights beyond what individual members may achieve; the development of new knowledge may also be stimulated by conversations and language-based learning in teams (Brown and Duguid, 1991; Nonaka and Takeuchi, 1995). However, while knowledge creation in teams has its virtues, there are special difficulties associated with aligning interests of team members (Scott and Einstein, 2001). Not only will teams be particularly prone to moral hazard, notably in the form of shirking, but the right form of incentives may also be contingent on the type of team at hand. Questions arise that remain neglected in the KM-literature such as, Who should be rewarded – teams or individuals? Who should evaluate contributions of team members – other team members, a specialized monitor, or an external manager? What measures of performance should be used and when? An organizational economics perspective suggests that the success of teams’ knowledge creating efforts depend, *inter alia*, on 1) the size of the team, 2) trade-offs between individual and team incentives, 3) exclusion rules, and 4) the matching varying degrees of uncertainty to incentive design.^{vi}

Free rider problems and team size. Alchian and Demsetz (1972) provide a classic treatment of incentive problems in team-production — a process “... wherein individual cooperating inputs do not yield identifiable, separate outputs” (p.779). Where measuring individual input productivity and rewarding accordingly becomes difficult, team members may free-ride on other team-member’s contribution to knowledge creation. This is so because the benefits of withholding marginal effort accrues to each shirking member while the resulting losses accrue to the team as a whole. In principle, knowledge production in teams could be organized through a set of bilateral agreements between team members who promise best effort and ensure mutual control. However, such agreements are difficult to manage and will most likely incur large resource costs; for example, time spent on negotiation and haggling means that less time is available for knowledge creation. As teams grow in size, the larger these costs become, in fact, they increase exponentially with the number of team members (Rosen, 1988). In addition, free rider problems become more prevalent, the larger the knowledge-creating team becomes. Thus, one can derive the following refutable proposition:

P6: *Knowledge creation in teams will be less effective the larger the team size because shirking and free-riding will increase*

Individual and/or team incentives: Team size problems are aggravated if incentives are exclusively allocated to a team as whole rather than also considering incentives for individuals (Laursen and Mahnke, 2001). When capable and willing team members are forced to support free riders, they often withdraw effort or else leave the team. On the other hand, relying exclusively on individual incentives can inhibit cooperation in teams – especially when task performance crucially depends on the exchange of information and mutual adaptation (Thompson, 1967; Balkin and Gomez-Mejia, 1992). Nonetheless, many recommendations in the KM literature are mistaken when they note that individual rewards may be the antithesis to teamwork. An organizational economics perspective urges managers not to neglect possibilities to induce individual contributions on which team performance ultimately rests.

One possibility to resolve incentive conflicts in the knowledge creating team is that a team member specializes in monitoring other members’ contributions to generate reliable information based on

which rewards may be distributed (Alchian and Demsetz, 1972). A positive effect of monitoring is that knowledge about talents is discovered that can be used to reduce shirking but also better recombination or new uses of skills and talent. However, as specialized monitors become increasingly removed from actual teamwork, possible knowledge gaps between those creating new knowledge and those specializing in monitoring may increase over time to eventually compromise effective monitoring. As an alternative management may provide incentives for achievements of the group as a whole and let the group members distribute team rewards among themselves based on subjective performance evaluation (e.g. 360 degree reviews).^x This utilizes the fact that team members will often have information about each other's contributions, behavior, and ability that is superior to that of external management (Gibbons, 1998). Thus, specialized incentive procedures may cope with some of the incentive problems by combining incentives to teams with incentives to individual team members. This leads us to the following refutable proposition:

P7: *Knowledge creation in teams will be more effective in firms that use combinations of team based and individual incentives*

Exclusion rules: We mentioned earlier that firms often use promotion rules in order to solve incentive conflicts through setting up competition between employees. Similar mechanisms may reduce incentive problems in teams. Lazear (1989) suggests that tournaments may involve self-selection and exclusion mechanisms. These drive up effort levels, because only those are attracted who believe in their survival and exercise effort and skills in a team's knowledge creation effort (Dillard and Fisher, 1990). In particular, giving teams the right to exclude team members (Lazear, 1989; Malcomson, 1998) on the basis of subjective performance measures (e.g., peer evaluation, group leader assessment, or a combination), is clearly relevant in this context.

Setting up tournaments inside firms may be a viable control mechanism in team-based knowledge creation. But they also have also their dangers. If tournament rules cannot exclude sabotage among team members they may lead to outright breakdown of knowledge creation in teams (Lazear, 1989). An exaggerated emphasis on competition may also drive out exploration by team members who prefer to make quick wins through exploiting ideas of others rather than to explore new ideas on their own. This has two harmful effects on the knowledge creating team (March, 1994). First, explorers benefit from developing absorptive capacity based on which they can pick up good ideas that others engaged in the same team process cannot exploit on their own. The less others involved in the knowledge creating team are able to develop and exploit ideas themselves, the more

important it becomes that others can relate to their ideas. Second, as team members increasingly engage in exploitation to the neglect of exploration, the fewer ideas are available for exploitation. When competition provides disincentives for exploration and revealing ideas openly, the loss of relative absorptive capacity (Lubatkin and Lane, 1998) among team members diminishes the capacity for knowledge creation in the team as a whole.^{xi} Thus we suggest the following refutable proposition:

P8: *Knowledge creation in teams will be more effective the more team members are entitled to exclude not exploring team-members by self-selection.*

Uncertainty and team types: Knowledge creating teams may operate under varying degrees of means and end uncertainty. To illustrate, the KM literature distinguishes two types of knowledge creating teams: “communities of practice” and learning in “epistemic groups.” The former denotes a team of peers who learn during and about the execution of pre-specified tasks with defined outcomes (Lave and Wenger, 1990; Brown and Duguid, 1991; Brown, 1998).^{xii} Their key problem is to create knowledge about means whose ends are well known. Examples include how to fix a working process that has broken down, how to deal with customer demands more quickly etc. By contrast, “epistemic communities” deal with knowledge creation for non-routine problems whose ends and means cannot be specified ex-ante (Cohen et al., 1998). Here the key problem is to discover means for ends that are unknown at the time the team starts developing knowledge. An example comes from a KM team at a software security firm that described their situation as follows: “In 2-3 years’ time, our company will be designing security products we don’t know, incorporating technologies which haven’t been invented, made in processes yet to be defined, by people we have not yet recruited.”

One complication of means and ends uncertainty is that both complicate the provision of incentives in team. This is because measurement bases for the provision of incentives become increasingly noisy the less means and end can be pre-specified ex-ante. In other words: uncertainty lead to performance ambiguity, which complicates the provision of incentives (Ouchi, 1980). Only if performance ambiguity is low performance pay seems effective in aligning conflicting interest. If this is not the case, variable rewards might be appropriate if pay and control can relate to specified behaviour or to other forms of standardisation (e.g. processes), which can serve as a basis for measuring performance. Unfortunately, to the extent that standardisation of behaviour or processes is prevented, such as in the case of many epistemic communities, neither behaviors nor outputs can

be determined with precision. In this case, Ouchi (1980) suggests, clan control might be the solution to promote cooperation and mitigate conflict of interest: the basis of control becomes a set of internalised values and norms. It should be noted, however, that clan control can lead to normative fixation and group think that are both detrimental rather than conducive to knowledge creation in teams (e.g, Grandori, 2001). Comprehensive empirical research regarding managerial control dilemmas in knowledge-creating teams remains sparse and inconclusive. However, contrary to popular recommendations in the literature to abandon incentives in favor of normative control altogether^{xiii}, recent evidence shows that incentives for knowledge creating teams seem to prevail in practice across a number of industries (Laursen and Mahnke, 2001; Foss and Laursen, 2002). An organizational economics perspective on knowledge creation would not expect otherwise. Thus we suggest the following refutable proposition:

P9: *Teams employing combinations of individual incentives, team incentives, and exclusion rules will be more effective at knowledge creation than teams relying on clan control*

Nonetheless, as we move from inducing individual learning to knowledge creation in teams complications of providing incentives have vastly increased. Given these complications of knowledge creation in teams, an organizational economics perspective suggests that team based learning is a particular expensive knowledge creation mechanisms that is riddled with many problems that include but are limited to providing incentives. Seen this way, organizational economic insights might serve as reminder that knowledge creation in teams yields benefits at substantial costs. These may be compared to the benefits and costs of individual learning in firms as well as hiring of external expertise in form of employment or contingent work - - two alternative mechanisms of organizational learning (Simon, 1991).

3.2. Integrating Knowledge: Insights from Organizational Economics

Organizational economic insights (Coase, 1937; Demsetz, 1988; Jensen and Meckling, 1992; Williamson, 1985) have already substantially fertilized the literature on knowledge in organization that characterizes the firm as a knowledge-integrating institution (Conner and Prahalad, 1996; Grant, 1996; Kogut and Zander, 1992, 1995).^{xv} Therefore, this section is restricted to briefly review key insights on knowledge integration needs and mechanisms.^{xvi}

Specialization of tasks leads to focussed learning in narrowly defined domains (Smith, 1978). However, because the division of tasks also leads to the division of knowledge, knowledge-integration may be required when several activities are interdependent and individuals need to adapt their action to each other (Thompson, 1967). If individuals are specialized in different knowledge domains this will limit the rate at which knowledge that lies outside a narrow specialization can be assimilated, accumulated, and applied (Simon, 1945; Lane and Lubatkin, 1998). Three coordination-mechanisms may be conducive to address such knowledge-integration problems -- direction, common knowledge, and autonomous adaptation -- but their efficacy may vary with varying task-dependencies at hand.

Autonomous adaptation is the marvel of market. As Hayek (1945: 527) argues, markets (be they between or in companies) make individuals do desirable things without anyone having to tell them how to do them. While the price mechanisms economise on investments in common knowledge, it only facilitates thin communication among individuals that co-ordinate their tasks and action. Its applicability may also be limited to situations where task-coordination is signified by low uncertainty and low interdependence between tasks that makes autonomous adaptation possible (Grandori, 2001). Moreover, pricing knowledge in exchange faces a fundamental paradox: the value of knowledge to a purchaser is not known until after the knowledge is revealed; however, once revealed, the purchaser has no need to pay for it (Arrow, 1984). Second, Arrow also argues that, "... authority, the centralization of decision-making, serves to economize on the transmission and handling of knowledge" (Arrow, 1974: 69). Demsetz (1988) agrees when he suggests that "[d]irection substitutes for education (that is, for the transfer of the knowledge itself)." For example, employees transfer reports and memos rather than the knowledge on which they are crafted; superiors give advice on what to do and intervene at times rather than to transfer knowledge on which their judgement is based. Building on this argument, Conner and Prahalad (1996) stress that authority not only provides a low cost method of communicating, but also allows the flexible blending of expertise when contingencies emerge that were not foreseeable when, for example, an employment contract were concluded. This nicely corresponds to Coase (1937) who makes co-ordination by entrepreneurial direction based on employment contracts the distinguishing mark of the firm as an institution. Like price coordination, direction economises on investments in common knowledge. In addition direction saves communication cost not because communication is restricted to thin communications as was the case with price coordination, but because communication (be it thin or thick) is restricted to top-down interaction at particular

occasions. However, the application of top-down direction to coordinate knowledge, finds its limits when superiors do not understand what and how results are achieved at a lower level — as is often the case with knowledge work (Foss, 1999, 2001a). Finally, common knowledge (Grant, 1996) in the form of combinative capabilities, routines, shared context or codes or social capital (Kogut and Zander, 1992, 1996; Nelson and Winter, 1982; Nahapiet and Ghoshal, 1998) may ease coordination, particularly when tasks are highly interdependent. However, as a discussion of knowledge-codification tools illustrates, investments in common knowledge and knowledge-sharing — both in terms of managerial effort (see Zollo and Winter, 2002) and in terms of aligning diverging interest (Mahnke, 1998) — is particularly expensive. Thus, an organizational economics perspective suggests:

P10: Firm investing in common knowledge and engage in substantial knowledge-sharing only in the presence of high task interdependence will outperform firms that do so even under conditions of low task uncertainty.

4. Conclusions

Since its take-off in the beginning of the nineteen-seventies (e.g., Alchian and Demsetz, 1972), organizational economics has been centrally concerned with what is very a recent recognition in the KM literature, namely “... that social relations and learning processes do not happen in a political vacuum and, on the contrary, take place in a landscape of interests and differential power positions and relations” (Easterby-Smith, Crossan and Nicolini, 2000: 793). Fundamentally, organizational economics represents a body of theory that allows the theorist to understand the

nature of the obstacles to coordination within and between firms, as well as such issues as how the allocation of incentives and property rights influence the actions and investment decisions of individual agents (i.e., their human capital investments). It does so on the basis of precise assumptions about technologies (e.g., team production, complementarities), the distribution of information, the allocation of incentives and property rights, the degree of rationality and foresight possessed by agents, etc. In other words, organizational economics is taken up with the benefits as well as the costs of alternative contractual, organizational, and institutional structures. It puts forward comparative propositions on this basis.

Organizational economics advances research on KM by allowing the derivation of novel refutable propositions of direct relevance for the practice of KM. We have provided a number of examples. More fundamentally, it provides a micro-foundation (much needed, in our view) that allows focused research regarding the relation between KM, value creation, and value appropriation by the involved stakeholders. We are confident that further research along these lines will continue to be fruitful.

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Notes

ⁱ Krogh et al. (2000: 122) further observe that “... search costs are the total costs incurred by an organization’s efforts to get individual members or a group to act effectively.” It is not so: Search cost is a category that is entirely different from the incentive and coordination costs of getting “members or a group to act effectively.” More on this later.

ⁱⁱ We have dealt with the the issue of the boundaries of the firm in the context of knowledge management in Foss (2001a,b) and Mahnke (2001).

ⁱⁱⁱ Part of the motivation for the interest in, and growth of, various knowledge-oriented approaches to organizations appears to be the widespread belief that organizational economics approaches to organizations have very little to offer with respect to an understanding of learning processes in firms (Kogut and Zander 1992; Madhok 1996). This is, in our view, something of a misunderstanding. It is true that organizational economics approaches do not conceptualize firms as knowledge-based entities *per se*. However, that does not mean that it has little to offer of the processes whereby knowledge is created in firms.

^{iv} For example, incentives need to be provided so that agents are motivated to supply an efficient (i.e., second-best) level of effort, and undertake the required human capital investments; care must be exercised in connection with multi-stage projects where the firm may wish to stop projects at a certain stage and the project leader (who may be better informed) may not; risk-allocation is particularly pertinent here; etc. This is not to say that understanding knowledge creation is trivial in the context of organizational economics — far from it. In fact, because processes of knowledge creation are more uncertain in terms of the variance of the benefit distribution, and because the distribution of those benefits over time is harder to anticipate, than in the case of more routine investment projects, analysis is comparatively more complicated.

^v This argument holds important lessons for remuneration practices and career paths in consultancies, which employ up or out rules. When senior consultants do not make enough investments to be qualified as a partner, they are fired, but their value to the firm may exceed their value in the best alternative due to previously acquired firm-specific skills.

Firing thus means that firms waste firm specific investments in human capital. Thus, although up-or-out rules may be better than up-or-stay rules, they are still inefficient compared to the first-best.

^{vi} A further complication obtains when intrinsic motivation is an important consideration. In that case, high-powered (extrinsic) incentives may be counter-productive (Kreps, 1997). Moreover, social comparison processes may complicate the situation further. When such processes are strong, team members may be rewarded as a unit, rather than individually because differential individual rewards impede cooperation (Balkin and Gomez-Meijia, 1992; Jones, 1987; Ouchi, 1980). However, sometimes differentiated incentives may be used, particularly when it is up to the team itself to reward performance that team incentives might be differentiated. Pfeffer and Langton (1997) add that distributive justice relates to individuals' perception of whether they are receiving a fair share of the available rewards-proportionately to their contribution to the group, personal risk and responsibility assumed.

^{vii} For example, Brown and Duguid (1991) in a study of informal networks among Xerox repair representatives illustrate how informal "war stories" about painstaking customers and unusual repairs helped its members to deal with situations in their daily practices that were nowhere in the official manuals of the company. Learning in communities of practice is task-oriented, in the sense that there is less uncertainty about what should be achieved than about how to achieve it.

^{viii} The difference between the concepts is that while in epistemic communities, the main goal is to develop new knowledge under both means and ends uncertainty, in communities of practice knowledge creation is a by-product of task performances and concerns means uncertainty only.

^x Such exercises can be associated with 360 degree feedback mechanisms. For a review of this vast and specialised literature, see Borman (1998).

^{xi} In the words of March (1994: 248): "Since returns from exploration are preliminary returns from absorbing ideas [generated by others], those returns are insignificant if no one else is engaging in exploration. As long as nobody else is engaging in exploration, there is inadequate incentive for any individual participant - or potential new entrant to do so."

^{xii} For example, Brown and Duguid (1991) in a study of informal networks among Xerox repair representatives illustrate how informal “war stories” about painstaking customers and unusual repairs helped its members to deal with situations in their daily practices that were nowhere in the official manuals of the company. Learning in communities of practice is task-oriented, in the sense that there is less uncertainty about what should be achieved than about how to achieve it.

^{xiii} Recent contributions to the knowledge management literature have suggested to create a knowledge-creating atmosphere (Prusak and Davenport, this volume), to generate corporate spirit, or to enhance a climate of mutual care based on reciprocity (von Krogh, 1998). Additionally, appeals are made to intrinsic motivation (McGregor, 1960; Deci, 1975), peer recognition, or symbolic rewards such as Texas Instrument’s annual “best practice celebration and sharing day” (O’Dell and Grayson, 1998). We agree. However, while these possibilities play their part in stimulating knowledge-creation, explicit forms of incentives may also supplement them.

^{xiv} In the words of March (1994: 248): “Since returns from exploration are preliminary returns from absorbing ideas [generated by others], those returns are insignificant if no one else is engaging in exploration. As long as nobody else is engaging in exploration, there is inadequate incentive for any individual participant - or potential new entrant to do so.”

^{xv} There are also several studies on product development that have argued that varying degrees of knowledge integration is conducive to explain firm performance (e.g., Clark and Fujimoto, 1991, Iansiti, 1995; Hendersem 1994). Others suggest that patterns of common knowledge in the guise of combinative capabilities, routines, or core competencies are conducive in explaining differences in what firms can do well and how they perform (Hoopes and Postrel, 1999; Grant, 1991).

^{xvi} For a more detailed review on the relation between organizational economic insights and claims associated with a ‘new’ knowledge-based theory of the firm see Foss (1996 a, b) and Foss and Foss (2000).

Danish Research Unit for Industrial Dynamics

The Research Programme

The DRUID-research programme is organised in 3 different research themes:

- *The firm as a learning organisation*
- *Competence building and inter-firm dynamics*
- *The learning economy and the competitiveness of systems of innovation*

In each of the three areas there is one strategic theoretical and one central empirical and policy oriented orientation.

Theme A: The firm as a learning organisation

The theoretical perspective confronts and combines the resource-based view (Penrose, 1959) with recent approaches where the focus is on learning and the dynamic capabilities of the firm (Dosi, Teece and Winter, 1992). The aim of this theoretical work is to develop an analytical understanding of the firm as a learning organisation.

The empirical and policy issues relate to the nexus technology, productivity, organisational change and human resources. More insight in the dynamic interplay between these factors at the level of the firm is crucial to understand international differences in performance at the macro level in terms of economic growth and employment.

Theme B: Competence building and inter-firm dynamics

The theoretical perspective relates to the dynamics of the inter-firm division of labour and the formation of network relationships between firms. An attempt will be made to develop evolutionary models with Schumpeterian innovations as the motor driving a Marshallian evolution of the division of labour.

The empirical and policy issues relate the formation of knowledge-intensive regional and sectoral networks of firms to competitiveness and structural change. Data on the structure of production will be combined with indicators of knowledge and learning. IO-matrixes which include flows of knowledge and new technologies will be developed and supplemented by data from case-studies and questionnaires.

Theme C: The learning economy and the competitiveness of systems of innovation.

The third theme aims at a stronger conceptual and theoretical base for new concepts such as 'systems of innovation' and 'the learning economy' and to link these concepts to the ecological dimension. The focus is on the interaction between institutional and technical change in a specified geographical space. An attempt will be made to synthesise theories of economic development emphasising the role of science based-sectors with those emphasising learning-by-producing and the growing knowledge-intensity of all economic activities.

The main empirical and policy issues are related to changes in the local dimensions of innovation and learning. What remains of the relative autonomy of national systems of innovation? Is there a tendency towards convergence or divergence in the specialisation in trade, production, innovation and in the knowledge base itself when we compare regions and nations?

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There are at present more than 10 Ph.D.-students working in close connection to the DRUID research programme. DRUID organises regularly specific Ph.D-activities such as workshops, seminars and courses, often in a co-operation with other Danish or international institutes. Also important is the role of DRUID as an environment which stimulates the Ph.D.-students to become creative and effective. This involves several elements:

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- participation in research projects
- access to supervision of theses
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