

# Limits to outsourcing and the evolutionary perspective on firm boundaries

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## **Abstract:**

*Although there is reason to expect that outsourcing plays an increasingly important role in world of commerce, theories of firm boundaries poorly address associated processes of governance change. This paper seeks to address this gap in the spirit of the evolutionary theory of the firm. This approach highlights the significance of outsourcing as a “process of shifting from internal to external procurement of activities.” Adopting an evolutionary process perspective suggests limits to outsourcing due to governance inseparability and partly tacit complementarity of capabilities as well as related dis-aggregation costs, including the costs of knowledge codification in the specification of interfaces in supplier/buyer relations, loss of absorptive capacity and integrating capabilities in the supplier’s system. A key departure from earlier approaches to firm boundaries is an explanation of such limits to outsourcing and their impact on two interrelated sources of efficiency: incentives and capabilities. For instance, when limits to outsourcing obtain, governance change for particular activities involves compromises of capability- and/or incentive efficiency in the experimental determination of organizational boundaries. Also discussed are environmental dynamics that variously emphasise efficiency properties of dispersed or concentrated ownership and capability development.*

## 1. Introduction

Firms are increasingly challenged to navigate in a 'new competitive landscape' (Bettis & Hitt, 1995; Schendel, 1995) characterised by decreasing transaction costs due to technological advance in communication technology (Coombs & Metcalfe, 2000), a need to integrate increasingly diverse technology and knowledge domains per product offering (Pavitt, 1999), and intensified competition due to deregulation and rapid technological change and diffusion (Clark & Wheelwright, 1993; D'Aveni, 1994). At a governance level, firms have responded to these challenges with an increasing degree of corporate dis-aggregation accompanied by relational forms of outsourcing.<sup>1</sup> Corporate dis-aggregation is the organizational response to knowledge based competition: a need to compete based on focussed and integrative learning, accessing external specialized knowledge, and developing relational advantages through inter-firm cooperation (Day&Wendler, 1999; Dyer & Singh, 1998; Hamel & Prahalad, 1994; Zenger&Hesterly, 1997).

Zenger & Hesterly (1997) explain the trend to relational forms of outsourcing by incentive advantages of smaller organizational units. As the size of a productive unit decreases, incentive intensity increases because performance can be better observed among smaller number of contributors, thus, linking performance to rewards is eased. Also, free riding may be less severe in smaller units because of lower monitoring costs. Empirical studies associated such work conditions with the attraction of talent and innovation (Zenger, 1994; Kamien & Schwartz, 1982). Others suggest that corporate dis-aggregation facilitates specialized learning and focus on core-competences (Prahalad & Hamel, 1994). Incentives for learning and knowledge sharing increase because the smaller productive units are, the fewer members have to share positive outcomes. When interaction frequency increases (Demsetz, 1988) in a smaller subset of relations between actors, cooperation is facilitated (Axelrod, 1984), shared specialized codes, language (Arrow, 1974; Grant, 1996), and coordination routines (Cohen & Bacadayan, 1994) emerge that facilitate knowledge combination (Kogut & Zander, 1992).

On the other hand, increased outsourcing may establish a greater need for accessing external knowledge in the form of contingent work (Matusik & Hill, 1998) embedded in specialized supplies (Demsetz, 1988) or, else through inter-firm learning

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<sup>1</sup> Such relational form of outsourcing include long term alliances, joint ventures, and other forms of relational contracting (e.g. McNeil, 1985)

(e.g. Dyer & Nobeoka, 2000; Lyles, & Stalk, 1999). Simultaneously, reduced activity share and learning variety (March, 1991) as a consequence of outsourcing may undermine a firm's absorptive capacity (Cohen & Levinthal, 1989). Thus, reaping specialisation gains through focused learning in a focal firm is limited by reduced absorptive capacity that prevents tapping into external knowledge sources of suppliers. Finally, outsourcing might also expose a firm to hold-up risks (Williamson, 1991). In sum then, corporate dis-aggregation, of which outsourcing is a special case impacts a firm's need and ability to access and embed specialised external knowledge, focuses internal learning, and creates a need to rely on external knowledge. Although the reasons and implications of outsourcing are increasingly understood, theories of firm boundaries poorly address associated processes of governance change.

This paper seeks to address this gap in the spirit of the evolutionary theory of the firm. Adopting an evolutionary perspective suggests limiting factors in managing governance change, including governance inseparability (Argyres & Liebeskind, 1999), and partly tacit complementarity of capabilities. A key departure from earlier approaches to firm boundaries is an explanation of such process limits to outsourcing and their impact on two sources of efficiency: incentives and capabilities. When limits to outsourcing impose dis-aggregation costs, governance change for particular activities involves compromises of capability- and/or incentive efficiency in the experimental determination of organizational boundaries. In this paper, I pursue an evolutionary approach to the boundaries of the firm to address the following questions:

- *What is the impact of governance change on capability and incentive efficiency?*
- *How do limits to outsourcing affect the evolutionary process of governance change?*
- *How do organizations experimentally respond to limits to outsourcing and dis-aggregation costs?*

While these questions fall under the traditional purview of organizational economics, progress has been hampered by the lack of an adequate process perspective in the theory of the firm (e.g. Mahoney, 1992; Foss & Foss, 2000). Ironically, despite the central role processes and learning play in evolutionary economics, it treats the experimental definition of firm boundaries not as a focal concern. By contrast, the

property right literature and transaction cost economics have given some insight in the determinants of (a) allocating ownership of residual usage rights to assets and (b) make-or-buy decisions, and, by extension, the efficient boundaries of the firm. However, because these models are not sensitive to the efficiency implication of capability maintenance and development (Langlois & Foss, 1999), they only partially explain the boundaries of firms by relative advantages of different institutional (Williamson, 1985) or ownership structures (Hart, 1995). Moreover, these theories assume that boundary definitions are discrete and reversible choices, and by implication, governance change to increase and decrease the boundaries of the firm is treated as theoretically equivalent. Not only do these theories side-step process issues of governance change (e.g. Argyres & Libeskind, 1999; Foss, 1999), they also are ill equipped to explain why processes that expand the scope of the firm differ conceptually from those leading to corporate dis-aggregation. This is a central concern of the current paper.

I build on the insights of the evolutionary approach to the theory of the firm to clarify the process, and process determinants that can be expected to affect the organization of economic activity. In particular, I will consider outsourcing as an experimental process that seeks to improve incentives and capability efficiency *by shifting activities from internal to external procurement*. This process approach is particularly appropriate given the increasing importance of corporate dis-aggregation in the economy. It reveals possible limits to the change of governance mechanisms. In addition, by considering the joint role of incentives and capabilities in an evolutionary process perspective (e.g. Dosi & Coriat, 1998; Dosi & Marengo, 2000), it is possible to answer some outstanding questions regarding the processes of governance change, limits to outsourcing such as dis-aggregation costs resulting in governance compromise in the experimental determination of firm boundaries. For instance, this approach facilitates the analysis of each of the three questions posed above. This paper proceeds by outlining the basic assumptions behind an evolutionary process perspective on governance change. Next I use this perspective to explicitly treat outsourcing as an experimental process. This facilitates the investigation of limits to outsourcing and dis-aggregation costs in relation to two sources of efficiency in environments of varying dynamics. Finally, I summarize the conclusions of the paper and compare and contrast it to related literature on the boundaries of the firm.

## **2. Evolutionary theory and governance change**

Evolutionary theory (Dosi & Marengo 1994; Kogut and Zander 1992, 1996; Nelson and Winter 1982; Nelson 1991; Marengo, 1999; Teece, Pisano & Schuen 1994; Teece et al. 1994, Winter, 1988; 1982) provides the kernel of a process theory of economic organization. A central question in evolutionary theory is why firm differences in terms of characteristics, capabilities, and performance persists over time? Addressing this question, evolutionary theorists (a) assume boundedly rational actors (Cyert & March, 1963; Dosi & Egidi, 1991), (b) focus on problem solving procedures and learning as the central unit of analysis (Nelson & Winter, 1982) and (c) emphasis sensitivity to the contextual embeddedness and path dependency of organizational behaviour (Dosi & Marengo, 1994) as three central elements of an evolutionary explanations.

‘Bounded rationality’ means that human actors involved in complex problem solving are limited in knowledge, skills and time. Thus, learning in organizations is path-dependent (Dosi & Marengo, 1994) because prior learning constrains current and future learning possibilities (Cohen & Levinthal, 1989). Also, ‘bounded rationality’ implies a need for cognitive specialization. Routinized coordination in collective problem solving is a response to this need (Cyert & March, 1963; March & Levinthal, 1993). Consequently, Nelson & Winter (1982, chapter 4 and 5) picture the firm as a repository of unique routines. As Winter (1982) points out, “[t]he coordination displayed in the performance of organizational routines is, like that displayed in the exercise of individual skills, the fruit of practice...the learning experience is a shared experience of organization members” (Winter, 1982:76). Routines, essentially recurring and context dependent action patterns that sequence individual actions into coherent organizational behaviour (Teece, et al, 1994), are selectable and change through adaptive learning dynamics. Collectively they present a firm’s capability (Selznick, 1957).

Because adaptation of routines is slow, they survive personal turnover (March & Simon, 1958) and give stability to organizations and direction to their re-current activities (Cyert & March, 1963). Put differently: Current ways of organizing enable firm’s to take advantage of sources of efficiency such as incentives and capabilities, but they may also constrain governance change because a firm’s past, via partly tacit

and path-dependent learning as well as prior contractual commitment, casts a shadow on the future.

The core concern of evolutionary theory, however, is with “the dynamic process by which firm behaviour patterns and market outcomes are jointly determined over time” (Nelson & Winter, 1982: 18). Much has been learned about both ‘firm behaviour patterns’ (the micro-evolutionary part) and ‘market outcomes’ (technological change as the macro-evolutionary part), but the question how both are inter-related remains to be addressed in greater detail. While the study of economic change and changing firm behaviour is deemed important and interesting in its own right (Nelson & Winter, 1982), governance change has not yet been addressed by evolutionary theory. Likewise, recent contributions to the knowledge based theory of the firm (Demsetz, 1988; Conner & Prahalad, 1996; Grant, 1996; Kogut & Zander, 1993) fall short in spelling out processes of governance change. But they have made governance forms the starting point of such an investigation: A knowledge-based theory of the firm is an important step in the understanding performance differences (Conner & Prahalad, 1996).

Thus, this paper suggest that examining governance change might provide an avenue to advance our understanding of how firm behaviour patterns and market outcomes are jointly determined over time. In this context, Dosi & Coriat (1998) recently stated a need to more clearly address the linkages between capabilities and incentives as two co-evolving and complementary sources of differential efficiency. In the authors word: “steps [need to be taken] towards an appreciation of the co-evolution of (highly imperfect) *mechanisms of governance*, on the one hand, and “*what a firm is able to do and to discover*” on the other” (p. 105). One step forward in this direction is an investigation of governance change, and this paper addresses the process of governance change in the context of outsourcing.

### 3. Outsourcing as an experimental process

Out of a vast and complex web of economic relations among agents, firms represent a dis-aggregated subset of salient relations. These relations involve exchange as well as non-exchange activities, they might be formal or informal, but the important point is that the way such relations are dis-aggregated influences incentives of actors involved to make investments in capabilities – the capacity to perform activities involved in such relations. Thus, the experimental definition of firm boundaries is about identifying and discovering possibilities to improve incentives, via the appropriation of returns to investments in relationships among actors (Williamson, 1985, Hart, 1989) and to enhance, via learning in continued interaction, their capacity for collective achievement (Nelson & Winter, 1982).

The evolutionary perspective on governance change defines “*outsourcing as an experimental process of shifting from internal to external procurement of activities.*” This definition has several implications. First, it requires that an activity and associated learning investments have been previously performed in-house (Coombs & Battiglia, 1998). Second, outsourced activities must remain in the foreseeable future important in the value creation process of the focal firm (be it as input for production, or as complement to product-market output). As a consequence, divestitures and spin-offs that do not contribute to the focal firm’s value creation process remain out of consideration.

Importantly, outsourcing in an evolutionary process perspective is conceptually different from vertical integration (the main concern of transaction costs theory and the property right approach) or diversification (a major concern of the resource-based view). Both concern processes through which a firm expands the scope of its activities. Teece et al (1994) argue in the context of diversification that “the boundaries of the corporation can be understood in terms of learning, path dependencies, technological opportunities, the selection environment, and the firm’s position in complementary assets” (p. 11). If this argument is correct, then boundary-decisions to expand the scope of the firm, once taken, might not be easily reversible (as assumed in transaction cost, and property right theory) - they are conceptually different from outsourcing. Also, outsourcing processes are consequential, because they are often irreversible. Focussing competencies too narrowly can impede possibilities to take advantage of external knowledge sources, because absorptive

capacity is reduced (Cohen & Levinthal, 1989). The effects of decreased absorptive capacity include higher search costs to find specialised production partners as well as impediments to access and utilise their knowledge (e.g. Aurora & Gambarella, 1994).

Finally, outsourcing processes are also experimental. They take place against the backdrop of path-dependent and partly tacit capability development (Nelson & Winter, 1982; Dosi & Marengo, 1994; Teece, Pisano, & Shuen, 1998) and prior governance choices (Argyres & Liebeskind, 1998). These can limit or slow down outsourcing due to governance inseparability, and (partly tacit) complementarity of capabilities. When such limits to outsourcing obtain and impose dis-aggregation costs, governance change for particular activities involve compromises of capability- and/or incentive efficiency in the experimental determination of organizational boundaries. Optimal outcomes should not be expected. Complications such as bounded rationality, path dependent capability development, interactions among multiple actors, and co-evolution between incentives and capabilities imply that process limits might not be obvious to actors involved and search efforts to overcome them are constrained by existing capabilities and incentives (March, 1994). By implication, process outcomes are likely to be sub-optimal, 'governance compromises' might be the rule rather than the exception, and process steps might be best thought of as experimental discovery.

In the following I aim to further develop the evolutionary perspective on governance change by addressing (1) the impact of governance change on two sources of differential efficiency: capabilities and incentives; (2) limits to outsourcing and their impact on governance change, and (3) governance compromise and their affect on the inter-temporal distribution of learning among partners in outsourcing relations.

### *3.1 Governance change and sources of efficiency*

Answers to the question about appropriate firm boundaries revolve around their efficiency implications. Two main sources of efficiency are prevalent in the theory of the firm boundaries: incentives (e.g. Williamson, 1985; Hart, 1989; 1995) and capabilities (e.g. Nelson & Winter, 1982; Madhock, 1996; Kogut & Zander, 1992). From an evolutionary perspective, both sources of efficiency serve as aspiration level in the search for efficiency (March, 1994). Already, Smith (1776) has established the basic argument that dis-aggregation of activities - along the dimensions of incentives



(e.g. ownership and its substitutes) and coordinated specialised learning (e.g. the division of labour) - influences efficiency in productive relations.<sup>2</sup>

He noted concern over the separation of ownership and control by arguing that the director of joint stock companies cannot be expected to be as vigilant watching over others money as partners in private companies watch over their own. This general exhibition of conflicting interest has found resonance in the contractual theory of the firm concerned with complications of shirking, agency (Alchian & Demsetz, 1972; Jensen & Meckling, 1979), opportunism and asset specificity (Williamson, 1975; Klein, Alchian, & Crawford, 1978). This literature has identified ownership and its substitutes (i.e. incentive schemes, monitoring) as sources of efficiency. In a world where transaction costs are positive some opportunities for using resources are difficult to know, costly to take into account if known, and, by implications, some of such uses are non-transactable. In such a world, incentive alignment poses challenges for parties involved in exchange relations, especially, when they are able and equipped to make investments in productive relations (Williamson, 1985). When skills and assets have to be brought to productive tasks, ownership of residual rights (Hart, 1989), and its substitutes (Alchian & Demsetz, 1972; Ross, 1973; Jensen & Meckling, 1979) are useful variable in a search process in which actors learn and discover ways to align interests.

Smith (1976) also argued that the division of labour enhances skill development, and by implication, influences the costs of knowledge production. A greater division of labour increases productivity because the time spent on tasks is usually more productive to specialized firms that concentrate on a narrow range of capabilities. This general exhibition of the costs of learning and experimentation in productive relations has found resonance in the knowledge-based theories of the firm (Cyert & March, 1963; Nelson & Winter, 1982; Kogut & Zander, 1992). This literature has identified capability maintenance and development as a source of efficiency. In a world where costs of knowledge production including learning and coordinating knowledge stocks are positive, new opportunities for using resources (Schumpeter, 1952) are easier to discover, know and act on for some relative to others. As Penrose (1959) notes: "...the productive opportunity of a firm must be

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<sup>2</sup> It is tiresome, however, to speculate what sources of efficiency is more important and the few empirical studies that seek to test their relative merits (Popo & Zenger, 1998; Knott & McKelvey, 1999) yield opposite results while sample specificity prevents generalization.

shown to be limited in any period. It is clear that this opportunity will be restricted to the extent to which a firm does not see opportunities for expansion, is unwilling to act upon them, or is unable to respond to them” (pp. 31-32). Where differences in the distribution of productive knowledge are present, coordination of productive activities poses challenges for parties involved in productive relations that cannot be reduced to conflicting interest but, importantly involve perceptual differences of opportunities. The underlying mechanism turns out to be the costs of learning and experimenting at varying degrees of dis-aggregated relations.

Importantly, however there is increasing consensus (Winter, 1988; Foss, 1993; Dosi & Coriat, 1998; Dosi & Marengo, 2000) that firms as institutions are neither exclusively loci of problem solving, via capabilities or loci of conflict resolution via incentive structures – they are both. As Nelson & Winter (1982: 108) argue: “...some sort of stable accommodation between the requirements of organizational functioning and the motivation of ... organizational members is a necessary concomitants of routine operation.” Thus, the two sources of efficiency – incentives and capabilities – are interrelated. For example, the effectiveness of incentives depends not only on the ability of actors to respond, but also on whether incentives address prior learned and organizationally conditioned preferences (McClelland, 1967; March, 1994). On the other hand, alternative degrees of dis-aggregating economic activity condition the incentives to invest in specialized learning. A central question then becomes how increasing degrees of dis-aggregation change incentives on the one hand, and the ability to maintain and develop capabilities on the other.

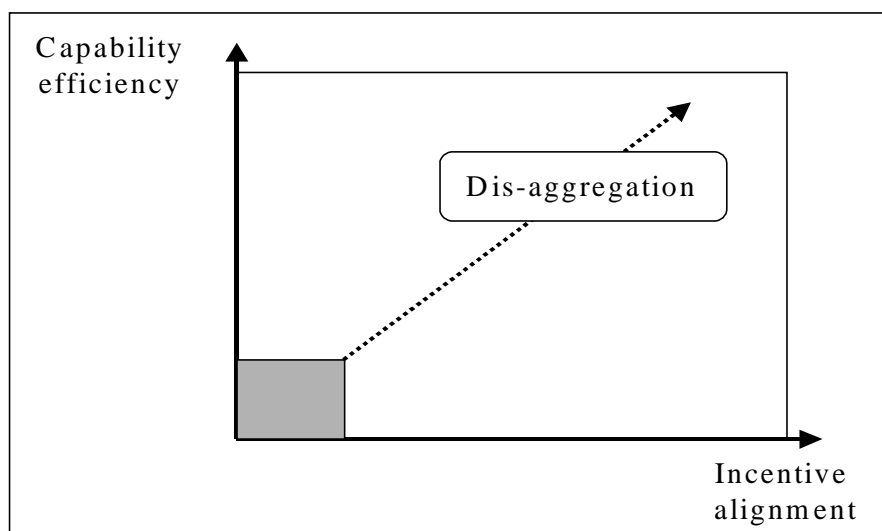


Figure 1: Dis-aggregation and two sources of efficiency

Capabilities - patterned routines that direct organizational behaviour - are maintained and developed through use and experimentation (Nelson & Winter, 1982; Hippel, 1988). Adaptation of capabilities requires tacit and explicit learning in the exploitation and exploration of such capabilities (March, 1991; March & Levinthal, 1993). However, while adaptation requires a balance between both, firms face difficulties to maintain this balance because successful routines tend to be reinforcing while incentives for selecting new initiatives are limited in variety. Corporate dis-aggregation can contribute to resolve both problems.

For example, competence traps (Levinthal & March, 1993) result from positive feedback between experience and competence. Firms engage in activities more frequently in which they are competent, thus, exploiting past learning for further refinement. The flip side, however, is that variety of experience and experimental learning diminishes as time passes, thus, tipping the balance between explorative and exploitative learning in the favour of the latter (March, 1991). Moreover, the costs of experimenting in areas outside current competence increase the more remote such experimental learning is from the current competence base. For one thing, the less knowledge one has to interpret experimental results the more misinterpretation may result. Additionally, the less experience one has in any given initiative the higher subjective risk evaluation might be. For another thing, to the extent that a learner becomes increasingly removed from remote bases of experience and knowledge, the more vulnerable to changes in his environment he becomes (Levinthal & March, 1993; Tushman & Andersen, 1986). Partly, increasing degrees of relational outsourcing contribute to cure the trap of over-exploitative learning. For example, through exposing the firm to a greater variety of learning possibilities at a higher number of organizational interfaces, and also, through risk sharing in inter-firm learning arrangements during co-operative experimentation.

Organizations are often constrained in differentiating their incentives. This is mainly because a shift to high-powered incentives (Williamson, 1985) could break prior contractual commitment (Argyres & Liebeskind, 1998), may be regarded as unfair (Pfeffer & Langton, 1993), or else, is simply incredible (Kreps, 1990; Williamson, 1985). For example, implicit contracts between divisions and corporate headquarters usually incorporate a sharing rule to carve up corporate profits (Argyres & Liebeskind, 1999). Would top management decide that an internal venture requires more high-powered incentives (e.g. stock-options) to spur intrapreneurship, this could

violate prior implicit contracts concerning profit sharing rules among divisions. At other times, providing high-powered incentives in firms faces limits due to pay comparison within organizations (Pfeffer & Langton, 1993; Zenger, 1992). Employees may reduce their effort when they perceive pay differences as inequitable (Deutsch, 1985). With these difficulties present, it is not surprising that undifferentiated incentives are the rule rather than the exceptions in firms (Holmstrom & Milgrom, 1991; Williamson, 1985). Increasing degrees of relational outsourcing circumvent impediments to differentiate incentives. For example, through exposing managers to real (rather than simulated) market discipline, high-powered incentives are facilitated if employees are made residual claimants through outsourcing. Also, outsourcing makes top management's commitment to high-powered incentives more credible. Finally, comparison issues might be relaxed when boundedly rational agents compare incentives more strongly within the boundaries of their firm rather than across it.

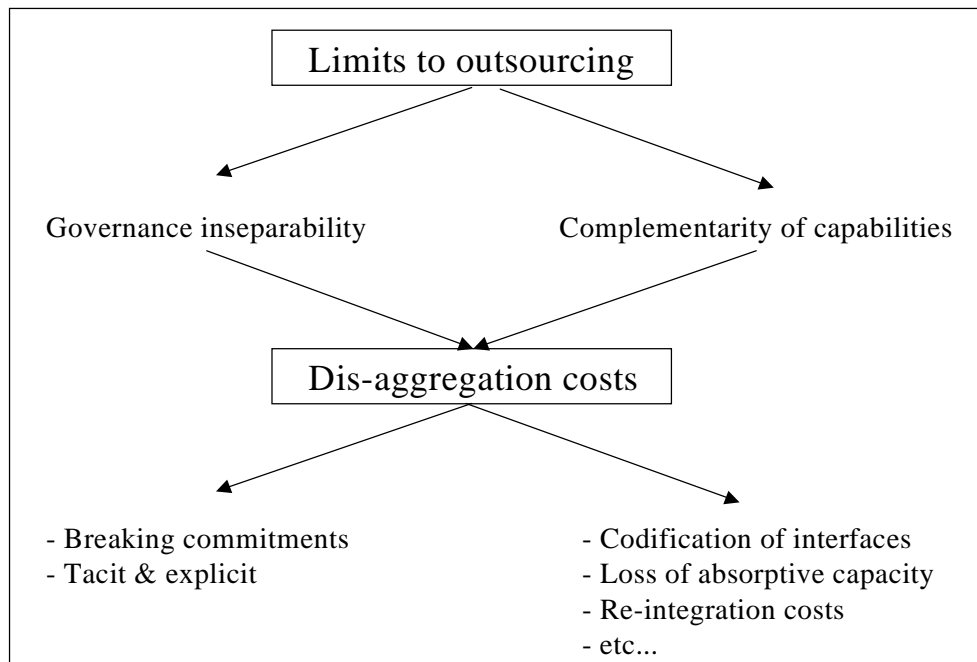
To summarize, this section has argued that governance change affects two general sources of efficiency: capabilities and incentives. Outsourcing can increase capability efficiency through (1) focussed learning in the outsourcing firm, (2) overcoming competence traps, and (3) by limiting the risk of experimentation in the exploration of new competence. Outsourcing can increase incentive efficiency through (1) re-drawing implicit contracts, (2) relaxing social comparison issues and, (3) by making credible commitments to high-powered incentives. The next section addresses the question: What are the limits to corporate dis-aggregation and how do they affect the process of governance change?

### *3.2. Limits to outsourcing and dis-aggregation costs*

In an evolutionary perspective on governance change, there are at least two general limits to outsourcing that have been insufficiently addressed in theories of firm boundaries: governance inseparability and complementarity of capabilities.<sup>3</sup> Resulting dis-aggregation costs are related to knowledge codification in the specification of interfaces in supplier/buyer system, loss of absorptive capacity, and complications associated with integrating capabilities in the suppliers system.

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<sup>3</sup> Other limits to outsourcing may occur because markets are incomplete or non-existent (Diericks and Cool, 1989; Casson, 1982)



**Figure 2: Limits to outsourcing and dis-aggregation costs**

**Governance inseparability:**

Argyres & Liebeskind (1999, 2000) recently suggested that prior contractual commitments made by a firm may limit its ability to differentiate or change its governance arrangements in the future. Rather than focussing on the characteristics of isolated transactions (Williamson, 1996), they argue that “...governance of any new transaction in which a firm engages may become linked inseparably with the governance of other transactions in which the firm is already engaged.” Examples of related prior commitments include patents, that provide more value to its holder (because they are combined with complementary physical and human assets) than in its next best alternative, exclusive supplier or distributor arrangements long term employment contracts. Prior legal and psychological commitments with employees are an especially important factor influencing governance change. If a firm wishes to reduce employment levels during outsourcing, it might have to bear severance payments to laid off employees, suffer from declining reputation as a good employer, and/or deal with reduced morale among remaining employees (Matusik & Hill, 1998; Kreps, 1990).

In essence, the authors assert that there are exit barriers on a governance level because a firm’s past governance choices significantly influence the range and types of governance mechanisms that it can adopt in future periods. But the authors also

introduce a crucial methodological point that bears resemblance to evolutionary reasoning (Argyres & Liebeskind, 2000: 238): "...focus on the transaction as the unit of analysis can obscure interdependencies between transactions." To focus governance choice on individual transaction attributes may lead to inefficient choices because this overlooks possible impact on related transactions. In sum then, firms cannot exist without making commitments (Kreps, 1990), but prior commitment presents limits to outsourcing. As a consequence, even when asset specific investments are not required for the efficient conduct of an activity, outsourcing options might be impeded by prior contractual commitments.

### **Complementarity of capabilities:**

Complementarity of capabilities is the technical corollary of governance inseparability. It is an essential insight in the evolutionary literature that capabilities develop in a context-dependent and path-dependent matter (e.g. Nelson & Winter, 1982; Dosi & Marengo, 1994). Moreover, interactive learning steps taken in capability development involve tacit dimensions and causal ambiguity (Polanyi, 1967; Lippman & Rumel, 1982). Thus, capabilities are not easily separated from each other nor do they remain valuable to full extent detached from their context – the nexus of routines in which they have evolved and in which they are conducted. Recent work in both organizational economics (e.g., Milgrom and Roberts 1990; 1995; Holmström and Milgrom 1991), the firm strategy literature (Dierickx and Cool 1989; Porter 1996) and the HRM literature (Becker and Gerhart 1996; Baron and Kreps 1999) has embraced this evolutionary insight to stress that activity systems are most effective when complementarities are manifest between their constituent elements. These interaction effects are the result of interactive, co-specialized, and partly tacit learning of members involved in capability maintenance and development.

Complementarity obtains between two activities (say IT support and airline logistics) when investing in one of these raises the return from investing in the other one and vice versa (Milgrom & Roberts, 1991). Such interaction effects between activities, lead to efficiency in executing capabilities. But this very effect also induce inertia (Rumelt, 1995) that impedes changes in complementary activity systems. Thus, the flip-side of this coin is that complementary activity systems can constrain outsourcing possibilities of particular activities. Because lost interaction effects and knowledge-spillovers between activities diminish the effectiveness of the remaining

activity system, firms that outsource particular activities (be they core or not) may suffer something akin to ‘phantom limb pains’ well known from medical cases. At times, capabilities cannot be separated nor contracted out without compromising complementarity in existing activity systems. Capability efficiency may also be compromised, at least for a while, when outsourced activities must be integrated in supplier systems. In sum then, limits to outsourcing obtain when there are costs to breaking prior commitment and separating partly tacit capabilities.

Next I consider dis-aggregation costs related to knowledge codification in the specification of interfaces in supplier/buyer system, loss of absorptive capacity, and integrating capabilities in the suppliers system.

### **Knowledge-codification costs:**

To outsource an activity requires that interfaces between a supplier’s and the firm’s activity system be made explicit to facilitate efficient contracting and coordination of activities. Unfortunately, however, such interfaces between activities involve tacit elements. For example, when Air Canada outsourced its IT-logistic system to IBM, the systems operation break down for 5 days and remained interrupted for another 3 month, causing substantial losses despite substantial up-front planning. The costs of codifying and making explicit interfaces between activity systems (e.g. logistics and other airline operation), impose cost of dis-aggregation during governance change. Cowen & Foray (1997:595) describe codification of knowledge as a production process that includes “model building, language creation and the writing of messages.” These sub-processes are performed in practice through brainstorming sessions, discussions in teams, exchange of thoughts, and interface analysis. It is important to note, however, that codification processes are often riddled by imperfection, that they are time consuming, and therefore costly. In the specification of interfaces among activity systems, there are several degrees of codification. Possibilities range from scarce specifications of requirements to rich description of procedures and context information. One of the key decisions in the process of codification is therefore not only the choice what knowledge to codify, but additionally to which extent knowledge should be codified at which costs (Liebskind, 1997). Approvingly, Nelson & Winter (1982: 82) argue: “...it should be emphasized that cost matter. Whether a particular bit of knowledge is in principle articulable or necessarily tacit is not the relevant question in most behavioral situations. Rather, the

question is whether the costs associated with the obstacles to articulation are sufficiently high so that the knowledge in fact remains tacit.” To identify associated costs it is helpful to describe knowledge codification as a production process through which prior tacit knowledge is transformed into codified artefacts, such as interfaces among activities:

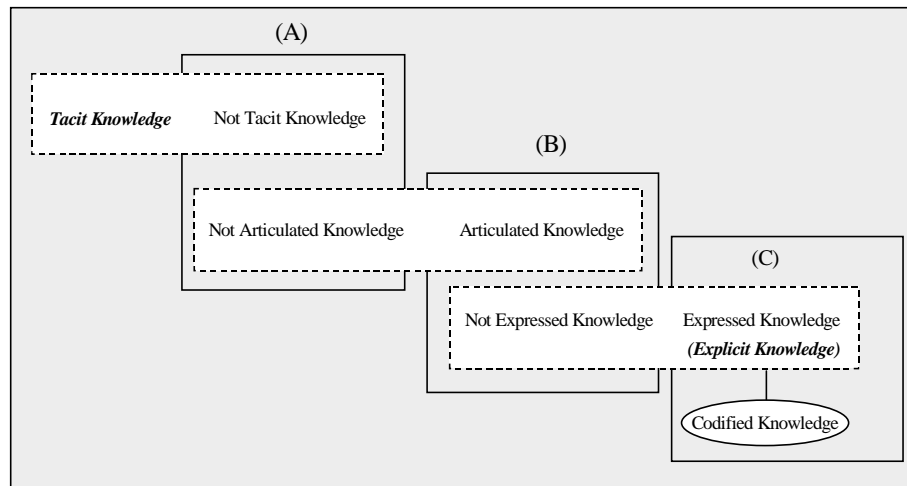


Figure 3: Knowledge codification as production process (Similar: Winter, 1987)

While Nonaka’s (1994) distinction between tacit and explicit knowledge is integral to the more fine-grained distinctions made here (See also Winter, 1987), it is interesting to ask why some knowledge is not expressed to others? For knowledge to be codified it must be previously expressed. Calling for a realistic model of ‘man’, Stein & Ridderstråle (1996) rightfully assert that individuals may not only know more than they can tell, they may also tell less than they know, and at times tell more than they know. Moreover, individuals may not articulate what they could articulate, and may not express to others what they articulate to themselves. This is particularly prevalent, when people fear to lose their job through outsourcing.

There are several reasons why knowledge is not expressed to others and as a consequence remains un-codified. For one thing, that might be impossible in principle when knowledge is purely tacit. For example an artist might not be able to symbolise how he creates his painting, a top sales manager might not be able to convey how he wins client deals, or a manager might not be able to articulate how he survives the daily thrill of political manoeuvring. More generally, in actual routine performances, time constraints may prevent articulation ‘during the attempt’ and people involved may lack understanding of causal relations between action and performance (cf. Nelson & Winter, 1982:80). Additionally, symbolizing knowledge might be possible



in principle, but the articulation of knowledge is difficult and time consuming. For example, why should manager formulate particular knowledge about interfaces between activities, at least to himself, when there are obvious personal costs to do so while personal benefits are absent or hard to identify? When knowledge is articulated, at least in the mind of one person (e.g. conscious reason, internal speech), there arises the question whether it should be expressed to others and why this should be done? People may hideaway knowledge strategically to create dependencies (Pfeffer, 1982). They may hoard knowledge for later harvesting (Stein & Ridderstråle, 1996), or gain advantages in contractual exchange (Akerlof, 1970). Moreover, they may seek to avoid loss of face value by 'biting tongues' or 'swallowing pride' (Harre & DeCarlo, 1985), or circumvent political hazards or conflict in situations where people may know more than is legitimate to express (Goldhaber, 1993).

When one decides to keep knowledge to oneself, knowledge remains entirely personal, unexpressed and not displayed. When one decides to express knowledge to others, there is still no guarantee that those who receive this expression understand properly. This requires prior shared knowledge from which understanding and fast learning can proceed (Cohen & Levinthal, 1989). In sum, there are many reasons why people can know more than they tell and others understand, including a general impossibility to articulate, a cost/benefits analysis with negative results, a hoarding of articulated knowledge for strategic reasons, an inability of receivers to understand due to lacking shared codes (Arrow, 1974). To further complicate the picture, while there are many reasons why people know more than they can tell, want to tell, or are able to communicate, they may at times not only tell less than they could, they may also tell more (cf. Stein & Ridderstråle, 1996). For example, when they opportunistically distort and manipulate signals expressed to others (e.g. Williamson, 1996; 1999).

Usefully, two categories of costs in codification processes can be distinguished: direct production costs and residual losses. While the former captures managerial time spent to seek and describe knowledge, detach it from initial use or users, and to embody it in some adequate form to make it accessible and useful for the specification of interfaces among activities, the later concerns losses that occur because tacit knowledge can only be imperfectly codified into explicit knowledge. Direct costs in the process of knowledge-codification are influenced by several cost-drivers. First, codification costs are the higher, the less the production process is codified ex ante. Second, the thicker and detailed the descriptions of activity interfaces (e.g. contextual

features are added to a codified process description), the more time will be used and the higher the efforts of codification. Finally, the more activities are interconnected with other activities, the less partial codification is self-contained and sufficiently useful in isolation (Winter, 1987).

Residual losses occur because the richness and nuances of tacit knowledge are partially lost in the process of codification. Since tacit knowledge can not be completely converted into explicit knowledge, attempts to codification involve simultaneously an element of reduction – that is, abstracting away nuances and details required for knowledge-based performances. For example, MacKenzie & Spinardi (1995) showed in the case of nuclear weapon production that, despite substantial efforts of codification, tacit knowledge could not be codified to full extent. Likewise, Polanyi (1967) has earlier argued that tacit knowledge and explicit knowledge are complements rather than substitutes. While explicit and codified knowledge is instrumental to develop tacit knowledge (e.g. a cook book aids cooking, but does not contain the ability to cook of the one who wrote it), tacit knowledge can be at best imperfectly described and encoded. It is thus, that any attempts to codify knowledge in the organization are inherently limited. In sum, when outsourcing requires the codification of interfaces between activities, codification costs contribute to explain the costs of dis-aggregation. Additionally, not only codification costs, but also quality, long term learning, and adaptability considerations are important during governance change (e.g. Popo & Liebeskind, 1998).

### **Loss of absorptive capacity:**

Section 3.1 has argued that outsourcing might contribute to overcome competence traps through exposing the firm to a greater variety of learning possibilities at a higher number of organizational interfaces. On the other hand, outsourcing may also establish a greater need for accessing external knowledge in the form of contingent work (Matusik & Hill, 1998) embedded in specialized supplies (Demsetz, 1988) or, else through inter-firm learning (e.g. Dyer & Nobeoka, 2000; Stalk, & Lyles, 1996). Simultaneously, however, reduced activity share and learning variety (March, 1991) as a consequence of outsourcing may undermine a firm's absorptive capacity – the ability to access, integrate and use external knowledge sources (Cohen & Levinthal, 1989). The effects of decreased absorptive capacity include higher search costs to find specialised production partners as well as

impediments to access and utilise their knowledge (e.g. Aurora & Gambarella, 1994). Thus, reaping specialisation gains through focused learning in a focal firm is limited by reduced absorptive capacity that prevents tapping into and taking advantage of external knowledge sources of suppliers. When outsourcing reduces absorptive capacity, long-term adaptability might be compromised, which imposes a long-term opportunity cost of experimental learning in exploring new competencies as a consequence of governance change. In sum then, outsourcing can contribute to overcome competence traps through exposing the firm to a greater variety of learning possibilities at a higher number of organizational interfaces. But it is one thing to say that learning opportunities are increased through outsourcing. It is quite another thing to take advantage of such opportunities.

#### **Integrating new activities at supplier side:**

Outsourcing processes are complex processes that span across the outsourcer's and outsourcee's activity systems. When it is possible to dissect capabilities on the outsourcer's side there is no guarantee that efficiency gains are realized because the supplier need to re-integrate outsourced activities to achieve complementarity. In practice, human resource might be transferred from one company to another or suppliers perform more related activities. Independently of how an integration of outsourced activities is achieved on the supplier side, it is well known from the literature on post-merger integration that such processes come with complications (Haspeslagh & Jemison, 1991, Jemison & Sitkin, 1986). Potential synergies (e.g. economies of scale and scope in various parts of the entire value chain) between new and prior performed activities might be available on the supplier's side. But integrating activities may also require substantial investments in, for example, transition teams, re-arranging knowledge and material flows, establishing advice networks, and encouraging cooperation (Hamel, 1991; Levinthal & March, 1993; Lawrence & Lorsch, 1967; Lyles & Stalk, 1996; Grant, 1996). Moreover, employees that are transferred from one to another company might react negatively to the new employer, see their career prospects compromised, or may reject a new working culture (Sales & Mirvis, 1984). Not in all cases do such integrative problems occur, but when they do, associated activities impose process costs of governance change, which require consideration.

To summarize, this section has argued that there are two important limits to governance change: prior contractual commitment and partly tacit capabilities. Outsourcing and governance change is constrained by these limits and associated dis-aggregation costs including (1) codification costs in interface specification, (2) loss of absorptive capacity, and (3) the costs of integrating activities in supplier systems. Outsourcing processes might be impeded by such limits to outsourcing and associated costs of dis-aggregation. As a consequence, a shift from internal to external procurement of activities is constrained or slowed down. Furthermore, taking advantage of sources of efficiency might be compromised. The next section addresses the question: How do organisations respond to limits to outsourcing and dis-aggregation costs?

### 3.3 Governance compromise

Outsourcing can increase capability efficiency through focussed learning in the outsourcing firm, overcoming competence traps, and by limiting the risk of experimentation in the exploration of new competence. Also, outsourcing can increase incentive efficiency through re-drawing implicit contracts, relaxing social comparison issues and, by making credible commitments to high-powered incentives. However, given the limits to outsourcing there are possible organisational responses, which compromise to various degrees two sources of efficiency in the experimental search to improve incentive alignment and capabilities.

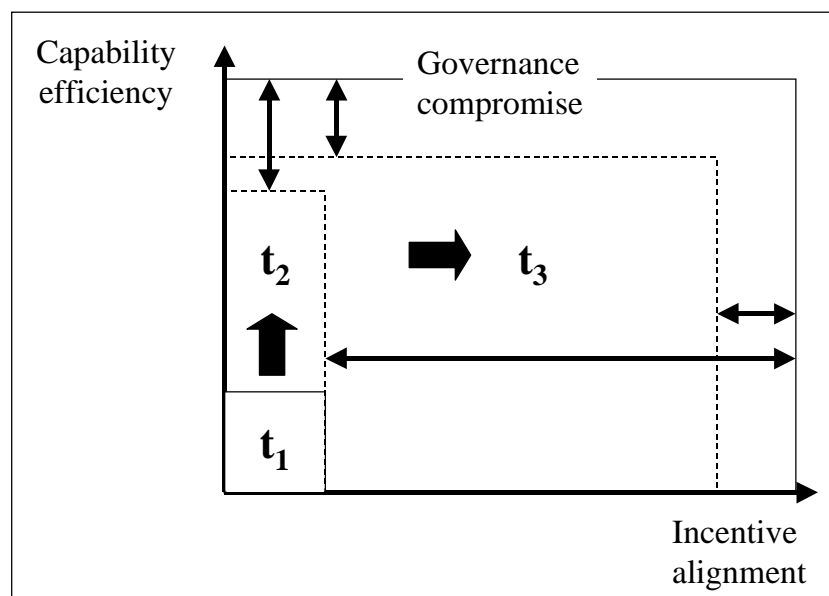


Figure 4: Governance compromises

This section suggests that the most significant impact of the above mentioned limits to outsourcing may be captured by trading off temporarily unavoidable efficiency losses that occur due to misalignment of incentive and inefficient learning investments in the maintenance and upgrading of particular capabilities. Governance compromises may result (Barney & Lee, 2000). Because, efficiency losses incurred due to limits of outsourcing may be overcome in the long run, an important short-term remedy can be to accept lower incentive efficiency and focus on efficiency improvement of learning investments. Alternatively, efficiency of learning investments may be compromised in the favour of higher incentive efficiency. For example, assume that in the long run an outsourcee might be better equipped to maintain and upgrade capabilities compared to the original firm. But because there are tacit complementarities between capabilities, employment contracts might be transferred to an outsourcee while employees remain temporarily in the same building with prior colleagues. In this case, employees might be rewarded according to new incentive schemes without compromising capability development because proximity to prior colleagues ensures that complementarity in capabilities remains undisrupted. Nonetheless, reward changes might be constrained because social comparison among former colleagues is still operative because of physical proximity.

Understanding the characteristics of inherent tradeoffs and/or substitution possibilities between capability and incentive efficiency in the long run, depends additionally on the environmental dynamics. Degrees of demand-, technological-, and contractual uncertainty in conjunction with pre-existing capabilities may influence possibilities and incentives for learning investments to maintain or upgrade activities. For example, more dynamic environments (e.g. creative destruction) de-emphasise efficiency losses related to knowledge-leakage due to weak property rights; but instead stress access to external knowledge and learning speed. Conversely, stable environments (e.g. knowledge accumulation regimes) stress property rights more, and protection against knowledge leakage becomes more important.

Furthermore, when knowledge-structures in markets change through differential rates of learning of market participants, new knowledge gaps may emerge which (a) suggest a re-allocation of property rights to resources among agents to channel resource to productive use in the process of creative destruction (Schumpeter, 1950) and (b) may lead to the use and exploitation of asymmetric knowledge and information through profit seeking behaviour (Knight, 1921). Conversely, when

knowledge-structures change through increasingly shared knowledge, and market participants know increasingly similar things, verification possibilities increase and agency conflicts may diminish. Additionally, when market participants learn about their partners in repeated games (Parkhe, 1993), costly ownership arrangements may be substituted by market contracting or relational contracting (Williamson, 1996). More generally, modern transaction cost theory assume that underlying knowledge-structures are essentially unchanged during the duration of the above mentioned strategic choices. This, however, cannot be assumed as knowledge-structures change through differential learning speed among agents in markets.

To sum up, governance compromises seek to consider trade-offs and substitution possibilities between sources of efficiency; environmental dynamics influence governance compromises, and governance compromises are temporary and experimental. As time pass by, compromises in incentive and capability efficiency might be improved as participants in the evolutionary process of governance change discover and learn further possibilities for improvements of governance efficiency.

#### **4. Discussion**

What determines the boundaries of the firm is a central question in the economic theory of the firm (Holmström & Tirole, 1989; Hart, 1995; Williamson, 1975, 1985). It is also an increasingly relevant question for business practice. Current theories of firm boundaries do not directly address process questions of corporate dis-aggregation including outsourcing. Nonetheless, they deal with important variables indicating when outsourcing might be considered as a governance option in the organization of productive activities (see table 1 below).

Focal Concern	Main Variable	Limits to outsourcing
<b>Transaction costs theory (Williamson, 1996)</b>		
<p><b>Main proposition:</b> Activities requiring specific investments should be governed in the firm to avoid hold up, which may occur in the outsourcing case.</p> <p><b>Possibilities to outsource:</b> Activities that do not require (or do not require anymore) assets specific investments (small bargaining argument).</p>	<p>Asset specificity,</p> <p>Frequency,</p> <p>Uncertainty</p>	<p>Never outsource activities that require specific investment</p> <p>Stop outsourcing when production-cost disadvantages (including efficient learning investments) are smaller than risk costs of hold up in outsourcing arrangement.</p>
<b>Measurement costs (Barzel, 1997; Alchian &amp; Demsetz)</b>		
<p><b>Main proposition:</b> Measurement costs of input to the value creation process of the focal firm influence relative efficiency of firm and market procurement.</p> <p><b>Possibilities to outsource:</b> Contribution to the value creation of the focal firm can be efficiently rewarded (contribution linked to pay) through external contractual arrangements.</p>	<p>Measurement costs</p>	<p>Do not outsource, when measurement difficulties can be better (cheaper, more effectively) be alleviated in firms (selective invention, authority, task restriction, surveillance technology).</p>
<b>Property right approach (Grossman &amp; Hart, 1986)</b>		
<p><b>Main proposition:</b> Allocation of residual rights of assets to parties whose investment incentives (in human capital) are most important to their productive use.</p> <p><b>Possibilities to outsource:</b> Outsource assets to parties whose learning investments are more important for the productive asset use.</p>	<p>Residual decision rights</p> <p>Specific human capital investments</p>	<p>Never outsource assets, when the learning investment of the focal firm are most important to asset usage</p> <p>Importance of learning of different parties might change over time</p>
<b>Resource based view (Barney, 1991 &amp; Peteraf, 1993)</b>		
<p><b>Main proposition:</b> Govern and conduct activities inhouse that are rare, valuable, non-imitable, and non-substitutable</p> <p><b>Possibilities to outsource:</b> Activities, which miss some or several of these attributes (not core-resources)</p>	<p>Resource properties</p>	<p>Core resources and activities that do not have these attributes, but cannot be sourced from incomplete or imperfect markets (market failure)</p>
<b>Competences (Prahalad &amp; Hamel, 1994)</b>		
<p><b>Main proposition:</b> Focus on core competences</p> <p><b>Possibilities to outsource:</b> Outsource the rest</p>	<p><i>Learning</i> in organizations, especially how to coordinate diverse production skill and integrate multiple streams of technology</p>	<p>Never outsource coordination tasks, when learning about coordination of skills and technology is superior to other companies (e.g. dis-similar activities)</p>

**Table 1: Firm boundaries and limits to outsourcing**

Taken together these theories suggest that outsourcing might be considered as a governance option

1. if hold up risks are absent (Williamson, 1975, 1985, 1996);
1. if outsourced input to the value creation process of the focal firm can be measured (Barzel, 1997; Alchian & Demsetz, 1972).
2. if learning investments in asset-usage-specific skills are less efficient relative to potential outsourcing partners (Grossman & Hart, 1986);
3. if technologies and skills might be more efficiently integrated elsewhere because of superior coordination knowledge in other firms (Prahalad & Hamel, 1994);
4. if resources utilized lack one or several of the following characteristics:.. resources might not be simultaneously rare, valuable, non-imitable, and non-substitutable (Barney, 1991; Peteraf, 1993).

For example, transaction cost economics (Williamson, 1979; 1996) and the property right literature (Grossman & Hart, 1986; Hart, 1995) speak to the question what variables influence make or buy decisions by concentrating on required incentives to make asset-specific investments in support of a given transaction (Klein, Crawford, & Alchian, 1978). Placing the ownership of the assets in a given transaction into the hands of a single party improves the incentives for making efficient transaction-specific investments when contracts are incomplete and the cost associated with a hold-up is significant (Grossman & Hart, 1986; Hart & Moore, 1990). Investment incentives may be diluted when parties to a transaction are exposed to hold up risk in contractual relations. Such risk may be attenuated, however, either by the acquisition of residual rights to asset usage (Hart, 1995) or, more generally, by hierarchical governance to make provision for flexible adaptation in incomplete contracts (Williamson, 1991). While contractual theories of the firm are perhaps most concerned with vertical integration (an increase in the scope of the firm), they also indicate when outsourcing becomes an option. Although current theories of firm boundaries indicates when outsourcing becomes a governance option, collectively they fails to address the question why not all firms outsource if there are potential efficiency gains and specific investments are not required? Answers to this question are hard to device unless we gain a deeper understanding of outsourcing as a process.



## **Conclusion**

In the spirit of the evolutionary theory of the firm, this paper has addressed the process gap in theories of firm-boundaries. Adopting an evolutionary perspective suggests limiting factors in managing governance change, including governance inseparability, and partly tacit complementarity of capabilities. A key departure from earlier approaches to firm boundaries is an explanation of such process limits to outsourcing and their impact on two sources of efficiency: incentives and capabilities. When limits to outsourcing impose dis-aggregation costs, governance change for particular activities involves compromises of capability- and/or incentive efficiency in the experimental determination of organizational boundaries. Future research is needed to link the processes of governance change to different forms of relational contracting. Also, theories of selection in the context of organizational forms and particular governance mechanisms (Grandori, 2001, forthcoming) deserve attention.

- Akerlof, G. A. 1970. The market for lemons: Quality and the market mechanism. *Quarterly Journal of Economics*, 84: 488-500.
- Alchian, A. & Demsetz, H. 1972. Production, information costs, and economic organization. *American Economic Review* 625: 772-795.
- Argyres, N. & Liebeskind, J. 1999 Contractual commitments, bargaining power, and governance inseparability: Incorporating history into transaction cost theory. *Academy of management review*: 49-63.
- Argyres, N. & Liebeskind J. 2000. The role of prior commitment in governance choice. In: Foss, N. & Mahnke, V. *Competence, governance, and entrepreneurship*. Oxford University Press
- Arrow, K. 1974. *The limits of organization*, New York: W.W. Norton & Co.
- Axelrod, R. 1984. *The evolution of cooperation*. New York: Basic Books.
- Barney, J. & Lee W. 2000 Multiple consideration in making governance choice. In: Foss, N. & Mahnke, V. *Competence, governance, and entrepreneurship*. Oxford University Press
- Barney, J. 1991. Firm resources and sustained competitive advantage. *Journal of Management* 17: 99-120.
- Baron, J. N & D, M. Kreps. 1999. Consistent human resource practice. *California Business Review*, 41, 3: 30-52.
- Becker, B., & Gerhart, B. 1996. The impact of human resource management on organizational performance: Progress and prospects. *Academy of Management Journal*, 39: 779-801.
- Bettis, R. A., & Hitt, M. A. 1995. The new competitive landscape. *Strategic Management Journal*, 16: 7-20.
- Clark, K. B., & Wheelwright, S. 1993. *Managing new product and process development*. New York: Free Press.
- Cohen, M. & P. Bacadayan, 1994. Organizational routines are stored in organizational memory: Evidence from a laboratory study. *Organization Science*, 5: 554-568.
- Cohen, W. M., & Levinthal, D. A. 1989. Innovation and learning: The two faces of R&D. *Economic Journal* 99: 569-627.
- Conner, K. R. & C. K. Prahalad. 1996. A resource based theory of the firm: Knowledge versus opportunism. *Organization Science*, 7 5: 477-501.
- Coombs & Battiglia, 1998. Outsourcing, Mimemo
- Coombs, R. & Metcalfe, S. 2000. Organizing for innovation: Coordinating distributed innovation capabilities. Foss, N. & Mahnke, V. *Competence, governance, and entrepreneurship*. Oxford University Press
- Cowen, R. & Foray, D. 1997. The economics of codification and the diffusion of knowledge. *Industrial and Corporate Change* 6/3: 595-622.
- Cyert, R. & March, J.G. 1963. *A Behavioural Theory of the Firm*. Englewood Cliffs, N.J.: Prentice Hall.
- D'Aveni, R. A. 1994. *Hypercompetition: Managing the dynamics of strategic maneuvering*. New York: Free Press.
- Day, J. & Wendler, J. 1999. The new economics of organization. *McKinsey Quarterly*. 1999 Number 1: 4-17.
- Demsetz, H. 1991/1988. The theory of the firm revisited. *The nature of the firm*, O. E. Williamson and S. Winter, eds., Oxford University Press, New York: 159-178.
- Dierickx, I., & Cool, K. 1989. Asset stock accumulation and sustainability of competitive advantage. *Management Science*, 35: 1504-1511.
- Coriat, B. and G. Dosi (1998), Learning how to govern and learning how to solve problems, in Chandler et al. (1998). *The dynamic firm*. Oxford University Press
- Dosi, G. and M. Egidi (1991), Substantive and Procedural Uncertainty. An Exploration of Economic Behaviours in Complex and Changing Environments, *Journal of Evolutionary Economics*, vol. 1, pp. 145-68.

- Dosi G. and L. Marengo (1994), "Toward a Theory of Organizational Competencies", in R.W. England (ed.), *Evolutionary Concepts in Contemporary Economics*, Ann Arbor, Michigan University Press, pp. 157-78.
- Dosi, G. & L. Marengo. 1994. Some elements of an evolutionary theory of organizational competences. In R. W. Englander. *Evolutionary concepts in contemporary economics*. Ann Arbor: University of Michigan Press.
- Dyer & Nobeoka (2000) Creating knowledge and managing a high performance knowledge-sharing network: The Toyota case. *Strategic management Journal*, 21: 345-467.
- Dyer & Singh (1998) Relational Advantage. *Academy of Management*, 23, 4: 660-679.
- Foss, K. & Foss, N. 2000. Economic organization in a process perspective. In J. Krafft: *The process of competition*. Edward Elgar
- Foss, N. 1999. Research in the strategic theory of the firm; isolationism vs. integrationism. *Journal of Management Studies* (forthcoming).
- Foss, N. J. 1993. Theories of the firm: Competence and contractual perspectives. *Journal of Evolutionary Economics*, 3, 127-144.
- Goldhaber, G.M. 1993. *Organizational Communication*. Madison, Wis.: Brown & Benchmark.
- Grandori, A. 2001. *Organization and economic behaviour*. Routledge
- Grant, R. 1996. Toward a knowledge-based theory of the firm, *Strategic Management Journal* 17: 109-122.
- Grossman, S., & O. Hart. 1986. The costs and benefits of ownership: A theory of vertical integration. *Journal of Political Economy* 94: 691-719
- Hamel, G. 1991. Competition for competence and interpartner learning within international strategic alliances. *Strategic Management Journal*, 12: 83-103.
- Hamel, G., & Prahalad, C. K. 1994. *Competing for the future*. Boston: Harvard Business School Press.
- Harre, R. & deCarlo, N. 1985. *Motives and Mechanisms*: London: Methuen.
- Hart, O. 1995. *Firms, Contracts and Financial Structure*. Oxford: Clarendon Press.
- Haspeslagh P.C. & D.B. Jemison, 1991. *Managing acquisition: Creating Value through corporate renewal*. Free Press. New York.
- von Hippel, E. (1988), *The Sources of Innovation*, Oxford: Oxford University Press.
- Holmstrom, B. R. & J. Tirole. 1989. The theory of the firm. In: R. Schmalensee & R. D. Willig (Eds.), *Handbook of Industrial Organization*, Volume 1, Amsterdam: North Holland, 61-133.
- Holmström, B. & Milgrom, P. 1991. Multitask principal-agent analyses: Incentive contracts, asset ownership, and job design, *Journal of Law, Economics, and Organization* 7: 24-52.
- Ichniowski, C. T.A. Kochan, D. Levine, C.Olson, and G.Strauss. 1996. What Works at Work: Overview and Assessment. *Industrial Relations*. 35(3): 299-333.
- Jemison D.B. & S.B. Sitkin, 1986. Corporate acquisition: A process perspective. *Academy of management review* 11: 145-163.
- Jensen, M. C., & Meckling, W. H. 1976. Theory of the firm: Managerial behavior, agency costs, and ownership structure. *Journal of Financial Economics*, 3: 305-360.
- Kamien, M. & N. Schwartz, 1982. *Market structure and innovation*. Cambridge University Press
- Klein, B, R. G. Crawford, & A. Alchian. 1978. Vertical integration, appropriable rents, and the competitive contracting process. *Journal of Law and Economics*: 297-326.
- Knight, F. 1921. *Risk, Uncertainty, and Profit*. New York: Houghton Mifflin.
- Kogut, B., & Zander, U. 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, 3: 383-397.
- Kreps, D. 1990. Corporate culture and economic theory. In: J. Alt and K. Shepsle, (eds.) *Perspectives on positive political economy*. New York: Cambridge University Press, pp. 90-143.
- Lyles M. & J. Stalk. 1996. Knowledge acquisition from foreign parents in international joint ventures, *Journal of International Business Studies*, 27,5: 877-904.

- Langlois, R. N. & N. J. Foss. 1999. Capabilities and governance: the rebirth of production in the theory of the firm, forthcoming in *KYKLOS*.
- Lawrence, P. R., & Lorsch, J. W. 1967. *Organization and environment: Managing differentiation and integration*. Boston: Harvard University Press.
- Levinthal, D. A., & March, J. G. 1993. The myopia of learning. *Strategic Management Journal* 14: 95-113.
- Liebeskind, J. 1997. Keeping organizational secret: Protective institutional mechanisms and their costs. *Industrial and Corporate Change* 6/3: 623-663.
- Lippman, S. A., & Rumelt, R. P. 1982. Uncertain imitability: An analysis of interfirm differences in efficiency under competition. *Bell Journal of Economics*, 13: 418-438.
- Lyles M. & J. Stalk. 1996. Knowledge acquisition from foreign parents in international joint ventures, *Journal of International Business Studies*, 27,5: 877-904.
- MacKenzie, D. & Spinardi, G. 1995. "Tacit knowledge, weapons design and the uninvention of nuclear weapons." *American Journal of Sociology* 101: 44-99.
- Madhock, A. 1996. The organization of economic activity: Transaction costs, firm capabilities, and the nature of governance. *Organization Science*, 7, 5: 577-590.
- Mahoney, J. T. 1992. Organizational Economics within the Conversation of Strategic Management in *Advances in Strategic Management*, Vol. 8, Greenwich, CT: JAI Press, Inc., 103-155.
- March, J. 1994. *A primer in decision making*. Free Press.
- March, J. G. 1991. Exploration and exploitation in organizational learning. *Organization Science*, 2: 71-87.
- March, J.G. & Simon, H.A. 1958/1991. *Organizations*. New York: John Wiley.
- Marengo, L. (1999), Decentralisation and market mechanisms in collective problem-solving, mimeo.
- Matusik, S. & C. Hill. 1998. The utilization of contingent work, knowledge creation, and competitive advantage. *The Academy of Management Review*, 23, 4: 680-697.
- McClelland, 1965. Towards a theory of motive acquisition. *American Psychologist*: 221-233.
- Milgrom, P. & Roberts, J. 1995. Complementarities and fit strategy, structure, and organizational change in manufacturing. *Journal of Accounting and Economics* 19: 179-208.
- Milgrom, P. R. & Roberts, J. 1992. *Economics, organization, and management*. Englewood Cliffs, NJ: Prentice-Hall.
- Nelson, R. & Winter, S. 1982. *An evolutionary theory of economic change*. Cambridge, MA: The Belknap Press.
- Nelson, R. 1991. Why do firms differ and how does it matter? *Strategic Management Journal*, 12: 61-74.
- Nonaka, I. & H. Takeuchi. 1995. *The knowledge creating company*. Oxford University Press.
- Nonaka, I. 1994. A dynamic theory of organizational knowledge creation. *Organization Science* 5: 14-37.
- Parkhe, A. 1993. Strategic alliance structuring: A game theoretic and transaction cost examination of interfirm cooperation. *Academy of Management Journal*, 36: 794-829.
- Pavitt, K. (1999), *Technology, Management and Systems of Innovation*, Cheltenham, Edward Elgar.
- Penrose, E. 1959. *The theory of the growth of the firm*. Oxford: Basil Blackwell.
- Peteraf, M. A. 1993. The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal* 14: 179-191.
- Pfeffer, J. & Langton, N. 1993. The effect of wage dispersion on satisfaction, productivity, and working collaboratively: Evidence from college and university faculty. *Administrative Science Quarterly*, 38: 382-407.
- Pfeffer, J. 1982. *Organizations and organization theory*, Pittman, Boston.
- Polanyi, M. 1967. *The Tacit Dimension*. New York, NY: Doubleday

- Poppo L. & T. Zenger. 1998. Testing alternative theories of the firm: Transaction cost, knowledge-based, and measurement explanations for make-or-buy decisions in information services; *Strategic Management Journal*, 19, 9: 853-877.
- Porter, M. E. 1996. What is strategy. *Harvard Business Review*, 746 November-December: 61-80.
- Rumelt, R. P. 1995. Inertia and Transformation, in C. A. Montgomery, (Ed.), *Resource-based and Evolutionary Theories of the Firm*, Boston: Kluwer Academic Publishers, 101-132.
- Schumpeter, J. A. 1950. *Essays on Entrepreneurs, Innovations, Business Cycles, and the Evolution of Capitalism*, Transaction Publishers, New Brunswick.
- Selznick, P. 1957. *Leadership in Administration*, Berkeley: Harper & Row..
- Smith, A (1776)
- Stein. J & Ridderst le. 1996. Managing the Dissemination of Competences. *Working Paper*. The Stockholm School of Economics
- Teece, D. J., Pisano, G., & Shuen, A. 1998. Dynamic capabilities and strategic management. *Strategic Management Journal*, 18: 509-533.
- Teece, D. J., Rumelt, R. P., Dosi, G., & Winter, S. G. 1994. Understanding corporate coherence: Theory and evidence. *Journal of Economic Behavior and Organization*, 23: 1-30.
- Tushman, M. L. & Anderson, P. 1986. Technological discontinuities and organizational environments. *Administrative Science Quarterly*: 31:3: 439-465.
- Williamson, O. 1985. *The economic institutions of capitalism*. New York: Free Press.
- Williamson, O. 1996. *The mechanisms of governance*. Oxford: Oxford University Press.
- Williamson, O. E. 1991. Comparative economic organization: The analysis of discrete structural alternatives. *Administrative Science Quarterly*, 36: 269-296.
- Williamson, O. E. 1998. Strategy research: Governance and competence perspectives. *mimeo*. Druid Conference 1998, Bornholm.
- Winter, S. 1987. Knowledge and competence as strategic assets. In: *The competitive challenge*. D. Teece (ed.), 159-184. Cambridge, MA: Ballinger.
- Winter, S. G. 1988. On Coase, competence, and the corporation. *Journal of Law, Economics, and Organization*, 4, 163-80.
- Winter, S.G. (1982), An Essay on the Theory of Production, in H. Hymans (ed.), *Economics and the World around It*, Ann Arbor, University of Michigan Press, pp. 55-93.
- Zenger, T. R. 1992. Why do employers only reward extreme performance? Examining the relationships among performance pay and turnover. *Administrative Science Quarterly*, 37: 198-219.
- Zenger, T. 1994. Explaining organizational diseconomies of scale in R&D: The allocation of engineering talent, ideas, and effort by firm size. *Management Science*, 40(6): 708-729.
- Zenger, T. R; & Hesterly, W. S. 1997. The disaggregation of corporations: Selective intervention, high-powered incentives, and molecular units. *Organization Science*, 8,3: 209-222.