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Managing 'collisions' between entrepreneurial networks and industrial supply chains: a modified Penrosian perspective

Richard Blundel

Abstract

One of the most perplexing management challenges concerns the relationships between larger and smaller organisations, a typical example being the ties between a long-established corporation and a newly-established supplier firm. The paper explores contrasting ways in which the 'focal firm' network most commonly associated with smaller, entrepreneurial ventures engages with the characteristically vertical network morphology associated with established industrial supply chains. The central argument, which builds on the extensive literature relating to inter-organisational networks, is that empirical research in this area lacks appropriate conceptual tools to address the complex and dynamic interactions that arise from 'collisions' between these contrasting network types. A simple explanatory framework is introduced, which is based around an extension of the Penrosian concept of 'productive opportunity' (Penrose 1959, Best 2001). The framework indicates four generic interaction patterns ('classical' 'centrifugal', 'centripetal' and 'collateral'), derived when the different forms of productive opportunity are coupled with the relative stability of the relevant inter-organisational relationships. The principal features of each pattern are outlined, and their dynamics are depicted in four brief, case-based cameos. The concluding section indicates possible refinements and assesses the implications for future research and practice.

Keywords: *entrepreneurial networks; supply chains; interaction; Penrosian learning; productive opportunity.*

INTRODUCTION

Inter-organisational networks: the challenge of engagement

One of the most perplexing management challenges concerns the terms and dynamics of engagement between larger and smaller organisations. This paper is concerned with the concepts that are used to make sense of these complex inter-organisational relationships. It identifies a limitation in the network literature, regarding the processes underpinning these network ‘collisions’, and proposes a framework that may help to clarify the different dynamics that are generated. The primary focus of the paper is on the processes that are initiated when a growing entrepreneurial network begins engage with the characteristically vertical network morphology of an industrial supply chain. Unequal engagements of this kind are relatively commonplace phenomena in the contemporary industrial landscape. Examples might include a high technology start-up forming a high-profile strategic alliance with an established telecommunications company, or a specialist food manufacturer entering into a long-term supply contract with an international multiple retailer. However, these relationships raise a number of questions for researchers, policy-makers and practitioners. For example: why are the consequences of these interactions so varied?; is there any pattern to the complex interactions observed in such situations?; and what kind of trajectory should either party anticipate as the relationship develops? The paper begins with an introduction to the inter-organisational network literature and a more focused review of the existing literature on entrepreneurial network morphologies and processes, and the empirical evidence for ‘collisions’ with industrial supply chains. It then turns to the conceptual and practical challenges posed by interaction with these powerful network forms.

LESSONS FROM THE NETWORKS LITERATURE?

The business networks perspective

The closing decades of the last century saw a ‘surging wave’ of publications addressing the nature and dynamics of inter-organisational relationships (Ebers 1999: 4). Theoretical re-assessment built on Richardson’s (1972) insight into inter-firm co-operation, providing a cogent and enduring conceptual challenge to the prevailing dichotomy of markets and hierarchies:

I was once in the habit of telling pupils that firms might be envisaged as islands of planned co-ordination in a sea of market relations. This now seems to me a highly misleading account of the way that industry is in fact organised. (Richardson 1972: 883)

Conceptual development was driven by an accumulation of empirical material, sometimes anecdotal, but increasingly supported by more detailed research, which pointed to the (re)invention of inter-organisational networks in a variety of industrial settings (e.g. Best 1990, Grandori and Soda 1995, Håkansson and Snehota 1996, Sabel and Zeitlin 1997, Birkinshaw and Hagström 2000). With the removal of Coasian certainties, researchers of many persuasions were attracted into the field, stimulating an intense period of re-assessment and speculation:

The recent proliferation of network organizational forms that don’t fit neatly into either the market or hierarchy frameworks proposed by Coase to explain economic change has resulted in some scrambling to explain how such organizations are governed. (Larson 1992)

The most obvious result of this academic ‘scrambling’ is the rich ontological and epistemological variety of contemporary network theory (Note 2). The diversity is reflected

in competing conceptualisations of inter-firm networks (Thorelli 1986, Powell 1990, Hakansson and Snehota 1995), and in a tendency for researchers to specialise in specific network types (e.g. entrepreneurial networks, industrial districts, supply chains). One side-effect of this specialisation has been that each manifestation of network organisation has been exposed to a different 'mix' of contributory disciplines, including geography, economics, history, entrepreneurship and industrial marketing. These intellectual differences are reflected in distinctive approaches, emphases and terminology, posing a challenge to those wishing to draw out common features (Blundel and Smith 2001). Awareness of these complexities has prompted expressions of concern that this network research is becoming, in Nohria's (1992: 3) memorable phrase, 'a terminological jungle in which any newcomer may plant a tree.' More than two decades ago, a review of social network analysis techniques argued that, 'a coherent framework' was needed to capture prescribed and emergent network processes (Tichy *et al* 1979: 507). More recently, Oliver and Ebers (1998) have called for future research to develop useful conceptualisations of the processes involved in inter-organisational networking, including both the 'triggers' and the consequences. However, the continuing growth of network-related studies has contributed relatively little to conceptual consolidation or coherence:

To the contrary, the increase in the number of studies has contributed to a rather messy situation marked by a cacophony of heterogeneous concepts, theories and research results. (Oliver and Ebers 1998: 549)

It is in this context that the present paper proposes a modest exercise in drawing together network concepts from two of the broad sub-fields, entrepreneurship and supply chain management. The paper considers seemingly 'hidden' processes that transcend established network typologies by exploring the dynamics of engagement between two nominally distinct network types. In order to present a clear and concise set of illustrations, it addresses these processes from the perspective of the *entrepreneurial network* only (i.e. the illustrations neither preclude nor claim precedence over alternative perspectives). The argument proceeds as follows. Following a brief review of the relevant literatures, a simple framework is outlined, which describes four generic trajectories for entrepreneurial networks, under different contingencies. These trajectories are illustrated using case material, questions are raised and some provisional conclusions are drawn.

The distinctive morphology of entrepreneurial networks

Research suggests that entrepreneurial networks have a distinctive morphology. At their core, these networks tend to comprise a few strong, 'multiplex' (i.e. multi-purpose) ties. Their combination of economic and affective/emotional content has been identified as providing the core entrepreneurial venture with a shelter from the opportunism and uncertainty of the market (Aldrich *et al.* 1989). Entrepreneurial networks also contain many links to external sources of knowledge and experience through overlapping 'weak ties' (Granovetter 1973, Leonard-Barton 1984, Aldrich and Zimmer 1986). Together, these form a low density or 'loose-knit' structure in which linkages can remain dormant and are readily interchanged. Research of this kind has challenged an ingrained Western image of entrepreneurship as a highly individualistic phenomenon, presided over by 'heroic' figures of the kind depicted in many entrepreneurial (auto)biographies (Gray 1998, Jones and Conway 2000). However, identifying the general 'shape' of an entrepreneurial network is a necessary but not a sufficient condition for explaining its inherent potential to create and sustain innovation. As several commentators have noted recently, it is also important to understand how the network operates over time:

In my view, the addition of a much needed dynamic perspective to heretofore largely static research designs, coupled with analyses of intra- and inter-firm organizational learning processes, represent the most noteworthy recent developments in the field.' (Ebers 1999: xi).

There has been considerable progress in the investigation of process, both in the broader entrepreneurship literature and in the entrepreneurial network field. The following subsection highlights the areas in which our understanding of entrepreneurial ventures has already been enhanced. It is followed by a critique, identifying an important limitation in current theory.

Entrepreneurial network formation and development

The process of *creating* a network is now identified as a key entrepreneurial activity, and has been the subject of many studies (Aldrich *et al.* 1989; Birley 1985; Gartner *et al.* 1992; Johannisson 1996; Larson 1992; Larson and Starr 1993). One of the initial findings, which is supported by subsequent work, is that entrepreneurs rely primarily on *informal* sources in their personal contact network (PCN) to mobilise resources before the formation of a venture (Birley 1985: 113). If one accepts a Kirznerian view of entrepreneurship, the make-up of the personal network takes on a key role. It becomes an 'opportunity set' (Aldrich and Whetten 1981), enabling the entrepreneurial actor(s) to become aware of opportunities that are not apparent to others. The time and energy that entrepreneurs invest in these 'pre-organisational' networks appears to be converted into future benefits for their emerging firms (Hansen 1989, cited in Larson and Starr 1993: 8). This is likely to include both human capital, in the form of relevant experiences, skills and knowledge, and social capital in the form of being trusted by other parties. Trust can facilitate access to resources (i.e. collaboration and sharing) and help to overcome institutional barriers to entrepreneurial activity (e.g. local political resistance to a proposed development). The extensive *personal* ties used by entrepreneurs often lead a blurring of business and social life, with mixed consequences. Research in the United States, Ireland, Sweden and elsewhere has identified similar personal contact networks with overlapping social and business relationships (Cromie and Birley 1992; Dubini and Aldrich 1991; Johannisson 1996). Entrepreneurs appear to use these personal networks in distinctive ways. More specifically, it is the process of *enactment* involved in entrepreneurial networking that distinguishes it from the more conservative or 'managerial' type of networking that is characteristic of established ventures:

Within a *management* perspective, networks and coalitions, e.g. strategic alliances and joint ventures, represent just another calculated way to intermittently reduce environmental uncertainty. Entrepreneurial networking, in contrast, means expanding the action frame of the venturing process. Entrepreneurs *continuously* network as they pursue and react to new realities. (Johannisson 2000: 368 - emphasis added)

While it might be argued that *all* start-up ventures make what Johannisson would regard as an 'entrepreneurial' use of their personal networks, most of these resolve themselves into a rather limited set of ties, beyond the dense core of the network. This characteristic morphology gives rise to a similarly constrained pattern of interactions that persist for extended periods. Hence, the typical small firm network is observed has been in previous cross-sectional studies as relatively homogenous, stable and inert (e.g. Curran *et al.* 1993). Entrepreneurs, in contrast, continue to engage in network development, with the more or less explicit aim of expanding the existing venture, or with a view to establishing new formations. This recursive process depends upon the existence of a broader and more diverse 'latent network'

(Ramachandran and Ramnaryan 1993) than is typical of other small firms. Weak ties in the latent network are activated as required, providing flexibility of response and the opportunity to innovate through the creation of novel combinations (Schumpeter [1934] 1961). Entrepreneurial network activity thus appears consistent with previously revealed morphological characteristics, such as diversity of ties and 'loose-knit' structure. By exploring entrepreneurial networks in a longitudinal and process-based perspective, it is possible to see connections between forms of 'portfolio' and 'serial' entrepreneurship (Carter 1998, Scott and Rosa 1996), where the entrepreneurial network provides the foundation for several interlocking ventures over a period of time. Each venture is a separate, yet linked outcome of the personal networking of an entrepreneur or entrepreneurial team. It also draws attention to the differing dynamics of entrepreneurial networks and those of other small firms:

In such a perspective individual ventures appear as condensations of nodes and ties in the personal network, demarcated in space and time. The birth of a venture may then be seen as the institutionalization of a part of the entrepreneur's personal network. (Johannisson 2000: 373)

This insight has important theoretical and practical implications. As entrepreneurial actors engage in networking, they are changing both the network's structure and its flows. Given this constitutive role, it is particularly important to recognise that any depiction of an entrepreneurial network can be no more than a 'snapshot', mapping the current position in an ongoing process. The subjective perceptions of entrepreneurial actors are also highlighted in this dynamic conceptualisation, recasting the network as a context in which 'productive opportunities' are identified, and as a medium through which they are both enabled and constrained (Penrose 1959: 31, Best 2001: 64-66). Furthermore, the abundance of linkages that arise from entrepreneurial networking can, in certain circumstances, create interfaces with unfamiliar network forms, such as those associated with industrial supply chains. The next section considers why such network interactions be worthy of more detailed exploration.

NETWORK INTERACTION: A 'BLIND SPOT' IN PROCESS THEORY?

The theoretical case for studying network interaction

Considerable effort has been expended in exploring the network processes associated with the *initial* phases of entrepreneurial venture creation. However, there remains a 'blind spot' in processual research, where the continuing growth of an entrepreneurial network brings it into contact with other network forms. The challenge presented in this paper is to explore the processes in play when entrepreneurial networks confront industrial supply chains. Interactions of this kind are not addressed in existing models of entrepreneurial network evolution (Butler and Hansen 1991, Larson and Starr 1993), yet they give rise to important conceptual and practical questions. For example, how do different network forms interact?; and what are the longer-term consequences of such interactions for the reproduction of knowledge practices in at the level of the entrepreneurial firm? Questions of this nature, which cut across the established boundaries of network research, appear to offer considerable scope for development. There are also practical implications for industrial policy and for business-level strategy.

The empirical basis for network collision

Some of the most compelling manifestations of network collision are to be found in the spatial networks literature. Here, they provide an empirical foundation to the protracted and largely unresolved debate over the relative power of regionalised networks and global supply chains. The issues arising are illustrated in a recent study, conducted in the opto-electronics industry (Brown and Hendry 1997). The researchers identified an increasing overlap between

industrial districts and vertical supply chain networks. In a battle between the tight vertical linkages of the supply chain and the geographical specificities of the industrial district, the former is proving to be the more potent network form:

Increasingly, industrial districts are influenced by supply chain factors. Baden Wurtemberg, for example, includes large firms that dominate the supply chain [...] while supply chains attempt to acquire such industrial district characteristics as trust and partnership and often involve clusters of firms in close geographical proximity. (Brown and Hendry 1997: 131)

Network collisions are also apparent in recent studies addressing relationships between multiple retail organisations and small-medium supplier firms (Blundel and Hingley 2001, Blundel 2000, 2002). These studies presented a detailed account of interactions between network structures, network flows and firm-level phenomena. They identified radical changes in the focal firm networks of ‘developmental’ suppliers, which followed a period of engagement with specific vertical networks, in this instance those associated with the supply chains operated by multiple food retailers:

The evidence collected in the fresh produce supply chain suggests that developmental suppliers are, in effect, ‘learning’ from their large retailer customers, both directly, by acquiring knowledge (e.g. market intelligence, technical specifications, improved logistics) and indirectly, as their responses to the challenges of innovation and re-investment generate new demands and a further cycle of activity and experience. This learning and re-investment both supports, and is supported by, the supplier status transitions, enlarging what Penrose termed their ‘productive opportunity’. For better or worse, it is this recursive interaction which contributes to the rapid growth of favoured supplier firms (Blundel and Hingley 2001: 260)

Productive opportunity: extending the Penrosian learning dynamic

The Penrosian concept of productive opportunity can assist in overcoming this apparent blind spot in processual explanations of the growth of entrepreneurial networks. It is important to recognise that Penrose’s original (1959) argument was developed in the context of a single industrial firm. Indeed, she took great care to establish limits to her theory of growth with reference to the firm’s administrative boundaries; these were operationalised as the area of ‘authoritative communication’, a term that she derived from Chester Barnard’s classic managerial study (*ibid.* 20). Penrose argued that a firm’s capacity to generate specific ‘productive services’ (i.e. what are now generally termed ‘capabilities’) was directly related to the process by which authoritative communication was developed within the core managerial team. Anticipating much of the recent literature in the field of knowledge creation and management, she pointed out that both explicit and tacit knowledge (i.e. in her terms, ‘objective knowledge’ and ‘experience’), had to develop together over time as new managers were introduced into the firm. This fundamental insight, which Penrose termed the ‘receding managerial limit’, was intrinsically connected to her concept of productive opportunity:

The experience gained is not only of the kind [...] which enables a collection of individuals to become a working unit, but also of a kind which develops an increasing knowledge of the possibilities for action and the ways in which action can be taken by the group itself, that is, by the firm. This increase in knowledge not only causes the productive opportunity of a firm to change in ways unrelated to changes in the environment, but also contributes to the ‘uniqueness’ of the opportunity of each individual firm. (Penrose 1959: 52-3)

The question raised by this paper is whether a similar dynamic, combining capability development and changing managerial perception, is evident in the kinds of close dyadic

relationships outlined above. If this is the case, the Penrosian concept of productive opportunity may have a useful role when it is redeployed at the network level of analysis, highlighting the importance of subjective perceptions of entrepreneurs, and how these are shaped by their pattern of interactions over time (Loasby 1999, Mathews 2001). In the next section, productive opportunity is applied in an effort to conceptualise the dynamics of engagement between entrepreneurial networks and industrial supply chains.

CHARACTERISING NETWORK INTERACTIONS

Introducing the four interaction patterns

This section identifies four distinctive patterns of interaction between entrepreneurial networks (EN) and industrial supply chains (ISC). For the purposes of this exploratory review, the four patterns are presented along two discrete dimensions, the first representing the nature of the ‘productive opportunity’ and the second relating to the degree of dynamism in the engagement (Figure 1). The first dimension reflects the idea that engagement in close dyadic relationships tends to reveal new ‘productive opportunities’ (Penrose 1959), which are themselves embedded in the pre-existing network structures:

Firms learn, but in the context of what they can know. The disposition of the availability of knowledge is structured by the structure of social relations. What firms know is determined by their position in an industrial network. (Kogut 1993: 145).

Hence, actors in an entrepreneurial network may become aware of productive opportunities that draw them closer to the ‘corporate’ web of the industrial supply chain, or they may continue to draw on ‘independent’ sources of opportunity through other branches of their expanding network. The implication, consistent with the Penrosian model, is that the nature of these productive opportunities represents a powerful influence on learning, and hence on the growth trajectory of the entrepreneurial network. The second dimension is based on the idea that connections between entrepreneurial networks and industrial supply chains can vary between relatively stable/static arrangements, in which some form of equilibrium is established, and more unstable/dynamic ones in which inter-network flows generate morphological change, restructuring the relationship between the parties. The contention is that these two dimensions combine, under as yet unspecified contingencies, creating a propensity for the entrepreneurial network to develop in particular directions:

- **‘Classical’ interaction patterns:** where EN has little or no engagement with an ISC, and its subsequent development is unrelated.
- **‘Centrifugal’ interaction patterns:** where EN engagement with an ISC leads to a degree of isomorphism and possible absorption.
- **‘Centripetal’ interaction patterns:** where EN engagement with an ISC leads to a degree of differentiation and possible expulsion.
- **‘Collateral’ interaction patterns:** where EN engagement with an ISC leads to parallel development, with balancing effects.

INSERT FIGURE 1 ABOUT HERE

At this exploratory stage, the main aim is to consider whether analytically distinct patterns of entrepreneurial network development can be mapped using the basic framework. The four interaction patterns are introduced using case-based cameos, which have been selected for illustrative purposes only. The discussion section addresses some of the limitations of the basic framework, and indicates some potential refinements.

Classical EN interaction patterns – the ‘independent’ entrepreneurial network

Classical EN interaction patterns pursued by entrepreneurial networks that remain effectively disengaged from any major industrial supply chains operating in a particular industry or sector. Hence, while the EN may form new connections, giving rise to separate ventures over time, its networking activity does not bring it into close or persistent contact with the large, established vertical networks that channel the supply and distribution of goods and services. In most respects this is the most straightforward of the four interaction patterns, but it remains difficult to summarise, due to the wide variety of ENs engaging in relationships of this kind. For instance, many small businesses succeed in occupying small but defensible market niches, which have little or no recourse to industrial supply chains (e.g. a costume jewellery maker, reaching customers via local markets, through a self-created network of specialist outlets, or via the internet). Artisanal firms may form localised and largely self-contained networks or clusters, which display some characteristics of entrepreneurial networking, without the participation of a larger corporate actor (Note 4). Various forms of ‘social’ entrepreneurship, in which commercial factors are marginalised or superseded, can also be seen as relatively ‘pure’ or classical entrepreneurial network forms (e.g. a local, community-based charitable organisation). The independence of these networks can be explained in terms of their relationship with industrial supply chains, and the productive opportunities perceived by entrepreneurial actors. The key distinguishing characteristic of the Classical EN pattern is that the network displays a capacity to generate sufficient resources to maintain, and in some cases to defend, its separate existence. However, the co-existence of Classical ENs and more powerful and avaricious network forms, such as contemporary ISCs, may be no more than ‘a particular historical formation.’ (Hendry *et al.* 2000: 140). The independence of Classical ENs can be swept away by the deliberate – or inadvertent – actions of corporate actors. For example, the status of many voluntary organisations (e.g. child welfare and international development charities) has changed in the last two decades, as they have been drawn into closer relationships with government agencies, often acting as direct service providers. Independence can also be eroded when the network’s entrepreneurial actors perceive opportunities that lie beyond its existing pattern of linkages. The implication is that researchers need to look beyond the *formation* of an entrepreneurial network, recognising that the factors that set it on a ‘classical’ pattern, may prove to be transitory. This phenomenon is exemplified by changes taking place amongst spatial clusters in the opto-electronics industry. The continued existence of these Classical EN forms has been challenged by a combination of international outsourcing and market development:

While untraded interdependencies may help to cement a cluster, they could be regarded as a residual feature, created out of localized trading patterns. Pragmatically, the issue then is, if those trading patterns change, will local institutions and relationships also decay or can they continue to nourish local firms so that the cluster retains its vitality. (Hendry *et al.* 2000: 140)

Centrifugal EN interaction patterns – the biotechnology start-up

Centrifugal interaction patterns involve an independent venture, spawned by an entrepreneurial network, forming strong ties with an industrial supply chain. The consolidation of these cross-network connections initiates a process of assimilation. The boundaries of the EN are redrawn as the venture becomes incorporated within the vertical ISC

network. This pattern is typified by many start-up ventures in the biotechnology sector. Intellectual property is created through the activity of a network comprising scientists, medical practitioners and business managers, often under the auspices of a university department. The venture is 'entrepreneurial' in the sense of being both innovative and growth-oriented. It is normally incorporated at an early stage, to provide a legal and financial vehicle for research and development activity. However, its separate existence is likely to be brief. As research efforts proceed, the pattern is distinguished by its increasingly strong (multiplex) links with an industrial supply chain, in this instance, an international pharmaceutical company. Ventures of this kind have an explicit 'exit strategy', maximising the market value of the legal entity within which the intellectual property is held. This entrepreneurial networking strategy is based on a pragmatic evaluation of market dynamics. In short, the commercialisation stage requires the marketing and distribution resources of the larger organisation. The relationship with the supply chain is a dynamic one, which changes dramatically as the 'idea' moves from the laboratory through to clinical trials. In addition, the productive opportunity, from the perspective of the entrepreneurial network, is closely tied to the established vertical linkages of the large corporation. In the case of the biotechnology venture, the pattern is evident *ex ante* to the entrepreneurial actors. Other centrifugal interaction patterns may be less transparent. Consequently, in contrast to the Collateral EN interactions pattern (see below), owner-managers of an entrepreneurial venture are likely to find themselves drawn towards ever-closer collaborative relationships with their key suppliers or distributors.

Centripetal EN interaction patterns – the television production company

Centripetal interaction patterns result in the creation, and subsequent ejection, of a differentiated entrepreneurial network from within the confines of an industrial supply chain. In a typical case, the network is formed by a small group of employees in an established corporation (e.g. a specialist team of film-makers, producers and engineers working for a national television company). In some cases, the opportunity perceived by these 'intrapreneurs' (Kanter 1993) proves to be consistent with the strategy, governance mechanisms and operational characteristics of the host corporation. However, entrepreneurial networking activity often reveals productive opportunities beyond its legal and financial boundaries. When this perception on the part of the nascent intrapreneurial team is combined with a degree of instability/dynamism in the relationship between the two network forms (e.g. the corporation initiates outsourcing or downsizing of existing operations; long-established isolating mechanisms are undermined by legal or technological changes), an entrepreneurial network may succeed in breaking away. In the British television industry, for example, many independent production companies have followed this pattern, creating new entrepreneurial networks around substantially reconfigured corporations (Barnatt and Starkey 1994). While networks pursuing a centripetal pattern may retain close dyadic links into their former employer, they also display distinctive network dynamics, based on knowledge flows emerging from interactions with other entrepreneurial networks (e.g. Brunninge 2000).

Collateral EN interaction patterns – the supermarket supplier

Collateral interaction patterns arise when an entrepreneurial network establishes a relatively stable relationship with an industrial supply chain. In contrast to the centrifugal trajectory, there is little or no assimilation, though the development of closer dyadic relationships may prompt a degree of isomorphism. The specialist small-medium food producer engaged in a close supply relationship with a multiple food retailer typifies this trajectory. The entrepreneurial supplier's knowledge and capabilities (e.g. in relation to complex and uncertain processes such as the supply of fresh produce to 'continuous consistent quality')

standards) provides an isolating mechanism, which stabilises the relationship. These dyadic links are consistent with Richardson's (1972) case of organisations involved in 'closely complementary' but 'dissimilar' activities. Entrepreneurial network actors recognise the productive opportunities arising from close co-operation with large corporations in an established supply chain. Given this pattern of interaction, there is no *prima facie* expectation that the 'balance' between the two network forms will be disturbed. However, the apparent stability masks other mechanisms that harbour centrifugal potential. The foremost of these is the 'dynamic' aspect of capabilities. For example, in my own research, it was evident that suppliers were developing new firm- and network-level capabilities as a result of their connection to industrial supply chains. Furthermore, these capabilities shared many characteristics with those of larger, industrialised suppliers (Blundel 2000, 2002). The power of these isomorphic changes requires further investigation. However, the evidence suggests that it can be sufficient to draw entrepreneurial networks into much closer connection with the large corporations co-ordinating these complex vertical networks. One important counter-argument, to set against the more fatalistic and path-dependent interpretations of this outcome, is that entrepreneurial agents have the capacity to anticipate threats to existing isolating mechanisms, leading to possibility of micro-strategic adaptation. The role of the pre-existing entrepreneurial network is likely to play a crucial role in this process, as a medium through which differentiation can be sustained, through the re-activation of latent ties, for example.

CONCLUDING DISCUSSION: APPLYING THE FRAMEWORK

The four interaction patterns: a common starting-point

The four interaction patterns presented in this paper represent a convenient framing device, which provides a common point of departure for more focused conceptual and empirical questions. For example: in what ways are centrifugal interaction patterns modified by national institutional frameworks or sectoral characteristics?; how do collateral interaction patterns vary within and between industries?; how do centripetal interaction patterns unfold over time?; are the mechanisms driving the 'migration' of productive opportunity across networks common to all interaction patterns?; what are the consequences of particular interaction patterns at firm and network levels of analysis? Addressing these questions requires a range of analytical tools. The primary contribution of the framework is thus seen as integrative rather than analytical. Future research should be based on useful conceptualisations of the *processes* involved in inter-organisational networking, including both the 'triggers' and the consequences (Oliver and Ebers 1998). These efforts would be enhanced by more frequent, and more fine-grained, application of qualitative methodologies. In their review of the literature, Oliver and Ebers (1998) argue that processual studies of this kind have been under-represented to date:

This could be why we find relatively little thick description in the literature of, for example, the relations and interplay between the formal and informal aspects of networking, or the processes, ambiguities, conflicts and cognitive schemes that play a role for network relations and design. (Oliver and Ebers 1998: 558)

Refining the framework

Like any conceptual framework, this depiction of four generic interaction patterns requires refinement in the light of research evidence. For example, it is important to establish whether the patterns illustrated by the four cameos can be generalised to other institutional settings (Casper and Kettler 2001). Furthermore, it may be more appropriate to represent the two dimensions as continua, rather than in a simplified '2x2 matrix' format. However, the

Penrosian resource-capability approach, which underlies the framework, offer one way in which researchers can *begin* to probe the dynamic interaction between these different network forms. A more detailed focus on process needs to take account of the ways that entrepreneurial actors construct their environments, but also needs to consider context in which entrepreneurial agency is exercised. The interaction patterns framework enables researchers to abstract both of these dimensions from the inherent complexity of interactions between entrepreneurial networks and industrial supply chains. The paper has raised a number of issues relating to entrepreneurial networks, and their relationship to industrial supply chains. It has argued that process-based explanations of entrepreneurial network development need to be extended to incorporate their tendency to ‘collide’ with these large, powerful and ubiquitous network forms. Lastly, the paper has touched on a broader question, regarding the contribution of business network research. It has supported the argument that, while much has been achieved, there is now a need for consolidation and refinement. A modified Penrosian framework has been presented as one potentially fruitful starting-point on the path towards (re-) integration.

NOTES

- 1 The initial impetus for this paper was a series of discussions arising from a policy-oriented literature review on business networks, prepared for the UK’s Small Business Service (Blundel and Smith 2001). This indicated the lack of cross-fertilisation between research efforts that focused on distinct network ‘types’.
- 2 Detailed debate over the ontological status of business networks is beyond the scope of this paper. References to network mapping may suggest a ‘realist’ perspective (i.e. that networks exist ‘out there’ (Fletcher 1998: 8). However, the Penrosian concept of ‘productive opportunity’, which is applied in the later sections, reflects constructionist insights. Furthermore, the pursuit of a process perspective (Reed and Hughes 1992, Ebers and Grandori 1999), is suggestive of a critical realist ontology, capable of incorporating the perceptions of entrepreneurial agents and other network actors (Tsoukas 1989, Whittington 1989, Sayer 2000).
- 3 These findings, regarding the effect of supply relationships on smaller firms, contrast with the more cautious conclusions of recent policy-oriented studies (Competition Commission 2000, Dobson Consulting 1999). One reason for this apparent anomaly is that the latter studies have adopted ‘static’ research methods, typified by cross-sectional and aggregated measures of buyer power. These tend to underplay the dynamics of inter-firm relationships and hence the potential for organisational learning, entrepreneurial agency and mutual adjustment amongst networked firms (Best 1990, Ebers 1999: 202). Sobrero and Schraeder’s (1998) distinction between ‘contractual’ and ‘procedural’ dimensions of co-ordination provides a helpful point of clarification here:

Several authors assume that contractual and procedural co-ordination are closely linked to each other [...] Empirical evidence, however, suggests that this is not necessarily the case. (Sobrero and Schraeder 1998: 592)

Evidence from the food sector provides additional support for the view that, in conflating these two dimensions, researchers are obscuring distinct mechanisms of network governance. (Inter-) organisational learning arising from procedural co-

ordination can have important countervailing effects on relationships where the contractual dimension appears unfavourable to the smaller firm. The power exercised by larger firms can undoubtedly lead to an inequitable distribution of the returns generated by 'value added' (Hardy, 1996). However, it is also clear that such relationships can 'broaden the horizons' of the supplier, exposing them to new ways of thinking and acting.

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Figure 1: Fundamental modes of engagement and networking interaction patterns

Nature of EN-ISC relationship	Dynamic	Centripetal	Centrifugal
	Static	Classical	Collateral
		Independent	Corporate
Nature of EN 'productive opportunity'			