Executive summary

1. The Department of Trade and Industry's Small Business Service (SBS) is concerned with helping small firms realise their potential, developing business support services that enhance the performance of small firms and promoting enterprise across our society. Consequently, an area of growing interest both for the DTI in general, and the SBS in particular, is to assess the part that business networks play in achieving these policy objectives.

2. The term 'network' is used in a number of ways. As well as business networks one can distinguish physical networks, such as those used by computer systems, and personal and social networks, comprising relatives, friends and acquaintances. They are not normally part of the value chain delivering service/goods to the customer. Business networks are normally directly concerned with the conduct of business. They are inter-organisational. Typically, these organisations include other businesses, trade associations, chambers of commerce, professional bodies and public sector agencies. Their role is often an enabling one that facilitates the operation of the business, for instance in service delivery or new product development.

3. There are many different definitions of the term 'business network', the following being a typical example:

   > *A select, persistent and structured set of autonomous firms (as well as non-profit agencies) engaged in creating goods or services based on implicit and open-ended contracts.* (Jones, Hesterly and Borgatti 1997)

   This clearly identifies business networks as involving inter-firm collaboration. However, given the policy context of the SBS, we propose the following, more comprehensive definition:

   > *A complex pattern of formal and informal linkages between individuals, businesses and other organisations such as government and voluntary agencies.* (Blundel and Smith 2001)

4. It is possible to identify a number of different types of business network. Though there are others, this study distinguishes four types:

   - **Industrial districts/clusters**. These comprise spatial concentrations of firms in a single or closely related line of work. Well known examples would include Silicon Valley and the textile region of Northern Italy

   - **Supply chain networks**. Typically these consist of producers of final products and the associated chain of suppliers. They are often represented as hierarchical or pyramid-shaped with the producer of the finished product at the top and tiers of suppliers underneath. Examples include the automotive and aerospace industries

- **Entrepreneurial networks**. These 'ego-centric' network structures are created out of the personal contacts of entrepreneurs. New and existing links are 'enacted' in a variety of ways, to create new ventures (i.e. start-ups) and to redirect current business activities into other areas (i.e. diversifications, 'serial' and 'portfolio' entrepreneurship).

- **Innovation networks**. A relatively new form of network comprising a loose-knit group of knowledge-intensive firms and other organisations that contribute to the development of new products and services. They are sometimes found in dynamic spatial clusters (e.g. 'Motorsport Valley' in Oxfordshire / Northamptonshire).

5. Several factors have contributed to increased interest in, and use of, business networks in recent years. The major technological factor has been developments in information technology, especially the convergence of computing and telecommunications technologies (ICT), leading to vastly improved voice and data transmission between organisations. These technologies are a facilitating factor, making it easier to establish links between business organisations for rapid, reliable and cheap information transfer. In addition, rising customer expectations have highlighted the role of external links in meeting customer needs, and increased use of outsourcing has stimulated the formation of network structures (e.g. a new breed of production-related firms surrounding the major television broadcasting companies).

6. The literature on inter-organisational networks gives rise to a number of important concepts, including the following:

    - 'Institutional thickness' (Amin and Thrift 1995) – the quantity and quality of support organisations associated with a particular network. The concept extends to the sense of common purpose shared by members of the network. Examples of institutions include: trade associations, clubs, universities, professional bodies and research agencies.

    - 'Untraded dependencies' (Storper 1995) – informal flows of information and support between firms within a network. The concept is both a cause and a consequence of collaboration. It is a form of reciprocity - firms are willing to help each other without immediate prospect of gain. As ties become more complex, it is possible to obtain additional benefits, such as a reduction in transaction costs (i.e. due to 'trust'), and the exchange of tacit knowledge. This can contribute to collective learning and thus enhance the pool of knowledge contained within a network.

    - 'Entrepreneurial networking' (Johannisson 2000) – this is characteristic of, but not restricted to, business start-ups. It can be distinguished from managerial networking by its conscious effort to expand the 'action frame' of a business venture. In other words, it focuses on the exploration of new network links, rather than simply the exploitation of existing ones.

7. A number of themes emerge from the literature on business networks which have a particular significance for *small firms*:

- The 'flexible specialisation' thesis, anticipating the demise of large multi-purpose business corporations, and the widespread emergence of small firm networks, proved to be exaggerated (Piore and Sabel 1984). However, as the review illustrates, the restructuring of larger businesses has created many new networking opportunities for *small firms*.

- Business networks are characterised by diversity. This is manifest in a variety of ways. Examples of diversity include structural, locational and linkage aspects of business networks. Network structures range from the ego-centric to the hierarchical. Similarly while some business networks are formed on a spatial basis, others are formed on a sectoral basis. The links between organisations range from informal ones based on friendship or family ties to arms' length contractual relationships or risk-sharing partnerships. Hence business networks are highly differentiated, though what they share is inter-firm collaboration.

- Business networks tend to be sector-specific. For example, while they are widespread in some sectors (e.g. medical equipment, motorsport, some forms of craft production), they are unknown in others. There are also major spatial variations in the scale and characteristics of business networks. Both of these factors militate against 'blanket' policies, and the assumption that a successful network model can be replicated elsewhere.

- Business networks are not static. They are dynamic and constantly changing. Business networks evolve. Through change comes renewal which helps to keep the network healthy. Networks that remain static and unchanging go into decline as, very often, do the firms within them.

- Business networks involve much more than market transactions (i.e. buying and selling). As indicated in the discussion of 'institutional thickness' and 'untraded dependencies', networks can become the medium for inter-firm partnerships where ideas, information, knowledge and expertise are exchanged and developed across the boundaries of the firm.

- The interests of the individual firm and those of wider the network do not necessarily coincide. For example, rapid staff turnover can adversely affect the short-term performance of a firm. However, the business network can benefit from the indirect effect of staff turnover, as specialist knowledge is 'churned', stimulating product and process innovation.

- Network 'governance' is a fundamental and often under-stated issue, where current arrangements can affect the longer-term performance of the network and its component firms. For example, the review questions whether new network governance arrangements in the television industry can provide the level of training previously undertaken by the major broadcasters. Just as corporate governance became an important topic of debate in the late 20th century, so network governance may well prove to be a significant policy issue for the future.

- The business network is not an entirely new concept. It is therefore important to identify both their continuing features and those that are novel or altered. The report indicates that industrial districts and supply chain networks have existed for many centuries. For example, the Lancashire textile industry and the Sheffield cutlery trade, were analysed by Alfred Marshall ([1920] 1986). However, it is clear that new patterns of network activity (e.g. those featuring close *collaborative* relationships between large and *small firms*) have emerged in the last two decades.

- Business networks contain many paradoxes. For example, successful networks achieve a fine balance between collaboration and competition. Firms may work closely together over certain issues, such as training or exporting, whilst at the same time competing vigorously in their home markets. Another important trade-off relates to the structure of a business network. This is the balance between 'exploring', (i.e. keeping the structure open and flexible), and 'exploiting' (i.e. running the existing structure as efficiently as possible).

8. Increased use of business networks is creating new opportunities for *small firms.* There are a number of factors at work, including greater interest in the supply chain, the growth of 'supply chain management' (i.e. managers taking a broader perspective than one confined to the systems over which they exert direct control) and the increased popularity of outsourcing, which is itself linked to developments such as core competences and resource-based strategy. All are helping to make business networks more widely used. Greater reliance on networks means scope for more small firm start-ups, especially as large firms cease to undertake certain activities, preferring to buy them in instead. At the same time business networks can make *small firms* more competitive. Where small firms are linked through a network to other firms, they can concentrate on those aspects of business where they have a competitive advantage while others in the network ensure the provision of an effective service (e.g. as in the chilled meals sector of the food industry, where *small firms* compete successfully as suppliers by delivering the variety and responsiveness demanded by the supermarkets).

9. It would be mistaken to portray business networks exclusively in positive terms. While they can be a source of substantial benefits for small firms, they can also exert an adverse influence. This is likely to occur in sectors that are in decline, where the network fails to renew itself and its inward perspective results in firms failing to break out and take up new opportunities.

Policy Implications

1. Public sector agencies often form an important part of the 'institutional thickness', that is a feature of many business networks. Privatisation and commercialisation may threaten these institutional arrangements, as information and knowledge that once circulated freely within the network becomes restricted because it has to be bought and sold. Hence public policy has to tread a 'fine line' between openness, which facilitates the diffusion of new ideas and new knowledge, and commercialisation that increases commercial applications, but may hinder the spread of knowledge/learning.

2. The scope for government in creating successful business networks appears to be very limited. Such networks tend to arise by chance rather than by design. They grow and develop organically. However if government cannot create networks it can support them, and there may be scope for shifting government policy away from support for individual *small firms*, in favour of supporting business networks where they are to be found, instead. Clearly any policy shift of this kind would have to be carefully monitored by **SBS**.

3. There appears to be a role for government in facilitating the establishment of common standards and protocols that enable *small firms* to work with large ones, by transferring information, materials and products (e.g. Chilled meals sector). Effective transfer facilitates links between organisations enabling networks to develop and thrive. But it is often difficult to reach agreement about standards, especially where there is intense competition. Government can take the role of neutral third party and it is has the power and resources to force through agreement between competitors.

4. Increased use of supply chain networks and innovation networks, suggests increased opportunities for *small firms* and new business start-ups. This has implications for government and **SBS**, in terms of ensuring the removal of obstacles to effective *small firm* start-ups and the provision of advice through **Business Links**. There may also be broader implications. As well as facilitating *small firm* start-ups and spin-offs, **SBS** could also encourage them by influencing education policy so that newly trained scientists and engineers are aware of the opportunities presented by business networks for these forms of enterprise and know where and when to get assistance.

5. Innovation networks especially thrive on competition. There would appear to be a role for government in ensuring ease of entry to and exit from business networks. Networks can become moribund. Their vitality is dependent on the movement of *small firms* in and out of the network. The departure of old firms and the arrival of new ones enhances the knowledge base, bringing in new people, new ideas and new experience. There may well be a role for **SBS**, working with **Business Link** advisers, in identifying entry barriers and recommending appropriate action to government.

6. There may be a role for government in facilitating the transfer of knowledge and learning from large firms to *small firms* via business networks. This would serve not only to broaden the knowledge base by spreading knowledge around, but also create new opportunities as knowledge found its way into a more creative and enterprising environment. While **SBS** cannot impose a requirement for knowledge transfer, it could support activities (e.g. product development teams), likely to foster knowledge transfer.

7. The very informality of many business networks and their relatively low public profile, when combined with the fact that they are widespread in some sectors but unknown in others, means that there is a general lack of awareness about business networks within society. There would appear to be a role for government in general and **SBS** in particular, in raising awareness of business networks and the opportunities for small firms within them, both amongst the public at large and amongst policy-makers. More specifically there may be scope for including information about the role and importance of business networks, together with a simple typology, in the training and development of **Business Link** advisers. Similarly **SBS** could put forward initiatives designed to raise awareness of business networks on the part of policy-makers. This should lead to better policies or at least better policy implementation.

Further Research

The following points provide examples of proposals for additional research, identified in the report, which may help to inform the work of the **SBS** in relation to business networks:

1. *Why do business networks (e.g. the footwear industry in Northamptonshire and textile machinery manufacturing in Lancashire) decline and become moribund?* At one time the Northamptonshire Footwear industry was a thriving industrial district, comprising a range of organisations including: trade associations, retailers, local colleges and even schools. There is scope for analysing similar networks to identify specific causes of decline, examples of rejuvenation or reconfiguration proceses, and possible models of intervention in such cases.

2. *What is the role of voluntary sector organisations in business network formation and development?* This study has highlighted the importance of 'institutional thickness', a necessary condition for successful networks. Thickness is often constituted by the activity of non-profit institutions. Research is needed to assess the nature and scale of the involvement of the voluntary sector in particular networks, and to identify ways in which its contributions can be both supported and enhanced.

3. *What is the most appropriate way to support business networks?* This study has shown interventions must be measured and sensitive to the needs of specific network forms. The vitality of a business network is critical to its overall performance. This is partly dependent on the rate of entry and exit of firms. Research is needed to identify economic, political and socio-cultural barriers that might impede the inward flow of new firms entering a network and the outward flow of old firms exiting.

4. *Are there different forms of network governance?* In supply chains one can distinguish between 'Buyer-led' (e.g. medical instruments sector) and 'Supplier-led' (e.g. canoe manufacturers) network governance arrangements. Further research is needed to investigate the governance arrangements to be found in other types of business network, and their relationship to network and firm-level performance.

5. *How do small firm owners and managers perceive their business networks?* Evidence from the entrepreneurship literature suggests that network awareness and specific network capabilities (e.g. focusing and 'enacting' links) are associated with the growth of firms. The report highlighted the potential value of network mapping as a method for describing network architectures and flows. Building on this research, it would be useful to assess levels of awareness (e.g. of 'blind' links), relating these to firm-level performance measures.

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Glossary

The networks literature makes use of specialised terminology. However, readers should note that the language is not always used consistently across (or, indeed, within) the various disciplines that have contributed to this subject-area in recent years. Hence, the following definitions should be treated as provisional and incomplete. They are elaborated upon in the relevant sections of the report.

Actor	An individual or an organisation within a network.
Complex	Describes a connection between two network actors, or a flow, that has several dimensions (e.g. economic and friendship). Also known as 'multiplex'.
Density	Describes the number of connections between actors (i.e. it may be 'tight' or 'loose')
Dyad	A connection between two network actors. Also known as a 'linkage' or 'tie'.
Ego-centric	A partial network based on links between one actor (e.g. an entrepreneur) and his/her main direct and indirect contacts. Contrasted with a 'socio-centric' network.
Embeddedness	Describes the degree to which economic activities and organisations (including networks) are affected by social and cultural factors.
Flow	That which is transferred via a network connection (e.g. knowledge, power, financial resources, emotion/friendship).
Governance	Describes the way that a network is co-ordinated and regulated (Jones *et al*. 1997).
Linkage	A connection between two network actors. Also known as a 'tie' or 'dyad'.
Morphology	The 'shape' of a network (i.e. its density, range, reachability etc.).
Multiplex	Describes a connection between two network actors, or a flow, that has several dimensions (e.g. economic and friendship). Also known as 'complex'.
Partial	All representations of networks are 'partial', in the sense of being incomplete. The real issue is what to include when drawing a partial network.
Range	Describes the extent and heterogeneity of a network (e.g. may comprise a few, similar ties or many varied ones).
Reachability	Describes the extent to which connections between actors are direct, or via intermediaries.
Socio-centric	A partial network which includes links between many different actors. Contrasted with an 'ego-centric' (or 'focal') network.
Strong tie	Describes a connection between two network actors that is either embedded or formalised. Contrasted with 'weak' tie (Granovetter 1973).
Structural hole	Describes a position within a network in which it is possible to exercise power, because the actor occupying it is a 'go-between', providing the only point of connection for other actors in the network (Burt 1990).
Weak tie	Describes a connection between two network actors that is neither embedded, nor formalised. Contrasted with 'strong' tie (Granovetter 1973).

1 Introduction

As with any fad that in fact has substance, there is the need to sort out the necessary from the nonsense in 'collaboration'. Mintzberg, H. *et al.* (1996: 60)

1.1 Networks and performance

1.1.1 Scope of the review and opening questions

This literature review is concerned with business networks, and their importance for the small business community. Business networks are sometimes defined as comprising only inter-*firm* relationships (e.g. those that exist between component supplier and a manufacturer). However, it soon becomes apparent that a broader perspective is required, if research findings are to contribute meaningful insights for policy and practice. We have therefore incorporated research evidence on personal networks, notably those associated with entrepreneurship (see: Section 4), and on links between firms and supporting institutions, such as trade associations, government agencies and universities (see: in particular, Sections 2 and 5).

The review begins with two pragmatic questions that might reasonably be posed by any sceptical business owner or advisor confronted by this topic:

1. **Is there anything new about business networks?**: Is there any real difference between today's business networks and the kind of links that have 'always' existed?

2. **Do business networks matter to small and medium-sized enterprises (SMEs)?**: Do SMEs commonly engage in networking?; if so, does this activity have any significant effect on their performance and subsequent development?

On the basis of an extensive review of the research evidence, we suggest that the simple answer to both questions is 'Yes'. There *do* appear to be novel features in some contemporary networks. Furthermore, many SMEs *are* engaged in networks, in ways that influence their performance and development. However, in each case there are important caveats to explore. These can be summarised in a third introductory question:

3. **How do today's business networks operate?**: How are these networks are created?; how do they evolve?; and how does participation in particular networks influence the success or failure of particular firms?

We hope that, by taking a broad-ranging and critical perspective on business networks, this review will provide insights that can inform policy and practice.

1.1.2 The novelty of networks: rhetoric or real change?

Business networks, in the form of non-market linkages between firms, have always existed. However, they have not always been recognised. In the 19th century, the economist Alfred Marshall saw that inter-firm networks played an important role in regions that he termed 'industrial districts' (see: Section 2.1). However, much of the subsequent work on industrial economics, organisation and strategy either ignored or underplayed the importance of a firm's external linkages. One of the reasons for this is the

long-established distinction between the ways that things are organised 'inside' the legal/administrative boundaries of a firm (i.e. via the hierarchy) and 'outside' (i.e. via the market) (Note 1). The orthodox 'markets or hierarchy' dichotomy led economists and organisation theorists to misrepresent firms, implying that they operated in splendid isolation, from each other and, incidentally, from the wider social and environmental context:

> 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)

The pioneering contribution of Richardson, and that of other researchers reviewed in the following pages has helped to remove this artificial distinction (Note 2). The 'network perspective' on industrial organisation is 'blurring' firm boundaries, recognising that similar processes guide network linkages both within and between organisations (Birkinshaw and Hagström 2000). Networks have lately become a popular topic for researchers (Fletcher, 1998). Indeed, the last decade of the 20th century saw an 'explosion' in the research literature (Ebers 1999). This raises a second question. Does all this activity merely reflect a change in the way that academics look at firms, or is there a 'real' increase in the volume and intensity of inter-firm networking? (Conway 1999).

This review begins with the tentative assumption that something *has* changed. In short, we suggest that there may be more inter-firm networking going on, and that much of it involves SMEs. The topic is surrounded by considerable hype and confusion, but as Mintzberg (1996: 60) has suggested, this is a fad which has some substance. But why should there have been an increase in the scale or intensity of inter-firm networking at this time in history? Several inter-connected factors have been proposed by way of explanation. Four of the more popular are summarised below:

- Macro-economic restructuring in capitalist and reformed economies, has involved the wholesale liberalisation of regulated and former state-owned enterprises. These changes provide many new opportunities for entrepreneurship, and associated networking.

- The proliferation of powerful, low cost information and communication technologies is creating new market opportunities, but presents major challenges to large, hierarchically-organised firms. It also facilitates more flexible methods of co-ordinating activity within and *between* firms, particularly in areas such as flexible manufacturing and logistics.

- Restructuring of large, established organisations includes both vertical and horizontal 'dis-integration', replacing internal / hierarchical co-ordination with external inter-firm linkages. In a bid to increase flexibility and innovation, out-sourcing of 'non-core' activities offers opportunities for smaller firms.

- Globalisation pressures are leading many national firms to pursue geographic expansion strategies. Given the well-known obstacles to expansion through direct investment, strategic aims are often pursued through close collaborative arrangements with firms located in other regions.

Where does this leave the small-medium firm? It is important to note at the outset that several respected small firms' researchers have argued that their inter-firm linkages may be

much more limited than is assumed by the more enthusiastic proponents of business networks. For example, a series of studies, conducted with British small firm owners found little or no evidence of small firms using either formal or informal networks:

> Owner-managers tend to have relatively small and non-extensive networks with little resort to expected external contacts such as accountants and bank managers. Neither do owner-managers commonly use networks based on family, kinship or social groupings for business purposes. (Curran *et al,* 1993: 23)

The debate, between those who see networks as central to the lives of small firms and those that see them as marginal, remains polarised and unresolved. Clearly, we need to probe the reasons behind these conflicting views. However, for the impatient reader, there is a short answer. Anticipating the argument presented in the following sections, it can be summarised as follows: some firms network and some firms don't. In other words, both the quantity and quality of inter-firm networking seems to vary considerably, depending on the nature of the firm, its managers and the context in which it operates.

1.1.3 Networks and performance: universal panacea or urban myth?

Having accepted, albeit provisionally, that inter-firm networks are more prevalent today, we need to address a second implicit assumption. This is that networks are somehow important to the performance of firms. There is a considerable body of research evidence in which network relationships are identified as playing a key role in the emergence of entrepreneurial firms (Aldrich 1995; Birley 1985; Larson 1992; Johannisson 1986) and in subsequent firm-level performance (Birley 1985; Barkham *et al.* 1996; Chell and Baines 2000; Johannisson 2000). However, it is not clear *how* networking activity affects business performance:

> That which is taken for granted, especially in American but also European network research, that networks enhance qualitative and quantitative growth, must be reconsidered. (Johannisson 1995: 190)

Chell and Baines (2000: 197) endorse Johannisson's challenge. They concede that a causal relationship, 'while intuitively plausible, is far from self-evident.' The task, therefore, is to show how networks make a difference. More specifically, researchers need to identify specific mechanisms that translate participation in particular network relationships into different business outcomes. There is strong *anecdotal* evidence suggesting 'how' networks develop, and how networking influences the performance of participating firms. Some of these 'common-sense' views are supported by empirical research. However, the sheer volume of literature and diversity of approaches make it difficult to assess what has been learned. For similar reasons, it is difficult to relate research findings to the more practical concerns of small businesses and their advisors. As the leading sceptics have argued, it is therefore essential to sort the wheat from the chaff:

> 'Networks' and 'networking' have emerged as fashionable conceptual devices for theorising and researching a number of important aspects of the small business. However, as we have argued elsewhere (Blackburn, *et al*, 1990), much of the theorising and research using the notions of 'network' and 'networking' are conceptually and methodologically poorly realised. (Curran *et al,* 1993: 13)

This review seeks to balance the views of network sceptics and enthusiasts, focusing on research evidence that relates business networks to the performance and development of SMEs. We begin by clarifying some of the terminology used in the literature.

1.2 Initial definitions

1.2.1 The business network: a distinctive form?

Before introducing the literature, it may be helpful to note some of the more common definitions used in describing and explaining business networks (n.b. in addition, a short **glossary** can be found on page vi).

In broad terms, business networks are taken to comprise the complex patterns of formal and informal linkages between individuals, businesses, and other organisations such as government and voluntary agencies. In earlier literature, the linkages found in networks are commonly portrayed as falling somewhere between the open transactions of the market place and the sphere of 'managerial co-ordination' that defines the boundaries of the firm (Penrose 1959). However, subsequent studies, drawing on social network theory, have extended the concept of the business network. As a result it is regarded as a distinct organisational form, worthy of study in its own right, rather than some kind of hybrid combining market mechanisms with hierarchy (Hakansson 1996; Powell 1990; Richardson 1972). The distinctive features of this type of 'governance' (i.e. method of organising and regulating activities) is well-summarised in the following definition:

> Network governance involves a select, persistent and structured set of autonomous firms (as well as non-profit agencies) engaged in creating products or services based on implicit and open-ended contracts to adapt to environmental contingencies and to co-ordinate and safeguard exchanges. These contracts are socially - not legally - binding. (Jones *et al*. 1997: 913)

1.2.2 Three main approaches

Three broad approaches to the study of networks can be identified. These range from the metaphorical, which requires limited network data and informal methods of data collection, through to the network analysis, which applies complex mathematical techniques in order to test questions such as the relationship between power and centrality (Brass 1984) (Figure 1.1).

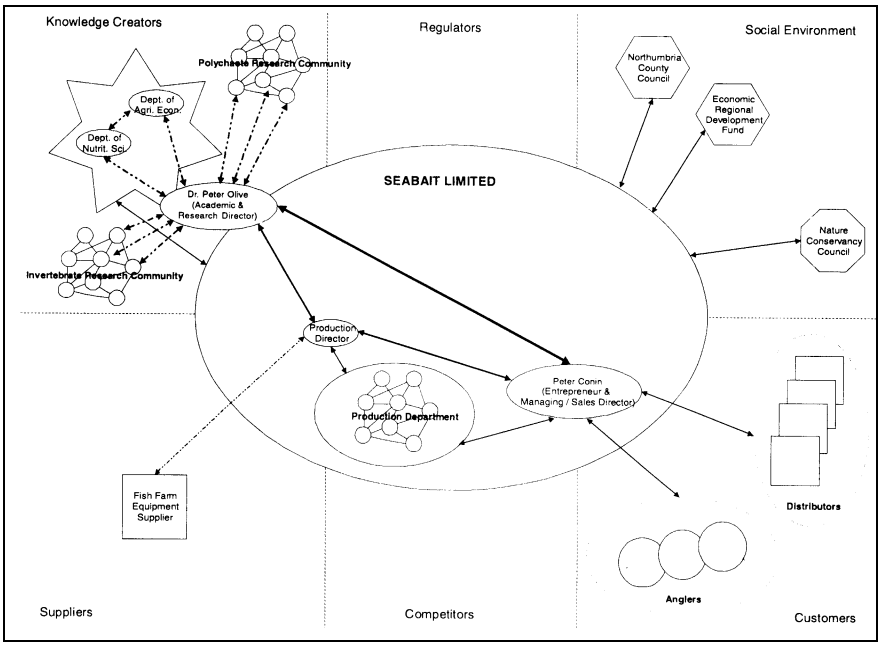
Figure 1.1 Approaches and orientations in studying networks

Approach	**Network as metaphor**	**Network mapping**	**Network analysis**
Orientation	Metaphorical	Graphical	Mathematical
Explicitness of method required	Low	Medium	High
Completeness of network data required	Low	Medium	High
Sample studies	Morgan (1986)	Bower (1993) Conway (1998)	Brass (1984) Burt (1992)

Source (Conway *et al*. 2000 - adapted)

The literature reviewed in this report is largely confined to the network mapping approach. This has proved to be the most widely adopted amongst business networks researchers, though a minority of studies actually present their findings visually. We also consider that it is the most appropriate approach for an exploratory review concerned with practical application. What does a network map look like? There are various formats, depending on the research objectives. For example, the following map was used to present results of an investigation into innovation networks. Actors and flows are identified using a range of symbols, lines and arrow-heads (Figure 1.2):

Figure 1.2 Illustrative network map



Source: Conway and Steward (1998: 244)

In drawing a network map, researchers have to address a number of questions. Of these, the most important relates to the level and scope of the analysis. In other words, which relationships should be included in the study? One of the major criticisms of network research is the tendency for analysis to be limited to individual linkages (i.e. 'dyads'), ignoring the wider pattern of network relationships (Shaw, E. 1998). There are obvious practical reasons for this kind of 'dyadic reductionism', notably the difficulties and time involved in collecting data from all the relevant actors (Harland 1996). Some researchers may also be pursuing well-defined questions, which do not require the broader 'network' perspective. However, if the objective is to explain how business networks influence firm-level performance, there is a strong case for looking beyond the individual dyadic links to consider the impact of indirect connections in the wider network. Even so, there has to be a 'cut-off' point for any study (Conway and Steward 1998). A potentially limitless set of linkages, once termed the 'total network', stretches out from each individual and organisation (Mitchell 1969). One of the first tasks of a researcher is to decide how to select (or 'abstract') a 'partial' network that is big enough to be meaningful, yet small enough to be studied. Again, the choice depends on the research question. For example, research into entrepreneurial start-ups is typically based on 'focal' or 'ego-centred' networks (i.e. it is 'anchored' on one individual's personal contacts, and fans out from

there). The innovation network depicted in Figure 1.2 is also based on a 'focal' firm. However, for researchers interested the economic development of a *region*, the focus is more likely to be on its wider population of firms and other organisations. In this case, the partial network is known as, 'socio-centred'.

1.3 Structure of the review

This literature review considers the role of business networks on the overall performance of SMEs. A critical overview of the diverse 'network' literature is conducted in four distinct but inter-related sections:

- Industrial districts and spatial clusters
- Supply chain networks
- Entrepreneurial networks
- Innovation networks

These sections reflect the diverse contributions of several strands of research, drawing on various disciplines, including geography, economics, organisation theory and psychology. Of course, it would be possible to generate many other categorisations. Each discipline has its preferences and prejudices (e.g. some researchers would want to add 'learning' networks and 'support' networks to our list). However, we consider that this four-way categorisation is sufficient to reflect the main research groupings and makes for the most fruitful comparisons. Each section of the review is organised in the same format, comprising four main elements:

- **Background**: This introduces the research literature, traces the origins of some of today's main debates and identifies a number of 'key' references which have helped to shape today's research efforts.

- **Emerging themes**: This brings the literature up to date, focusing on the major issues that have implications for SMEs. It identifies the major contributions and notes any significant limitations or gaps in the literature. It also highlights some parallels between research evidence presented in this and other sections. Where relevant, the themes are illustrated with short case studies.

- **Policy implications**: This identifies a number of issues, drawn from the preceding discussion, which appear to have particular relevance to small business policy. In most cases, these are presented as potential topics for discussion, rather than clearly-defined policy prescriptions. It also highlights several unresolved issues, which appear worthy of additional research.

- **Notes**: Some additional points of interest and supporting materials are included at the end of each section. References for all sections are included at the end of the review.

The concluding section of the review is entitled, 'Collaboration in perspective'. It brings together the key issues raised in each of the preceding sections. It also broadens the discussion by assessing the contribution of business networks to regional and national competitiveness. In short, it argues that business networks should be seen as part of a wider 'competition between contexts' (Clark 2000). The next section reviews the research evidence on industrial districts and spatial clusters, providing an introduction to this theme.

Notes

1 The term hierarchy is used to describe the internal structure of an organisation.

2 Richardson's (1972) paper seeks to explain why inter-firm co-operation occurs, and to establish it as an 'institutional fact', which is hidden by the false choice between 'hierarchy' and 'market'. His explanation, which draws on the resource-capability perspective (Penrose 1959), is outlined below:

- Economic activities have to be undertaken by organisations with appropriate capabilities (i.e. knowledge and skills).
- 'Similar' activities are those based on the same capabilities (e.g. carpentry skills can be used to make chairs and tables).
- 'Complementary' activities are those that represent different phases of one production process (e.g. growing trees, cutting timber, making chairs, selling chairs).
- Complementary *and* similar activities can be co-ordinated within a single firm.
- Complementary but *dis-similar* activities are normally co-ordinated beyond the firm, *either* through the market mechanism or by inter-firm collaboration.
- Inter-firm collaboration displaces markets if activities are 'closely complementary' but dis-similar. (i.e. they require 'quantitative and qualitative co-ordination)

Richardson does not present this as a complete explanation of the business network. On the contrary, he makes the wise, and rarely heeded, observation that:

> Theories of industrial organisation, it seems to me, should not try to do too much. (Richardson 1972: 896)

However, this simple formula fits neatly with the empirical evidence. Consider, for example, how fresh produce is supplied to today's multiple retailers. The supplier and retailer are engaged in dis-similar yet closely complementary activities. Many varieties of perishable, weather-dependent products have to be sourced and delivered within precise quantity, timescale and quality parameters. Until the last quarter of the 20th century, these activities were co-ordinated at a distance, through wholesale markets. Today, however, there are close 'partnership' links between retailers and fresh produce growers (Blundel and Hingley 2001; Fearne and Hughes 1999; Harland 1996; Hogarth-Scott and Parkinson 1993).

2 Industrial districts and spatial clusters

Locality is, if anything, even more neglected than size of firm in the literature on inter-firm relations. (Curran and Blackburn 1994: 47)

This section explores networking activity between firms and other organisations that are concentrated in specific locations. This research stream includes the work of geographers, economists and small business researchers. It has addressed several issues, including: the formation of 'clusters', their evolution and the factors that lead one cluster to be more competitive than another. Several practical and conceptual limitations are identified in the literature. For example, the more enthusiastic proponents of clustering have sometimes over-estimated the efficacy of policy interventions and have downplayed the negative consequences of certain types of collaboration. There are also new questions regarding the relevance of locality in an era of global competition.

2.1 Background

2.1.1 Industrial districts and economic development

Terms such as 'cluster', 'agglomeration' and 'milieux' have been used to describe business networks that are associated with specific locations. Perhaps the oldest and most common of these is the 'industrial district'. This term was coined by the economist Alfred Marshall (1842-1924), who devoted a chapter of his major treatise, *Principles of Economics* (published in eight editions between 1890 and 1920), to the localisation of industry. Marshall's aim was to, 'follow the fortunes of groups of skilled workers who are gathered together within the narrow boundaries of a manufacturing town or a thickly peopled industrial district.' (Marshall [1920] 1986: 225). 'Industrial district' has been adopted as a generic term for any localised network of independent firms operating in related markets (Brown and Hendry 1997). Marshall based his original concept on empirical research in the Lancashire textile industry and Sheffield cutlery industry, amongst others. These industrial districts illustrated his general view that **knowledge** and **organisation** are the twin 'agents of production', combining to provide the fundamental growth dynamic for capitalist economies. His focus on knowledge has a particular resonance, given the current rhetoric of knowledge management and organisational learning:

> Knowledge is our most powerful engine of production; it enables us to subdue Nature and force her to satisfy our wants. Organisation aids knowledge; it has many forms. e.g. that of a single business, that of several businesses in the same trade, that of various trades relatively to one another, and that of the state providing security to all and help for many. The distinction between private and public property in knowledge and organisation is of great and growing importance: in some respects of more importance than that between public and private property in material things; and partly for that reason it seems best sometimes to reckon Organisation apart as a distinct agent of production. (Marshall [1920] 1986: 115)

Economic development is based on increasingly specialised knowledge (i.e. 'differentiation' as epitomised in the division of labour) matched by increasingly complex forms of industrial organisation which pull it all together (i.e. 'integration'). As the previous quotation indicates, Marshall recognised that both 'internal organisation', within the firm, and 'external organisation', beyond the boundaries of the firm, were required in order for integration to be achieved. Effective internal and external networks were thus a pre-requisite for economic development and a potential source of competitive advantage.

2.1.2 The re-discovery of industrial districts: *Tre Italia*

The concept of the industrial district was 're-discovered' during the 1980s. Research conducted in Italian regions such as Emilia-Romagna, identified a link between prosperous local economies and the dense networks of independent, specialised, enterprises that were concentrated around particular towns. Many researchers investigated economic performance in the regions that Bagnasco (1977) called '*Tre Italia*', or the 'Third Italy' (Brusco 1982; 1990; Lazerson 1995; Piore and Sabel 1984; Pyke 1992). For example, Lazerson's (1995) detailed study of the knitwear industry in Modena pointed out that the current success of network forms is a relatively recent phenomenon, following their 'phoenix'-like re-emergence in the early 1970s. From this relatively narrow empirical base, a more wide-ranging 'flexible specialisation' thesis developed. Flexible specialisation has been presented under various labels, including 'Post-Fordist' production, the 'Benetton economy' and, more straightforwardly, the 'industrial district thesis' (Curran and Blackburn 1994: 3). The most influential version was presented in, *The Second Industrial Divide* (Piore and Sabel 1984). This widely-cited text argues that geographically-concentrated business networks present a direct challenge to large-scale mass production and are part of a radical restructuring of today's industrialised economies. This argument has since been pursued, with variable results, in many other sectors and locations, ranging from high technology and entertainment industry clusters around Los Angeles, California (Storper 1988; Scott 1993), to mature manufacturing sectors in Rochdale and Leicester (Penn 1992; Hardill *et al*. 1995).

But why should an industrial district perform any better than either a large hierarchically-organised corporation or a more dispersed set of firms? Is it possible to isolate any specifically *spatial* factors that might explain superior performance of this type of business network, beyond those found in the general literature? Two broad explanations can be linked to the industrial districts literature in this period:

(a) Balancing collaboration and competition

One of the central lessons is that the dynamism of industrial districts depends on constituent firms maintaining a fine balance between **collaboration** and **competition** (Lawson and Lorenz 2000: 305). Two distinct forms of collaboration can be identified. Firstly, collective support services, such as specialised education and training or research and development are provided. Secondly, this provision is reinforced by cultural 'norms of reciprocity', including:

> [S]haring of technical information; subcontracting out to one's less successful competitors; and refraining from wage competition and labour poaching. (Lawson and Lorenz 2000: 306)

Proponents of the flexible specialisation thesis argue that, by balancing collaboration and competition, spatial clusters can achieve the attractive combination of scale economies, previously limited to large, hierarchically-organised businesses, and adaptable, innovative performance (Best 1990).

(b) Organising around a 'social' division of labour

The second broad explanation for the performance of spatial clusters is provided by Piore (1992), who draws on Karl Marx's distinction between the 'social' and 'detailed' division of labour. Though less commonly cited, it provides an important insight into the debate.

As Marshall suggested, industrial districts represent one solution to the problem of (re-) integrating specialised knowledge (i.e. co-ordinating activities in order to produce a marketable product). Piore argues that industrial districts are based on the 'social' division of labour. This means that each activity has, 'a distinct conceptual core' (e.g. a craft or technical specialism such as cheese making, leather-working etc.). The social division of labour allows people to reflect on their activity, deepen their knowledge and enhance performance. The factory system, by contrast, is based on the 'detailed' division of labour, as exemplified in Adam Smith's celebrated pin factory. Here, the task allotted to each worker (e.g. pin heading, component assembly) has no independent meaning, it is simply part of a mechanised process. The factory system 'solves' the problem of re-integration by bringing detailed tasks under one roof, where they are re-conceptualised by managers. Flexible specialisation, based on the social division of labour, solves the re-integration problem in a different, and perhaps more effective, way:

> Network structure facilitates both the deepening [of knowledge] and the reintegration because to better integrate with other conceptual specialities, the specialists are forced to develop their own speciality more fully. The conceptual level of understanding in this form of growth permits horizontal co-ordination, thus avoiding hierarchy, but the degree of interactions across specialties is too intense to permit a market. (Piore 1992: 443)

Most of the arguments in support of flexible specialisation in contemporary spatial clusters are based on similar, 'institutionalist' views to those outlined by Lawson and Lorenz (2000) and Piore (1992). In the following sections, we evaluate this research, establishing whether there is evidence of collaboration and learning in industrial districts. We also consider the nature and effectiveness of policy intervention.

2.2 Emerging themes

The continuing, and often heated, debate over the flexible specialisation thesis has raised several questions that are relevant to small firms policy in the new century. Four themes help to frame this discussion (Hendry *et al*. 2000). First, we consider the factors that appear to prompt the creation of new clusters. The second theme explores the growth of clusters. This is followed by a critique of a sometimes overly optimistic industrial districts literature. We investigate the 'dark side' of industrial districts, including an apparent tendency to for some networks to operate *against* innovation, competitiveness and equity. The final theme focuses the debate into a simple but fundamental question: does proximity matter today? In other words, whatever its historical rationale, is this type of business network capable of enhancing the performance of firms in an era of global collaboration and competition?

2.2.1 How are clusters created?

(a) Concentrations of 'natural' resources

From the earliest times, economic activity has had a strong local flavour. People living in one geographic region have developed distinctive products and services which they have traded for those of other regions. Perhaps the most important *initial* impetus for geographic specialisation is the uneven distribution of natural resources. These 'given' resources, including geological formations, soil types, plant varieties and micro-climates, have provided a basis for many industrial districts:

> Straw plaiting has its chief home in Bedfordshire, where straw has just the right proportion of silex to give it strength without brittleness; and Buckinghamshire beeches have afforded the material for the Wycombe chair-making. The Sheffield cutlery trade is due chiefly to the excellent grit of which its grindstones are made. (Marshall [1920] 1986: 223)

Historical evidence suggests that industrial districts based on concentrations of natural resources have often developed over several centuries. Shropshire's iron industry, for example, was based largely on its rich mineral deposits. Its ironworks date back to at least the early 16th century, forming part of an inter-dependent network of firms, which extended from the Lake District to South Wales (Trinder 1983). In the mid-18th century, a complex combination of events prompted a wave of investment and innovation in this district. 'Ironbridge Gorge' became the 'cradle' of the Industrial Revolution and, for a few decades, Britain's leading iron producing area. However, its pre-eminence was short-lived. Natural resource factors, including the vagaries of the River Severn, and the exploitation of other, more extensive coalfields, contributed to its decline throughout the first half of the 19th century.

Are concentrations of natural resources a factor in the creation of today's spatial clusters? There are isolated examples, such as the petroleum engineering cluster around Aberdeen, which emerged following the discovery and exploitation of North Sea reserves. Today, nature's contribution is likely to be more indirect. The landscape or 'amenity' value of particular locations is now a significant natural resource, providing perceived 'quality of life' advantages that attract and retain 'footloose' entrepreneurs and knowledge workers (Keeble *et al*. 1992). Where 'quality of life' is combined with established concentrations of human and institutional resources such as the leading research universities, such as Cambridge and MIT, there are strong incentives for the creation of new clusters of high-technology enterprises (Lawson and Lorenz 2000). Natural resources can, of course, work against less favourably-endowed locations.

(b) Policy initiatives

Spatial clusters are not simply a product of existing concentrations of resources. Some are, at least in part, the result of conscious and deliberate action (i.e. economic development policy). Two distinct, but closely related types of policy intervention can affect the spatial distribution of resources:

- Attracting external resources to a location (e.g. providing incentives for inward investment or in-migration).

- Enhancing indigenous resources (e.g. investing in education, training, political institutions and infrastructure).

Population movements, perhaps the most obvious spatial 're-distribution' of resources, have often contributed to the development of regions. Immigrant communities combine a geographic concentration of 'new' skills with personal networks that can stimulate and support entrepreneurial activity. Most migrations have been an 'indirect' consequence of policy (i.e. typically a response to war or religious persecution). For example, some 40,000 French Huguenots settled in Britain during the 17th century, bringing industrial skills, including textile manufacturing; Courtaulds was founded by a descendant. However, on occasion relocations have been directed. Marshall provides an early example, tracing the 'mechanical faculty' of (19th century) Lancashire to the (11th century) decision of Hugo de Lupus, a Norman duke, to relocate skilled metalworkers to the town

of Warrington. More recent examples include the attraction of populations to new towns (e.g. atomic weapons researchers to Los Alamos, New Mexico and steel workers to Corby) and government-inspired industrial relocation (e.g. car manufacturing on Merseyside in the 1960s). Of course, many policy interventions have had a different objective: to *maintain* or *salvage* an established spatial cluster, rather than to create a new one. The effectiveness of these remedial interventions is discussed in more detail below.

2.2.2 What makes a cluster grow?: unpacking 'industrial atmosphere'

Whatever the initial impetus, once industry is localised, industrial districts and manufacturing towns provide a context in which the benefits of specialisation can be realised. A number of mechanisms appear to reinforce the initial basis of advantage. As a consequence of this, the district develops its own distinctive social structure. Marshall referred to this process as the creation of an 'industrial atmosphere':

> When an industry has chosen a locality for itself, it is likely to stay there long: so great are the advantages which people following the same skilled trade get from the near neighbourhood of one another. The mysteries of the trade become no mysteries; but are as it were in the air, and children learn many of them unconsciously. Good work is rightly appreciated, inventions and improvements in machinery, in processes and the general organisation of the business have their merits promptly discussed: if one man starts a new idea, it is taken up by others and combined with suggestions of their own; and thus becomes the source of further good ideas. (Marshall [1920] 1986: 225)

These 'industrial atmosphere' effects are long term, cumulative and dependent upon a degree of co-operation in the creation of and sharing of knowledge (Keeble and Wilkinson 1999: 297). The process is possible because both firms and networks can provide a relatively stable setting within which the cycles of conjecture, experience and reflection can take place:

> Reputations have to be earned, local institutions developed and skills practised in the varying circumstances of a trade. Learning by experimentation is continuous, and both internal and external organisations provide frameworks within which to learn. (Loasby 1999: 98)

Much of the recent work on spatial networks is built around concepts that are essentially refinements of Marshall's 'industrial atmosphere'. Two of the most significant ideas in this tradition, **'institutional thickness**' (Amin and Thrift 1995) and **'untraded dependencies'** (Storper 1995), are considered in the following paragraphs. Perhaps unsurprisingly, similar concepts are to be found in other areas of business network research (see: Sections 3 to 5). They reflect a broader recognition that economic activity is 'embedded' in particular sets of institutional and the social relationships (Granovetter 1985) (Note 2). In contrast to Marshall's strong emphasis on the individual efforts of individual entrepreneurs, these researchers have placed much greater stress, 'on the collectivist and institutional basis for successful co-ordination.' (Keeble and Wilkinson 2000: 298). Their work can also be seen as a reaction against transaction cost-based explanations of clustering (Williamson 1975, 1985), which saw proximity as primarily the result of firms' efforts to minimise the costs of networking (Scott and Storper 1987; Scott 1988). These 'radically undersocialised' explanations (Amin and Thrift 1995: 100) failed to take sufficient account of social and institutional factors. Storper's (1995) paper includes a critique of his earlier work, whilst promoting 'untraded dependencies' as a more effective approach to the 'enigma' of regional concentration (Henry and Pinch 2000).

(a) Local support networks: 'institutional thickness'

As noted above, one of the main contributions of recent spatial networks research has been to explore the nature and significance of institutional supports in particular locations (Lawson and Lorenz 2000). 'Institutional thickness' is one of the most successful attempts to conceptualise this factor. However, as even its proponents concede, definition and measurement is problematic:

> Institutional thickness is not an easy concept to grasp. It often seems very general, even vague. Yet increasingly, it seems that it is these kinds of liminal concepts that hold the key to the workings of the global economy. (Amin and Thrift 1995: 101-102)

Institutional thickness refers to two distinct but connected phenomena: first, the quantity and quality of support organisations associated with a particular cluster; second, the consequences of their combined action and common purpose. Amin and Thrift (1995: 102) isolate four factors that they see as particularly important in constituting institutional thickness:

- 'A strong institutional presence', which comprises a 'plethora' of public, private and voluntary institutions, 'all or some of which can provide a basis for the growth of particular *local* practices and collective representations in social networks.' (n.b. emphasis in original).

- 'High levels of interaction amongst the network of institutions in a local area …'. These intense flows may lead in time to, 'a degree of mutual isomorphism.' In other words, these organisations may become more closely aligned, or more alike.

- 'The development, as a result of these high levels of interaction, of sharply defined structures of domination and / or patterns of coalition.' These bodies (e.g. trade associations, chambers of commerce) represent common interests of local businesses, share certain costs and impose norms on 'rogue behaviour'.

- 'The development, amongst participants in the set of institutions, of a mutual awareness that they are involved in a common enterprise.' Evidence for this includes, 'a commonly held industrial agenda', which may be re-inforced by other forms of identification, such as religion, gender or ethnicity.

Potential benefits of institutional thickness include the establishment and reinforcement of a common language, behavioural norms and a progressive build-up of trust. This, in turn, fosters collaboration and the development of a capacity for collective learning (Keeble and Lawson 1998; Keeble *et al*. 2000; Lorenz 1996). Both institutional thickness, and the resulting capacity for collective learning may be the product of many years of established practices, as in the City of London, for example. However, evidence from high-technology clusters suggests that it can be developed over much shorter periods (see: Section 5).

There are some interesting illustrations of how the institutional fabric supporting local economic activity can grow 'thicker' and 'thinner' over time. A recent assessment of institutional thickness in the Cambridge region concludes that until the mid-1990s, the University of Cambridge played an important, but somewhat isolated role in creating a local culture and initiating high-technology spin-offs. Institutional thickness has increased with the introduction of organisations such as the St John's Innovation Centre, specialist services firms and the Science Parks (Keeble *et al*. 2000: 327-329). Research into remote

rural economies in Ireland illustrates how local institutions were weakened over time. Traditionally, rural economic activity patterns were dispersed with small and similarly scattered settlements providing a focus for both social and economic life. Recent 'functional shifts in rural space' (e.g. increased mobility, coupled with an urban shift in employment, retailing and the provision of other services) have weakened or replaced local institutions, placing a severe constraint on current economic development initiatives (Keane 1990). Regions with a history of large-scale manufacturing employment can also lack the mixture of institutions, culture and capabilities that appear to promote inter-firm networking. Checkland (1981) describes this as the 'Upas tree effect', referring to a Sumatran tree which poisons the surrounding land, restricting the growth of other plants. There are many examples of a Upas tree effect in British manufacturing regions (Penn 1992). For example, a relatively low emphasis on firm-level learning in the Nottinghamshire textiles industry, was explained as being, 'due in part to the historical dominance of the industry by the large retailing organisations that have in the past insisted on arms-length contracting arrangements.' (Brown and Hendry 1997: 130). However, this study also pointed to encouraging evidence that Upas tree effects can be countered by a combination of independent entrepreneurial activity and the emergence of new forms of institutional support:

> An example of the latter is the Nottinghamshire Fashion Centre, opened in 1984, which is both a building housing a number of firms in an exhilarating learning environment, and a resource center that offers promotional support and market and customer information for all firms locally. (Brown and Hendry 1997: 130)

It is clear that institutional thickness matters. However, there is still a great deal to be understood about the relationship between firm-level performance and the nature of local institutions:

> We cannot claim to know much empirically about the strength or range of interactions between institutions in an area, the types of coalition that have resulted, or the construction of mutual awareness and common industrial agendas. Still less can we claim to know about the institutional requirements for economic regeneration in the context of less advantaged cities and regions. (Amin and Thrift 1995: 108)

(b) Complex ties between local firms?: the role of 'untraded dependencies'

'Untraded dependencies' are the informal flows of information and support between firms in an area. For example, neighbouring firms might offer one another advice or lend a piece of equipment (Storper 1995). Untraded dependencies can be seen as both the product of 'complex ties' (e.g. where simple trading relationships overlap with those of family and personal friendship), and a way in which complex ties are created and sustained. There are obvious attractions to the idea of long-established cultures and patterns of inter-firm relationships. This is based on an implicit assumption that complex *local* ties enhance *local* economic performance. But why should this be? The standard argument is similar to the one used in relation to institutional thickness (i.e. that untraded dependencies generate trust and intimacy between firms, enabling tacit knowledge to be shared). However, this fails to provide a clear explanation of the various stages in the process:

> The notion of "untraded dependencies" has a subtle appeal, hinting at the presence of a hidden world of social relationships that provide the glue to the surface world of economic transactions […] The question, however, is what relationship do "traded" and "untraded" dependencies have to one another? Does the development of one necessarily precede the other? How do they sustain each other? Do they need to be contiguous, local untraded interdependencies requiring the existence of local traded relationships? (Hendry *et al*. 2000: 140)

Empirical studies are needed to tackle these questions. For example, an analysis of opto-electronics clusters in three countries challenges the view that 'traded' dependencies may be less important than 'untraded' ones (Storper 1995). In this case, proximity appears to be important in the *creation* of the cluster, but local untraded dependencies have been out-weighed by the pull of national and international traded relations and collaborations (Hendry *et al*. 2000). However, it is important to note that the strength of this 'extra-regional' pull is itself dependent on the technological trajectory of the sector - in this instance 'constantly broadening and creating new opportunities' - and the direction in which its markets are developing (Hendry *et al*. 2000: 140).

From its origins in Marshall's industrial districts, this literature has highlighted the relationship between inter-organisational collaboration, learning and economic development. It has also presented these processes as 'situated' in particular historical, socio-cultural, institutional and spatial contexts (Keeble and Wilson 1999: 299). 'Institutional thickness' and 'untraded dependencies' are examples of the ways that researchers have begun to unpack Marshall's concept of 'industrial atmosphere', in order to understand its component parts. However, measuring these sociological concepts and specifying the mechanisms and processes that influence performance has proved problematic (Uzzi 1998). This has led some writers to question the whole concept of industrial districts. The next section outlines some of the more important challenges.

2.2.3. The industrial districts thesis: a critique

There is a 'motherhood and apple pie' element to the concept of collaboration between socially-embedded local networks of small, independent firms. Critics have pointed to a lack of clarity, rigour and well-founded data in many earlier studies (e.g. terms such as 'local economy' and 'local community' have sometimes been used interchangeably). Three challenges are elaborated in the following paragraphs:

- Localised networking activity is neither extensive nor common.
- The clusters identified as 'industrial districts' may be temporary phenomena.
- These clusters have a largely forgotten 'dark side'.

(a) Localised networking is less common (over here) …

Several empirical studies conducted in Britain have failed to identify the kinds of close collaboration associated with the 'Third Italy' (Blackburn and Curran 1994; Hardill *et al*. 1995; Penn 1992). Blackburn and Curran's study of small firms and local economic networks has an explicit aim of re-conceptualising the local economy, placing networking in its proper context. The researchers interviewed 400 small business owners in five locations and various sectors across the United Kingdom. They conclude that networking activity is much more limited than in accounts associated with the 'flexible specialisation' thesis:

> Local [business-to-business] relations were largely defined as trading relations, that is, as functional exchanges between buyers and sellers with locality *qua* locality having little relevance. Many small business owners do seek to personalise their trading relations with others, especially customers, but this is a strategy to secure customer loyalty not a recognition of shared locality. (Curran and Blackburn 1994: 167)

(b) Industrial districts as temporary phenomena?

Industrial districts are usually seen as the product of long established local labour markets, localised trading and proactive local authorities. However, it may be misleading to portray the 'peculiar relationships among firms' celebrated in this literature (Brusco 1990: 14) as permanent features:

> These [inter-firm relationships] can also be seen as a particular historical formation. (Hendry *et al*. 2000: 140)

In this interpretation, intensive intra-district trading in the Italian districts was largely the result of restructuring by large Italian firms during the 1960s. By the 1990s, this initial impetus was being eroded by other forces, including an increase in extra-regional sourcing. More formal policy interventions were prompted, which aimed to provide support services to sustain the district. A similar process of spatial clustering, subsequent dissipation and policy intervention has been traced in the development of an ebryonic cluster of spin-off firms in North Wales (Hendry *et al*. 2000). The Pilkington glass company was a fertile source of new start-ups in the 1990s. Owner-managers report that strong personal ties have survived the spin-offs. These relationships would appear to lend themselves to the close, collaborative climate of an industrial district, but the effects of globalisation appear to outweigh the benefits of proximity in this high-technology sector:

> Although these are 'traded' relationships, they involve rather specialized kinds of linkage and sub-contracting. However, while a number of Welsh firms commented on their use of local sources, significant examples involve firms outside the region. (Hendry *et al*. 2000: 141)

There have been efforts to formalise localised networking, including the establishment of a Welsh Opto-electronics Forum, which is supported by Pilkington. However, the continued innovative capacity of the cluster depends upon firms providing relevant support services (e.g. fabrication, equipment, specialist engineering and business services). If these services are unavailable locally, it seems likely that the cluster will continue to disperse.

Why should spatial clusters be undermined, despite the efforts of local policy-makers? Research suggests that industrial districts overlap with the vertical supply chain networks (see: Section 3). As these vertical and geographic influences compete with one another, today's supply chains often turn out to be the more powerful network form:

> Increasingly, industrial districts are influenced by supply chain factors. Baden Wurtemburg, 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)

The authors cite the example of a British defence company that had previously developed a cluster of suppliers around its West London factory. Following re-location to the Midlands, it has begun to focus on suppliers closest to its new site, generating a new spatial cluster.

(c) The 'dark side' of industrial districts

Strong and long-established institutional frameworks, cultural homogeneity and reliance on a core of shared tacit knowledge may be a recipe for disaster. In combination, they can create organisational inertia, insularity and complacency. Institutional thickness and untraded dependencies can act as a barrier against innovation, including new networking

initiatives. The Swiss Watch industry is an oft-cited example of resistance to environmental change, in which deeply-embedded craft traditions and institutions are seen as playing a decisive role (Glasmeier 1994). Past success is no guarantee of survival. Loasby (1999: 142), for example, notes that all of the industrial districts in which Marshall gathered his evidence have since collapsed. To the current proponents of industrial districts as an economic panacea, he sounds this timely warning:

> Although such a district typically permits greater variety than is possible within a single firm, effective interchange between its firms requires a broad basis of agreement, often tacit, and so radical ideas are rarely welcome. Moreover, the very effectiveness of such interchange in fostering the prosperity of the group discourages its members from looking outside; *they may be so busy learning from each other that they have neither the time nor the incentive to learn from outsiders*. Thus a successful district may be no less vulnerable to competence-destroying innovations than a single firm; indeed, it may be even more vulnerable to innovations which require major changes to be closely co-ordinated. (Loasby 1999: 142 – emphasis added)

Some firms may resist the decline of a district. A notable example is Northamptonshire-based shoe-maker, R. Griggs Ltd, which built an international niche brand, *Dr. Martens*, against a climate of widespread factory closures in this long-established industrial district. The networking activity of these idiosyncratic 'survivors' requires further research. However, it seems likely that some forms of entrepreneurial networking can act as a defence against the negative effects of a declining district (see: Section 4).

2.2.4 Does proximity matter today?: explaining contemporary clusters

Why do highly localised networks continue to emerge and prosper in an era of globalisation and 'friction-free' internet capitalism (Gates 1997)? Whilst it may be possible to develop a rationale for the industrial districts of the last century, contemporary clusters appear to present a paradox:

> [T]he principal dilemma of contemporary economic geography [is] the resurgence of regional economies and of territiorial specialization in an age of increasing ease in transportation and communication. (Storper 1997: 21)

This increase in localised networking seems to operate against the homogenising effects of globalisation:

> [T]his story goes resolutely against the grain of those recent and numerous commentaries that describe the modern world as a sort of placeless expanse caught up in a universal structure of flows. It is true, of course, that the extraordinary efficiency of modern transportation and communication technologies has made possible many new and far-flung spatial configurations of the world economy. This possibility is realised, however, not through the elimination of the effects of geography, but in the concrete appearance of ever more finely grained patterns of locational differentiation and specialization and interregional trade. In the world we inhabit today, space has not become a less important factor in the structuring of economic processes; on the contrary, it has become considerably more important. (Scott 1997: 399)

Researchers have identified several fairly straightforward explanations for the continued importance of locality in business networks. For example, firms form in clusters because:

- Business support services, both public and private, are typically based on local administrative boundaries.

- Despite modern technologies, population mobility is limited, as people tend to become attached to particular locations.

There is also some consensus over the general explanations of clustering. For example, Storper (1997: 181), like Brown and Hendry (1997) (Section 2.2.3 above), sees spatial clusters as the result of a trade-off between 'territorial economies', and the 'flow' economies of global capitalism. Using a similar argument, Amin and Thrift (1995: 92) suggest that the performance of a local economy is closely linked to its capacity to 'capture' global economic flows. However, in order to assess the relative importance of global and local factors, we need to turn to recent empirical studies.

High technology clusters: a test case?

Research into the clustering of high technology firms can be seen as a useful test case for the continuing relevance of the industrial districts thesis (n.b. Section 5 provides a more detailed review of innovation networks). Saxenian (1991, 1994) presents evidence from one of the best-known modern spatial clusters, Silicon Valley. She argues that Californian high technology firms have similar proximity requirements to firms in previous industrial districts:

> The proliferation of inter-firm networks helps account for the continued dynamism of Silicon Valley. While the region's firms rely heavily on global markets and distant suppliers, there is a clear trend for computer systems producers to prefer local suppliers and to build the sort of trust-based relationships which flourish with proximity. The region's vitality is thus enhanced as inter-firm collaboration breeds complementary innovation and cross-fertilization among networks of autonomous but interdependent producers. (Saxenian [1991] 2000: 36)

We have seen that, in 'traditional' industrial districts, the kind of socially embedded economic activity that Marshall termed, 'industrial atmosphere', may have grown up over many centuries. Evidence from Silicon Valley (Saxenian 1991, 1994), Minneapolis and Cambridge, England (Lawson and Lorenz 1999), suggests that atmosphere can be created over much shorter time-frames. These spatially concentrated networks encourage close collaboration, and also allow shared labour markets to operate. Rapid circulation of people between organisations has been identified as an important mechanism for exchanging and developing the kinds of tacit knowledge that are required in innovative, high-technology sectors (Brown and Hendry 1997; Henry and Pinch 2000).

However, these arguments should not be taken as implying that clusters are *easily* formed, nor that they are insensitive to location. The impressive dynamism of both the Minneapolis medical equipment cluster, and the technology spin-outs clustered around Cambridge can be explained, in part, by the culture induced by the long-established, elite universities located in these cities. The distinctive structure of the firm population is also a factor:

> As with Minneapolis, a general spirit of openness has been identified by various researchers. By and large, this again has been encouraged by the open science culture in the university [...] but also by the existence of considerable technical overlap between firms which still compete in relatively different (often niche) product markets. (Lawson and Lorenz 1999: 314)

Contemporary clusters are fragile creatures. Earlier, we saw how knowledge transfer and fruitful re-combinations require a fine balance between co-operation and competition. This balance can be jeopardised by institutional changes. In the case of the high-technology clusters, one of the main dangers is the desire to 'protect' intellectual property. More specifically, the free flow of knowledge is likely to be constrained as universities become more 'commercial', internalising research activity and resorting to the threat of litigation:

> It may well be that conflicts relating to interest positions in the [Minneapolis] region are encouraging both the university and local producers alike to reflect on customary practices which have determined the diffusion of knowledge across their boundaries, and hence have impacted on the distribution of regional quasi-rents. In the intensified competitive position of the 1990s, and with federal and state legislatures acting to promote a new commercial mission for the universities, it may well be that a new culture based on a greater restriction of knowledge flows is being put in place. What remains to be seen is the longer-term impact of such changes on regional growth and performance. (Lawson and Lorenz 1999: 314)

Ultimately, as Saxenian has acknowledged, high technology clusters remain dependent on global economic flows. If national or international supply chain relationships become stronger than local ones, the spatial cluster becomes vulnerable. Some researchers have argued that the forces of globalsation (e.g. information and communications technologies, strategic alliances, user markets, institutional supports), are such that there may no longer be a need for spatial clusters of firms (Antonelli 1992). Hendry *et al.* (2000) is a recent test of this argument. The researchers compared relationships amongst opto-electronics firms in six locations in three countries. They conclude that the presence of a 'significant enterprise', either a large company or a university, acted as a catalyst for the creation of a cluster, primarily through their roles as incubator and source of spin-off activity. Whilst this finding appears consistent with earlier research on the *formation* of industrial districts, there was little evidence of 'industrial atmosphere':

> However, our data provide scant support for the industrial district model of local co-operation and traded relationships among regional firms in opto-electronics. Proximity without intimacy or interaction seems more common. (Hendry *et al.* 2000: 140)

Some personal relationships between personnel in the new firms survived the spin-offs, but the main focus for research collaborations and commercial ties with suppliers and customers was at a national or international level. Untraded interdependencies played only a *transitional* role in this sector. They were important when trading activity was limited to the region, but did not appear to survive a shift to outsourcing and the internationalisation of user markets:

> 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)

2.2.5 Concluding comments: the distinctiveness of districts

The contrasting evidence from these contemporary clusters suggests that we are dealing with a very complex phenomenon. The importance of proximity varies by sector, and over time, as the network evolves. This process is dependent on factors within the localised network, but is also subject to changes occurring far beyond its apparent boundaries. Networking beyond the immediate locality, typically through global supply chains, can have an important bearing on the development of a cluster. As a consequence, the performance and longer-term prospects of today's industrial districts are not amenable to generalised comments. The benefits attributed to flexible specialisation may be achieved in certain contexts, but it does not represent a universal panacea. Each industrial district pursues its own distinctive path. We close this section with an historical illustration that highlights this point.

In the early 19th century the British and French silk manufacturing districts adopted radically different organisational forms, with equally dramatic effect. The British pursued an aggressive modernisation strategy. In response to deregulation measures in the mid-1820s, they followed the 'classic' model of large-scale industrialisation that had been pioneered successfully in the country's cotton industry. By contrast, the French districts were based on localised networks of smaller firms. In the event, the French solution proved more successful:

> Throughout the nineteenth century dispersed manufacturing in Lyons was a success story while silk manufacturing in London and then throughout Britain went into steep decline. (Cottereau 1997: 76)

In this case, small firm networks appear to have won the day. However, the wider lesson from Cottereau's comparison of these two experiences, is that industrial development does not follow a pre-determined path. There is an urgent need to move away from generic solutions for industrial districts, in favour of analysis based on a deeper understanding of their distinctive histories and contexts.

2.3 Policy implications

2.3.1 A new perspective on 'local' economic activity

It is time to re-assess the ways that we analyse the economic activity occurring in particular localities. Researchers and policy-makers have too often been content to apply 'top-down' administrative definitions to demarcate 'local' economies, typically local authority boundaries, economic planning regions and travel-to-work areas. The definitions may provide convenient sampling frames but they often bear little or no relation to current patterns of economic activity, cutting across the kind of spatially-concentrated networks discussed in this chapter. Research which is framed in these terms is therefore likely to miss as much as it finds (Pratt 1994). Policy interventions can be constrained by the same boundary-setting. Various solutions have been proposed. Curran and Blackburn's (1994) response to the apparent atomisation of local economies was to suggest that conventional 'local' support strategies may be substituted by sector-based strategies. However, an overly-dogmatic application of sectoral definitions would pose similar dangers, with policy interventions that are insensitive to the unique conditions in a particular locality. These dangers could be minimised if policy-makers combined a sectoral focus with an understanding of inter-firm networks. This highlights the need for flexibility, so that local agencies can deliver support that is better attuned to the distinctive networks operating and emerging in their areas. Policy-makers also need to make allowance for the idiosycracies of networks, notably (in this context) their flagrant disregard for tidy administrative boundaries.

2.3.3 Adopt a selective approach to intervention

The effectiveness (or otherwise) of policy initiatives appears to depend on the type of action taken, and the nature of the network. At first sight, spatially concentrated networks seem more amenable to policy intervention than sectoral networks, since they reflect established political and legal boundaries. However, interventions must be well focused. Scott (1992), for example, is a strong advocate of targeted intervention:

> [E]conomic competitiveness and growth can often be much improved by policies that take direct aim at the regional production system as such, and that seek to build on its many-sided temporal and spatial externalities [...] (Scott 1992: 395)

By 'direct aim', Scott means public initiatives that avoid the 'standard approach' of unfocused fiscal incentives (i.e. general subsidies and tax breaks). For example, agencies can provide critical inputs to producers (e.g. export information, specialised training), assist with inter-firm collaboration and organise 'political' forums for issues ranging from securing trademarks for regional products to long-term strategy debates. These ideas, which sound rather familiar today, are not presented as a 'guaranteed passport to utopia'. For example, policy needs to take account of competitive factors in the wider economy:

> As the experience of many actual local economic development efforts over the 1980s demonstrates, it is in general not advisable to attempt to become a Silicon Valley when Silicon Valley already exists elsewhere (that is, unless some hitherto unexploited local advantage can be brought into play. (Scott 1992: 397)

However, others have argued against intervention *per se*, on the basis that business networks are essentially self-creating, and cannot be prescribed. In any event, it is essential to recognise their inherent complexity, which makes them delicate and not amenable to heavy-handed, 'one size fits all' policy measures (Henry and Pinch 1999).

2.3.2 Combine local and global perspectives

In developing policy for spatial networks or clusters, it is important to consider both the local base and its relationship to wider markets, at a regional or global level:

> Economic relations between the local economy and the larger regional economy have an important bearing on the potential that exists for certain types of economic activities [...] Potential in the local economy must be assessed with an eye to these spatial relationships and the constraints that they impose. (Keane 1990: 292)

This may require a review of support systems for clusters with significant extra-regional linkages, notably those operating in high-technology sectors. As a first step, policy-makers need to gain a deeper understanding of the technological trajectories of the sector, and the way that global markets are evolving. If it is the case these processes are driving towards the intensification of national and international networking, fruitless efforts at localised institution-building may be replaced by more productive initiatives:

> Successful intervention in such processes may be beyond the remit or competence of central and local government. But, at the least, it means recognizing the position of a particular industry in its global supply chain, and having a strategy to market the region to international companies or complexes of small firms, and to facilitate global networks for innovation. (Hendry *et al.* 2000: 142)

Notes

1 Piore (1992) has argued that Marshall did not observe the kind of industrial district that contemporary researchers have identified:

> [W]hat Marshall observed might best be termed a dispersed hierarchy, a set of narrowly specialized and hierarchically coordinated productive units. These units operated like the mass production factory of the functionally divided corporation, but the relationships were organised by contracts rather than by internal rules. (Piore 1992: 437)

2 In practice, both 'Marshallian' and contemporary districts are either linked into vertical supply chains, or at least affected by these network forms (see: Section 3).

3 Trinder's (1992) description of the business networks associated with 18th century iron-making have strong contemporary resonances. Note how power in the network was exercised by large firms that controlled the supply of charcoal to smaller entreprises. Technological innovation, in the form of the coke-based smelting process, removed this constraint:

> All of the works used charcoal as their fuel and water as their source of power. There were constant exchanges of iron at various stages of production between the works. Supplies of charcoal were a limiting factor in the growth of ironmaking. Charcoal was made from wood of up to 20 years growth, which was grown as a crop in coppices. The market for charcoal was dominated by large combines, like those of the Walkers of Bringewood and the Boycott partnership on the Middle Severn, and other works were often driven out of business by their inability to obtain charcoal. (Trinder 1983: 77).

3 Supply chain networks

In the literature, relations between buyers and producers have been more part of an ideological debate than the subject of thorough research. (Schmitz and Knorringa 1999: 5)

This section explores the connection between inter-firm networks and the purchasing and supply function within organisations. The origins of this connection are briefly examined together with the structure of supply chain arrangements. Two examples are used, both to highlight some of the features of supply chain networks and to analyse the reasons for the trend towards increased reliance on such networks. With SMEs in mind, opportunities presented by an environment in which vertical integration is increasingly giving way to network arrangements are examined.

3.1 Background: the nature of supply chain networks

3.1.1 Initial definitions

Increasing interest in supply chain networks has given rise to a field of management specifically devoted to managing these networks, namely 'supply chain management' (Christopher 1992). As the name implies, supply chain networks are essentially networks of firms on the supply side of an organisation, that feed it with materials, information or services. In the procurement literature, this is often termed the 'downstream' side of an organisation (Slack *et al*. 1995) (Note 1). The term 'chain' is used because commonly one has groups of interconnected organisations engaged in supply activities. This interconnectedness arises where some of the stages of production (i.e. the manufacture of materials and parts) are subcontracted out to independent firms, instead of being undertaken by the producer of the final product. Materials and parts therefore flow through the chain to reach the producer of the final product. A key element of the chain concept is that value is added at each stage (Porter 1987). Hence, the supply chain network has at its hub a relatively 'flat' organisation that relies on interaction with network partners who perform value adding activities that feed the network organisation's own operations (Cravens *et al*. 1996: 204).

The various elements described so far, are reflected in definitions of supply chain networks used by leading researchers in the field. Bower (1993: 84), for example, emphasises the value-adding nature of supply chain network when describing them as:

> The group of organisations which contribute to the development, production and marketing of a product.

Meanwhile, Harland (1996: S64) stresses the linkages when she describes a supply chain network as:

> A network of interconnected businesses involved in the ultimate provision of product and service packages required by end customers.

However, in reality, most organisations can be seen as belonging to, or participating in, supply chain networks in one form or another:

> The entire economy may be viewed as a network of organisations with a vast hierarchy of sub-ordinate criss-crossing networks. (Thorelli 1986: 3)

3.1.2 Origins and extent of supply chains

Some organisations have a very limited supply chain network. This is because they have internalised many of the value adding activities and integrated them within the organisation. Where this occurs one has vertical integration. The vertical element refers to the fact that these the various activities that process material are all downstream from the main production process. Vertical integration is associated with the rise of the large business corporations especially in the US in the late nineteenth and early twentieth centuries (Chandler 1977), as manufacturers, such Ford (Krafcik 1988), brought the supply chain in-house. Prior to indusrialisation, sub-contracting out major steps in the production process was common. In the textile industries in the seventeenth and eighteenth centuries, in order to escape the costly regulations of urban-based guilds (Hudson 1986), merchants operated a 'putting-out' system that had workers processing yarn and cloth in their own homes spread across the countryside. Similarly in the coal industry in the nineteenth century, sub-contracting was common. In the English Midlands, pillar and stall mining was organised around a 'butty', an independent contractor who employed a team of miners to extract coal from the coal face (Griffin 1971; Lawrence [1913] 1992: 26). Some writers (Marx [1887] 1979: 605) predicted the demise of sub-contracting with the onset of industrialisation. However, sub-contracting has remained widespread, as studies conducted in countries like Japan (Thoburn and Takashima 1993) and Taiwan (Whitley 1998) have demonstrated.

3.1.3 Renewed interest in supply chain networks

Over the last 20 years there has been a distinct move away from vertical integration in favour of supply chain networks. This involves an increased use of sub-contracting, which is often undertaken by SMEs (Thoburn and Takashima 1993), as large firms contract out stages in the production process to concentrate on either a single stage (e.g. final assembly), or at least a more limited number of stages. In some cases it has been associated with firms moving into new parts of the supply chain in order to embrace higher value-added activities. For instance, in aerospace (Smith and Tranfield 2000) and trucks (Brooks and Reast 1996), manufacturing firms have increasingly taken on maintenance/service activities, which they see as both highly profitable and less prone to cyclical fluctuations.

We can identify a number of factors that have prompted this change. One of the most important is the influence of Japanese manufacturing techniques. Womack *et al*. (1990: 155), in their major study of automotive manufacturing, noted that Japanese manufacturers sub-contracted almost three quarters of manufacturing activities to their suppliers, compared to little more than a quarter for some Western manufacturers. Not only did they rely more on sub-contracting, Womack *et al*. (1990) found they also managed their suppliers in a more co-operative and less adversarial manner. The wider acceptance of Japanese techniques helps to account for increased use of supply chain networks. A second factor is the increased popularity of outsourcing. Since Peters and Waterman's (1982) exhortation to firms to 'stick to the knitting', contracting out of non-core internal processes has increased in popularity:

> Outsourcing has resulted in greater selectivity over which stages in the value chain firms wish to engage in. (Grant 1998: 426)

According to Brown (1997: 57), the most frequently out-sourced activities are property services, catering and information technology. While the increased popularity of outsourcing owes much to managers' desire to concentrate their energies on core activities, its popularity can also be attributed to out-sourcing's role in enabling new entrants to start up in business. For instance, many of the new low cost airlines that have sprung up in Europe over the last decade, owe their origins to the ease with which entrepreneurs could start-up new airlines without having to invest in the facilities for full-scale airline operations. Instead, they have been able to rely on out-sourced activities, such as: maintenance, in-flight catering, pilot training and reservation systems.

A third factor is the increased availability and use of information and communications technology (ICT). A key element is not just that ICT enables employees to be more productive and gives managers increased information with which to manage but the communications capability provided by modern ICT systems. It is the communications capability of modern ICT-based information systems (Cravens *et al*. 1996) that facilitates the co-ordination of manufacturing and service activities amongst a group of independent network partners based at a number of locations.

A fourth factor has been the increased recognition of resources, capabilities and competences as a basis for competitive advantage (Grant 1998). Unlike earlier notions of strategy, which portray competitive advantage as a matter of positioning the organisation in relation to its environment, resource-based strategy (Penrose 1959; Richardson 1972; Wenerfelt 1984) argues that successful firms develop the competencies necessary to adapt or shape the environment. With resource-based strategy the emphasis is on the sustenance and development of the internal capabilities of the firm. As these ideas about strategy took hold in the 1990s, firms increasingly focused on their core activities. The outsourcing of non-core activities and the resulting vertical dis-integration has meant that extensive supply chain networks are now much more common than they once were. Lastly, supply chain networks have become more important as ideas about supply chain *management* have developed (Hayes and Wheelwright 1994). The essence of these ideas is that it is insufficent for a firm to rely on its own systems to ensure competitiveness, rather competitiveness is about a firm's ability to co-ordinate the whole supply chain.

3.1.4 Motives for networking

We have noted why supply chain networks have become more popular in recent years, but what factors motivate the individual firm? Firms can have a variety of reasons for networking. One of the strongest motives for preferring a network approach, rather than a vertically integrated one, is that the resulting externalisation provides a valuable cost discipline. Macmillan and Farmer (1979: 283) note how, 'the market test is still applicable', meaning quite simply that being able to buy something more cheaply outside is a valuable measure of cost-efficiency. Networks can also provide suppliers, and SMEs in particular, with significant scale economies:

> [A supply chain network] allows a firm to specialize in those activities of the value chain that are essential to its competitive advantage. (Jarillo 1988: 5)

By specialising in a narrow range of products, but servicing a number of final product producers, a smaller supplier can achieve viable scale. Specialisation also means working within a firm's capabilities (i.e. Peters and Waterman's (1982) well-known argument that organisations should 'stick to the knitting', confining themselves to the activities they know and not trying to manage activities they do not understand). Finally, the use of

supply chain networks can enable firms to avoid the problems associated with activities involving high fixed costs. By getting an external organisation to provide a service, they avoid both the high fixed cost itself and the problem of trying to ensure capacity utilisation.

3.1.5 Distinctive features of a supply chain

In contrast to industrial districts, which may facilitate a range of activities, supply chain networks concentrate on a single function (i.e. procurement, supplying final producers with resources). In many instances these resources are complex and sophisticated sub-systems in their own right, so that final producers are little more than assemblers of the end product. In cases where final producers add a great deal of value through their processing activities, supplies may extend to little more than raw materials. What can a supply chain provide? In reality, what is supplied can range widely, extending to raw materials, components, sub-assemblies, sub-systems, services and increasingly, information. Only where the end producer concentrates on assembly, will the range of what is supplied be broad.

Supply chain networks are based on relationships that are essentially vertical, connecting raw material suppliers and end-users. However the nature of these relationships can vary considerably. At one extreme, one has what is often termed the 'arm's length' relationship (Uzzi 1997: 36). This consists of no more than a market transaction where what is being supplied is simply traded. Such a relationship is likely to be characterised by a predominance of self-interest, frequent-switching, heavy emphasis on price and little personal contact. These relationships are often adverserial. This is, in many respects, the traditional relationship between the supplier and the supplied (Harland 1996). At the other end of the spectrum is the 'partnership' type of relationship. This is sometimes denoted as the 'systems thinking' approach (Hendry and Brown 1995: 12) because it is wide-ranging and long term. With this type of relationship there will be a high degree of integration between suppliers and the focal (i.e. final producer) organisation. Integration is usually associated with a high level of 'embeddedness' (Bozdogan *et al*. 1998; Provan 1993). Embeddedness refers to the strength and quality of the connection between supplier and focal organisation (see also: Section 2.2). A strongly embedded relationship between supplier and buyer implies a high degree of inter-dependence between the organisations. This, in turn, is associated with the absence of opportunistic behaviour, and the presence of reciprocity in the form of mutual co-operation and a sense of a shared destiny. This is likely to be a very different relationship from the more traditional arm's length one, which would be much more adversarial, involving little more than the exchange of basic information and the conduct of transactions. Consequently, a network made up of embedded relationships will also differ, being relatively stable and cohesive and involving a group of organisations working closely together. A number of industries have exhibited significant changes in the relationships that exist within their supply chain networks. Those producing sophisticated technological products such as the automotive (Sadler 1999) and aerospace (Bozdogan *et al*. 1998) industries appear to be moving away from traditional arm's length relationships and instead embracing relationships with a much higher degree of embeddedness. The resulting supply chain networks have become more integrated with closer co-operation between focal organisations and their suppliers.

As has already been noted, one of the key structural characteristics of supply chain networks is that they are vertical. This gives rise to another distinctive feature, with supply chain networks frequently being arranged in tiers (Liu and Brookfield 2000). The existence of tiers tends to be a function of the complexity of the tasks undertaken

(Dussauge and Garrette 1999). Suppliers producing sub-systems that go into the final product are on a 'higher' tier, that is to say closer to the producer of the final product, than those producing raw materials or individual parts. Parts manufacturers supply the makers of sub-systems who in turn supply the producer of the final product. Latterly, the presence of tiers within supply chain networks has increased. This is associated with the move away from traditional 'arm's length' relationships, relying on competition and price dependency (Harland 1996), in favour of greater embeddedness.

3.2 Emerging themes

3.2.1 Information and communications technology – creating seamless links?

If there are signs of the balance of power shifting in favour of small firms, especially where new institutional arrangements link them to hub organisations, a key factor has clearly been developments in information and communications technology (ICT). These have done much to remove one of the key attractions of large organisations and internal processes. In short, ICT has helped to make external communication no harder, no more expensive and no less reliable than that occurring inside the firm. A recent paper by Cox *et al*. (1999) provides a valuable insight into the effects of technology on inter-firm networks in general and supply chain networks in particular. The study focused on the food industry and the development of a new sector - chilled meals - in the early 1990s. Not only did the study uncover the extent of the supply chain network, especially the organisations involved and the nature of the linkages, it also showed why the network form of organisation was used rather than a hierarchical form based on vertical integration.

Historically, the food industry has been organised primarily through market transactions. Farmers sold livestock and crops through wholesale markets; there was little or no interaction between different levels in the supply chain. Food manufacturing, meanwhile, developed as a vertically-integrated activity. For example, in the 1950s, product development in the frozen foods industry was organised within the walls of a few large corporations, notably Unilever. However, when Marks and Spencer came to pioneer the introduction of chilled meals in the early 1990s, the relatively short shelf life of the product, combined with the need for variety and differentiation led to the use of small batch manufacturing rather than continuous process methods. In the food industry the firms engaged in this type of manufacturing were, for the most part, small independent manufacturers, including a number of 'micro-kitchens employing less than five people' (Cox *et al*. 1999: 12). Hence, large multiple retailers such as Marks and Spencer and Sainsbury began collaborating with these much smaller suppliers. Short shelf life meant that it was vital to match demand and supply accurately through effective management of the supply chain. This was achieved through the use of generic IT systems which were developed with the aid of a trade association, the Institute of Grocery Distributors (Bamfield 1994). The introduction of these integrated information systems enabled the multiple retailers to exercise:

> Control over an organisation structure which actually constitutes a network of independent firms revolving around the hub played by the retailer's head office. (Cox *et al*. 1999:11)

In short, the availability of ICT systems, developed with the assistance of a trade association, made it possible to operate a supply chain network comprising small independent food manufacturers, logistics companies and packaging companies, with the

retailer acting as the hub. This is in sharp contrast to the development of frozen foods in the 1950s, which relied on vertical integration, and to spot market transactions found in other areas of the industry.

3.2.2 Trust and reciprocity in supply chain relationships

The chilled foods industry case illustrates that information systems made the network structure viable. However, there was more to the linkages between organisations than simple data transmission. The study by Cox *et al*. (1999: 12) shows that there was a high degree of embeddedness in the relationships between the organisations. As other food industry studies have suggested, closer collaboration between network members is a gradual process, based on a degree of mutual advantage (Blundel and Hingley 2001). For the retailers, the main advantage of being able to use small independent food manufacturers, was their flexibility and use of small batch operations. Despite the obvious differences in bargaining power (Competition Commission 2000), there is some evidence of trust and reciprocity in these arrangements. For example, small food manufacturers benefit by not having to engage in branding, marketing or distribution. Perhaps more importantly, they can also gain access to specialist knowledge:

> For the supplier, meanwhile, the retailer can supply ideas as well as technical help and access to its network of specialists. (Cox *et al*. 1999: 12)

Retailers established 'product development teams' for chilled meals, comprising employees from food manufacturing and packaging companies, as well as their own staff. Collaborative working plays a vital role in enabling suppliers and retailers to tap into new sources of knowledge. As research from the fresh produce sector has indicated, the combined effect of knowledge-sharing and the insatiable demand of the 'customer' firm, can stimulate innovation and growth in small-medium supplier firms:

> 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 […] (Blundel and Hingley 2001: forthcoming)

In summary, these sectors of the food industry illustrate the extent to which network organisations, sometimes comprising close 'partnership' linkages, have displaced previous combinations of vertically integrated hierarchy and 'arms length' market transactions:

> An integrated information network has thus replaced a corporate hierarchy as the efficient method of managing large numbers of discrete transactions in the information age. (Cox *et al*. 1999: 10)

3.2.3 Networks arising from corporate out-sourcing

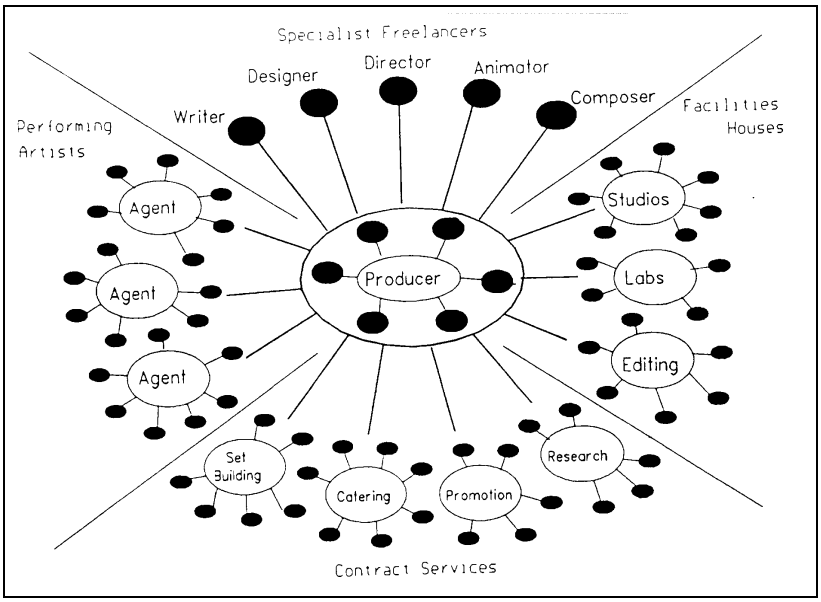
We have noted the recent trend for large, vertically-integrated organisations to reduce indirect costs by outsourcing (e.g. reducing the headcount at headquarters, replacing permanent staff with contractors). This presents an opportunity for smaller firms which are seen as competitive due to their lower overheads. Barnatt and Starkey's (1994) analysis of the UK television production industry in the late 1980s and early 1990s identified this pattern of changes, as more complex supply chain networks replaced hierarchical organisational forms. Television had been dominated by, 'rigid, bureaucractic corporates

sourcing programmes almost exclusively from internal facilities.' Amongst the corporates operating in this way, the BBC was the outstanding example. It was large, and covered a very wide range of functions which gave it a very broad production capability, ranging from sport to light entertainment and drama. The arrival of Channel 4 in the early 1980s instigated a move towards new structures for broadcasting. As the 1988 White Paper on broadcasting noted:

> Independent producers constitute an important source of originality and talents which must be exploited and have brought new pressures for efficiency and flexibility in production procedures. (Home Office 1988: 41)

Thus, during the following decade, even the BBC was subject to massive structural transformation. In the face of major institutional changes, notably the 1990 Broadcasting Act, and the emergence of more reliable, easier to use, cheaper and more widely available technologies, there has been a huge switch in both public and private sector broadcasting, away from broadcasters producing their own material (i.e. programming) in favour of external contracting using small independent production companies. A wide range of specialist services, from facilities houses (i.e. studios) to set building, animation, set design, catering and artists, are now co-ordinated by independent production companies who are themselves commissioned by the broadcasters to produce programmes for transmission. Hence, the independent production companies form an important layer or tier, in what is now a complex supply chain network. Barnatt and Starkey (1994) stress that a key feature of the organisations that make up the supply chain is that they are small. Indeed, many of the specialist services used by production companies, are provided by individuals who operate on a freelance basis. The independent production companies form part of what the researchers describe as, 'the growing array of very small independent companies within the industry.' While the relationships between organisations in this industry are clearly contractual, the creative nature of the work ensures that people operate in small close-knit teams (Figure 3.1). The individuals and small companies supplying these services provide specialised rather than commodity services. Consequently, there is a high level of embeddedness in these relationships.

Figure 3.1 Television production – a small firm network



Source: Barnatt and Starkey (1994)

3.2.4 Spin-offs and the search for difference

Small batch production, which has long been the province of smaller firms, is undergoing a revival. Rising living standards, in some population groups, have meant that consumers are increasingly searching for novelty and variety. For premium consumer goods and services (e.g. food products, leisure activities), lower costs and prices are of secondary importance, behind product innovation and differentiation. This change in emphasis offers opportunities to suitably-equipped small firms. Providers of these new and differentiated services can emerge via a variety of institutional arrangements, including spin-offs from larger organisations, management buy-outs and start-up ventures. However, whatever their origins, they need a route to market. Hence, new supply chain networks are created that promote the expansion of the small business sector of the economy.

3.2.5 Supply chain networks and the small firm – a critique

It is perhaps too easy to be seduced by the plausibility of the flexible specialisation hypothesis, and imagine that supply chain networks are being embraced and implemented across the industrial spectrum. The reality appears to be that, while there is a move away from vertical integration in favour of supply chain networks, this is not taking place evenly across industries. Those with a heavy reliance on creative inputs, such as television production and fashion textiles, are one such context. Industries where product differentiation, variety and choice are major competitive factors, such as the automotive and food industries, provide further examples. However, as yet there appears to be little evidence that collaborative networks are spreading beyond these very specific instances. The likelihood is that there will always be some circumstances (e.g. to ensure security of supply or control quality), where vertical integration remains attractive.

One has also to bear in mind that, although increased use of supply chain networks may bring opportunities for SMEs (e.g. spin-offs, management buyouts etc.), it may also bring potential problems. Neal (1999) and Bozdogan *et al*. (1998) note how increased reliance on supply chain networks in aerospace has been associated with a reduction in the size of the supplier base as prime contractors (i.e. aircraft manufacturers) deal with fewer suppliers. The suppliers they retain tend to be bigger, with responsibility for the design and development of complete sub-systems rather than just the manufacture of components. To undertake this new role, suppliers have had to broaden their sphere of influence and the skill base they can draw upon (Neal 1999). The resulting consolidation suggests that opportunities for SMEs may decline. In other words, the leading suppliers become bigger and more powerful, squeezing out the smaller suppliers.

Many of the well-known examples of supply chain networks involving large numbers of SMEs, such as the knitwear industry in Northern Italy (Lazerson 1995), or the electronics industry in Taiwan, rely heavily on SMEs based on cohesive family structures that are a part of the social fabric in the region where they are based. Transferring this form of industrial organisation to regions with a very different culture, or where the family is much less influential, may simply not be viable (see: Section 2.2).

3.3 Policy Implications

3.3.1 Highlight links between supply chain networks and growth of SMEs

There needs to be an increased recognition by the support and advisory community of the supply chain network as offering a potential route to growth for SMEs. In the case of both the chilled meals sector of the food industry and the television production industry the process of vertical dis-integration stimulated the birth and subsequent growth of large numbers of SMEs. Where this occurs there is a clear policy requirement for a supporting infrastructure to advise those leaving large organisations to set up on their own account, the most appropriate way of going about this. Whether this needs to go as far as the tax concessions, subsidies and favourable planning regimes (Lazerson, 1995) provided for the Italian knitwear industry based in Modena is perhaps less clear. However there may be a policy requirement for greater awareness amongst the population at large of the scope for spin-offs, management buy-outs and the like.

3.3.2 Help small-medium suppliers to select appropriate partners

Small-medium suppliers need to evaluate the potential of alternative and emerging routes to market. The managers of these firms should also consider whether they are likely to offer 'customer' firms benefits that can be sustained and enhanced through a closer supply relationship, bearing in mind the transformative effects that such a relationship is likely to have on their own 'bundle of resources' (Penrose, 1959). Advice needs to be sector-specific, though this review has identified some generic issues that could be highlighted.

3.3.3 Encourage the development of networking skills

The case studies in this section show how important it is for SMEs to develop close collaborative relationships. To reach this stage, managers need to tackle critical resource, capability and communication challenges. There may be scope for intervention by external agencies, in the form of focused training, development and mentoring support. The UK food industry's recent 'Small Food Producers Support Initiative' provides a useful model, which encourages the transfer of expertise between large and small firms.

3.3.4 Consider the effects of legislation on network governance

The television industry example shows how legislation can be an important element in policy. Barnatt and Starkey (1994) make clear that legislation was instrumental, not only in creating new institutional arrangements for broadcasting (e.g. Channel 4), but in changing the broadcasting environment and the expectations of broadcasters about the most appropriate way to organise broadcasting. This raises a number of questions. For example, will the new network governance arrangements in the television industry provide the level of training that was previously undertaken by the large broadcasting corporations (i.e. BBC and ITV)? Some commentator have raised doubts:

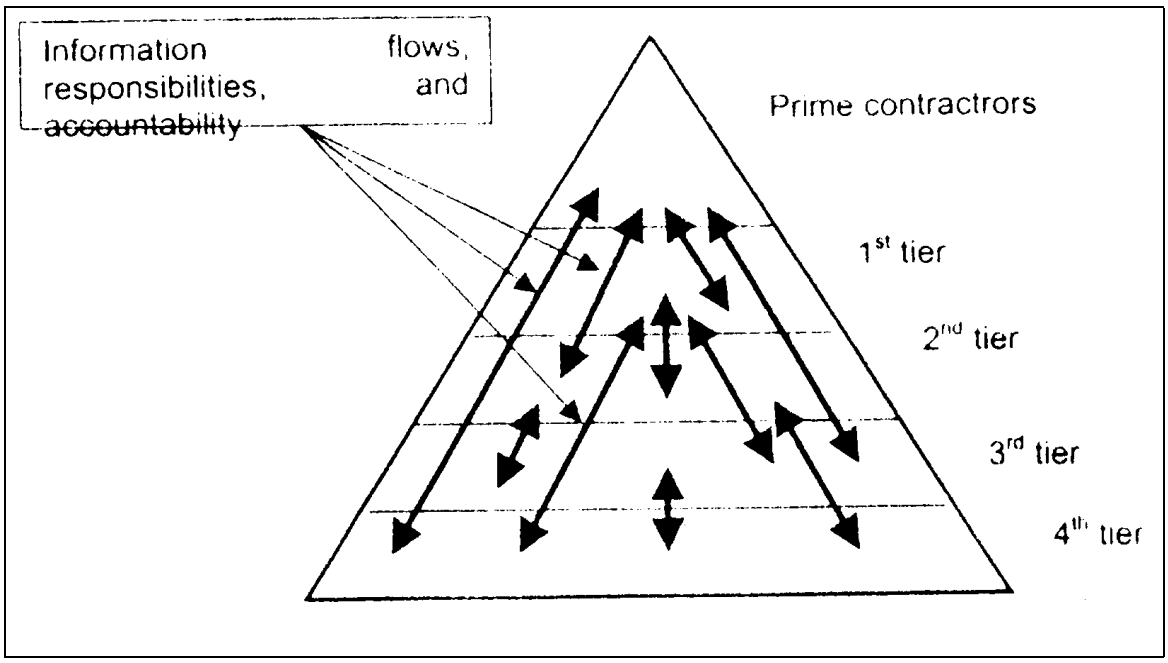
> It is precisely because the BBC and ITV diverge from the market form of governance that has made it possible for them to provide such training. (Abercrombie *et al*., 1990:11)

Just as corporate governance became an important topic of debate in the late 20th century, so network governance may well prove to be a significant policy issue for the future.

Notes

1 The terms 'upstream' and 'downstream' are widely used in connection with supply activities. Downstream is often taken to imply proximity to the market, or end customer, while upstream implies proximity to raw material supply. However, in the procurement literature, these terms are sometimes reversed. The 'chain' is portrayed as a pyramid, with final producers (e.g. an aircraft manufacturer) at the 'top', and raw materials suppliers at the 'bottom' (Neal 1999). In order to avoid confusion, we have minimised use of these terms in this section.

Figure 3.2 A supply chain pyramid



Source: Neal (1999)

4 Entrepreneurial networks

One of the implications of this perspective on entrepreneurial firms is that it allows us to contemplate an alternative network model of firm growth. (Larson 1992: 94)

This section reviews the evidence for networking activities amongst entrepreneurial business ventures. Three main approaches to entrepreneurship are outlined, each of which has contributed to recent work on entrepreneurial networks. This research is also contributing to a change in our view of the entrepreneur, from individualistic and solitary 'hero' to the creator of dynamic networks. These networks differ, in many respects, from those surrounding most other small firms. The discussion focuses on three emerging themes: the role of personal networks in entrepreneurial start-ups, the evolution of entrepreneurial networks as start-ups become established businesses, and the extent to which entrepreneurial networks are 'embedded' in their local context.

4.1 Background

4.1.1 Entrepreneurship and networks: diverse influences

Entrepreneurs have long been regarded as playing a distinctive and, for the most part, desirable role in the economy. An extensive research literature has built up, that seeks to understand entrepreneurship, often with the explicit aim of encouraging its development. Research into entrepreneurial networks is a more recent phenomenon, emerging as part of the upsurge of interest in the 'enterprise cultures' of the 1980s (e.g. Aldrich 1986, Birley 1985, Johannisson 1988). This strand of business network research has, therefore, been heavily influenced by the diverse, abundant and sometimes contradictory theories of entrepreneurship that had already been developed in the fields of economics, sociology and psychology:

Economic theories: Economists have tackled both the nature and the consequences of entrepreneurship, with varying degrees of success. The term 'entrepreneur' originates with the French physiocrats Richard Cantillon (1680-1734) and Jean-Baptiste Say (1767-1832), who first identified their distinctive role in economic development. Entrepreneurs were seen as commercial intermediaries or brokers who absorbed risk by purchasing goods for resale at an uncertain price. However this role proved problematic for neo-classical economics, which was built on the concepts of equilibrium and self-correcting markets (Marshall [1920] 1986). Two strongly contrasting views of entrepreneurship emerged during the twentieth century. Schumpeter ([1911, 1934] 2000) argued that 'new combinations' of ideas and resources resulted in major technological and market innovations. These innovations initiated a process of 'creative destruction' in which existing trading patterns are transformed, leading to 'step' changes in economic development. The 'dot com' revolution exemplifies this 'Schumpeterian' brand of entrepreneurship, particularly the radical structural changes occurring in business-to-business markets. Kirzner (1973) saw entrepreneurship as the identification and exploitation of profitable opportunities, which arise from an imperfect distribution of knowledge in the economy. 'Kirznerian' entrepreneurship, illustrated by a recent proliferation of businesses importing cheaper cars from continental Europe, may be disruptive in the short term but it tends to reduce disequilibrium in a market. Academic debate over these theories may seem to have little direct relevance to practitioners

(Swedburg 2000: 21). However, it does suggest that entrepreneurship can adopt different forms, an issue that is further developed in the sociological literature.

Socio-cultural theories: Sociologists have worked primarily on the causes of entrepreneurship. The underlying assumption is that this kind of activity can be traced to specific features of a society or its culture. Perhaps the best-known cultural theory is Max Weber's (1930) assertion that a religious ideology (i.e. ascetic Protestantism) contributed to the rise of entrepreneurial capitalism. By promoting certain ethical values (e.g. regarding work, self-denial and individual responsibility), this ideology is seen as helping to reverse prevailing negative attitudes to commerce. Merchants and industrialists began to combine these values with more 'methodical' ways of organising, derived from their religious practice. In short, this proved to be a highly effective recipe, which persists in a thoroughly secularised form today (Swedburg 2000: 27). Weber's over-arching thesis may be compelling, but it does not account for the many varieties in which entrepreneurship is to be found. Other sociological and anthropological studies have filled this gap, exploring how factors such as ethnicity, gender, migration patterns, occupational backgrounds and family structures relate to particular instances of entrepreneurial activity (e.g. Barth 1978; Carter 2000; Dhaliwal 1997; Granovetter 2000; Ram and Barrett 2000). Network research is itself based on concepts originating in sociology and anthropology (see: Section 1). These studies are a useful counter-balance to economic theories in which actors are often 'under-socialised' (i.e. treated as isolated, rational and driven solely by economic factors). However, it is equally important to avoid 'over-socialisation', attributing *too much* weight to social and cultural factors (Granovetter 1985) (Note 1).

Psychological theories: Psychologists have shared sociologists' interest in the causes of entrepreneurship at the level of the individual human being. There is a substantial body of research based on the search for distinctive psychological traits, such as 'locus of control' and 'need for achievement', that might act as predictors of entrepreneurship (McClelland 1963). Measures of this kind have an obvious appeal for practitioners and policy-makers. However, though human personality appears to be remarkably stable over time, it has not proved to be a reliable predictor of single instances of behaviour. There are several causal links that separate the personality of an individual from the performance of a particular venture. The interaction between personality and other factors, such as: past experience, existing competence and the immediate context, has proved to be decisive (Birley and Stockley 2000: 292). Work on personality traits has therefore been overtaken by studies that focus on entrepreneurial *behaviour* or *activity*, incorporating cognitive models of the ways that people respond to experience (Delmar 2000). The move from traits to behaviour is important for network theory because it directs attention away from isolated individuals towards inter-personal relationships within and between organisations.

Two emerging issues in the entrepreneurship research literature are of particular relevance to a discussion of business networks. Firstly, following on from the previous paragraph, there has been some re-assessment of the conventional image of the entrepreneur. Secondly, there is an increasing realisation that entrepreneurial networking is likely to differ from that undertaken by the 'average' small business.

4.1.2 No more heroes?: re-assessing the image of the entrepreneur

The traditional image of entrepreneurship is based on 'heroic' and fiercely-independent individuals, characterised by egocentric attitudes and behaviour (Gray 1998). At first sight, this appears to leave the more collaborative concept of entrepreneurial networks

looking somewhat paradoxical (Johannisson 2000). The focus on individuals is bolstered by a popular literature that is attracted to aspirational biographies (e.g. Dyson 1997; Gates 1997). Academic research is also influenced, and perhaps distorted, by the prevalent 'Western' image of the entrepreneurial hero. However, recent work on entrepreneurial teams and networks has prompted a re-assessment, putting the actions of individuals into a wider perspective and challenging explanations based on the entrepreneur as isolated individual (Donckels and Lambrecht 1995; Jones and Conway 2000). Research on entrepreneurial teams supports this challenge. Empirical studies have linked several variables with the emergence and growth of firms, including: team size, members' prior experience and heterogeneity, though defining 'the team' has often proved problematic (Penrose 1959; Birley and Stockley 2000; Vyakarnam *et al*. 1999). There are obvious, yet largely undeveloped, parallels between the entrepreneurial teams and entrepreneurial networks literatures. These similarities are highlighted by recent attempts to probe beyond the artificial (i.e. legal/financial) borders of the firm, using a network perspective; the sharp distinction between internal and external linkages begins to blur (Birkinshaw and Hagström 2000).

4.1.3 Entrepreneurial networking as a distinctive activity

Entrepreneurial activity is not confined to small businesses or start-up ventures. Firstly, entrepreneurship is also found in other spheres, including large organisations, where it is sometimes referred to as 'intrapreneurship' (Kanter 1983). Secondly, most small firms display few entrepreneurial features (i.e. they are evident either to a very limited degree, or only intermittently). In terms of their activities, many firms are 'reproducers' rather than 'innovators', adopting well-established templates (Aldrich 1999: 80). In addition, most owner-managed firms harbour limited ambitions regarding growth and change, often choosing to remain 'micro' businesses (Johannisson 2000). Various categorisations of owner-managers have been proposed. Stanworth and Curran (1976), for example, distinguish three socially determined identities:

- **Artisan**: focused on the intrinsic benefits of personal autonomy and job satisfaction.
- **Classical entrepreneur**: emphasises the generation of revenues and profit.
- **Managerial**: prioritises gaining wider recognition for managerial skills.

A similar categorisation in this tradition distinguishes the 'entrepreneur', 'quasi-entrepreneur', 'administrator' and 'caretaker' (Chell *et al*. 1991, Chell and Baines 2000). However, it would be wrong to interpret these categorisations as fixed and immutable. For instance, a longitudinal study of manufacturing SMEs (Smallbone *et al*. 1995) illustrates how roles can be modified by experience, with an 'artisan' founder later developing a more 'entrepreneurial' stance :

> An example includes a business started by a founder from a craft printing background but who 10 years later was beginning to think like an entrepreneur, seeking to manage the assets of the business to increase his returns, rather than simply to run a production plant. (Smallbone 2000: 413)

The change in role referred to in this example is associated with the firm diversifying out of printing into property management. Case study evidence of this kind suggests that it is possible to draw a distinction between networks formed by entrepreneurs and those that surround 'ordinary' small businesses. We have seen that entrepreneurial ventures have distinctive (i.e. 'Kirznerian' or 'Schumpeterian') orientations and consequences. They seek and exploit novel opportunities, often through some form of innovation, and under conditions of heightened uncertainty. They also tend to achieve higher levels of growth,

relative to other ventures, often based on a modification of existing patterns of trade. Given these characteristics, it seems highly likely that entrepreneurial *networks* will also differ markedly from those of other small businesses. Further empirical studies are needed to substantiate this difference. However, if supported, it could prove useful to theorists and policy-makers, helping to resolve the long-running debate over the extent and value of small business networks (Birley *et al*. 1991; Curran and Blackburn 1994; Gray 1995; Monsted 1995, Johannisson 1995) (see: Section 1.1). These issues, including policy implications, are discussed in more detail below (Sections 4.2.1 and 4.3).

4.1.4 Entrepreneurial networks: a more integrated approach?

It may appear self-evident that a comprehensive explanation of entrepreneurship needs to embrace both 'macro' and 'micro' levels of analysis, the minutiae of psychology and the broader concerns of economics and sociology (Coleman 1990). However, there are major obstacles to achieving this goal, notably the absence of a common theoretical framework for the 'non-economic' social sciences:

> All this makes for a very lively and multifaceted literature on entrepreneurship, which is much closer to practical reality than the writing which can be found in mainstream economics. It, unfortunately, also makes for a very sprawling literature and one that is hard to survey. (Swedburg 2000: 24)

To date, attempts to integrate these diverse perspectives have been limited. However, as the following paragraphs indicate, some new and interesting research on entrepreneurial networks is beginning to bridge this divide.

4.2 Emerging themes

4.2.1 Identifying the 'shape' of entrepreneurial networks

As in other areas of business network research, earlier studies tend to concentrate on the 'architecture' of entrepreneurial networks, measuring features such as network density and diversity. These studies follow in the tradition of Burt (1992) and tended to adopt quantitative methods to describe 'typical' network morphologies (i.e. shapes) at specific points in time (see: Section 1.2). The range, density and reachability of focal firm networks appear to be particularly important factors for entrepreneurial ventures:

Range: Entrepreneurial firms are surrounded by extensive and diverse networks. Linkages include many overlapping 'weak ties' (Granovetter 1973) to external sources of knowledge and experience (Aldrich and Zimmer 1986, Leonard-Barton 1984). This contrasts with small, low-growth rate firms, that tend to have more limited and homogenous networks.

Density: Entrepreneurial networks are typically 'loose-knit', meaning that 'weak ties' are readily interchanged, and may remain dormant, depending on current requirements. This contrasts with the higher density networks around many small firms. These 'tight' networks are composed of many similar, unchanging, direct connections, which can impede the flow of new information (Granovetter 1973).

Reachability: Entrepreneurial and innovative ventures often make use of indirect links to other networks as sources of ideas, information, financial, physical and human resources.

Intermediaries or brokers (e.g. venture capitalists, innovation centres, business support services) can play an influential role on these occasions, increasing 'reachability' in the absence of direct links (Conway 1997, Shaw, E. 1998, Tichy *et al*. 1979).

These findings provide new insights into existing theories of entrepreneurship. They also have practical value, providing measures that can be used to assess existing inter-firm relationships. However, it is not sufficient to know the general 'shape' of an entrepreneurial network. We also want to know how such networks are *created*, and how they *develop* over time. Answering these questions demands different research methodologies, which are able to capture the relevant *processes*, such as the transfer of knowledge between firms. In a recent review, the addition of more dynamic perspectives and the increased interest in inter-organisational learning processes are cited as, 'the most noteworthy recent developments in the field.' (Ebers 1999: xi). In the following sections, we review how 'processual' approaches have contributed to our understanding of the creation of entrepreneurial ventures (Section 4.2.2), and to their subsequent development (Section 4.2.3).

4.2.2 Creating ventures: the role of personal contact networks

The process of *creating* a network is now identified as a key entrepreneurial activity, and has been the subject of many research 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 in subsequent studies, is that entrepreneurs rely primarily on *informal* sources in their personal contact network (PCN) to mobilise resources before the formation of a venture:

> The results were startling. Despite […] St. Joseph County being relatively small, with a strong and active local community, the formal sources were hardly used. (Birley 1985: 113).

If we accept the 'Kirznerian' view of entrepreneurship as identifying opportunities, the make-up of this personal network takes on a key role. It becomes a kind of 'opportunity set' (Aldrich and Whetten 1981), enabling some people to become aware of entrepreneurial opportunities, whilst others do not. At the heart of this network, there are normally a small number of 'strong' ties that provide the entrepreneur with a shelter from the opportunism and uncertainty of the market. For example, one study found that most business owners reporting between three and 10 strong ties, primarily business associates plus a few close friends and family members (Aldrich *et al*. 1989). The time and energy that entrepreneurs invest in these 'pre-organisational' networks appears to be converted into future benefits for their emerging firms (Hansen 1995, 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) (Note 2).

The extensive *personal* ties used by entrepreneurs often lead a blurring of business and social life, with mixed consequences. Researchers in the United States, Ireland, Sweden and elsewhere have identified personal contact networks with overlapping social and business relationships (Cromie and Birley 1992; Dubini and Aldrich 1991; Johannisson 1996). Reliance on particular individuals can sometimes lead to sudden, unpredictable and potentially disruptive, structural changes:

> That social and business become intertwined in individual ties means that network members are unique. If the individuals leave, the network will change. That is why the network and its ties are labelled *personal* rather than *social*. (Johannisson 2000: 370 - emphasis in original)

As noted previously (Section 4.1.4), entrepreneurs appear to use their personal networks in distinctive ways. The *pro-active* and *dynamic* nature of entrepreneurial networking distinguishes it from more conservative or 'managerial' networking:

> 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)

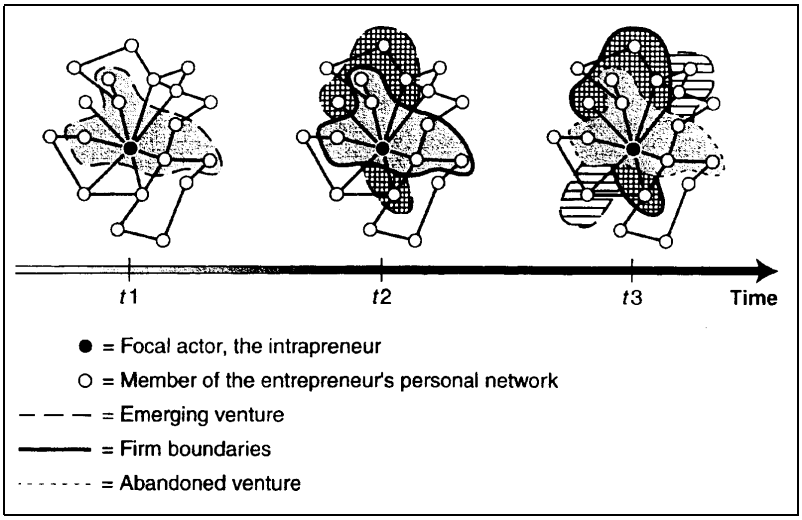
Whilst *all* start-up businesses make some 'entrepreneurial' use of their personal networks, most small firms settle down into an established and fairly limited pattern of interactions. Entrepreneurs, in contrast, continue to develop their networks, with the more or less explicit aim of expanding their existing firms or establishing new ones (Note 3). This continuing process requires a broader 'latent network' (Ramachandran and Ramnaryan 1993), parts of which are activated when required. Hence, we can see how research into entrepreneurial processes supports earlier findings regarding the shape of entrepreneurial networks, notably their more extensive range and 'loose-knit' structure (Section 4.2.2).

Figure 4.1 illustrates how the networking process might develop. An entrepreneur's personal contact network provides the foundation for several interlocking ventures over a period of time (i.e. from *t1* to *t3*). Each venture is a separate, yet linked outcome of the personal networking of an entrepreneur. By presenting entrepreneurial networks in a longitudinal perspective, it is possible to see connections between some forms of 'portfolio entrepreneurship' (i.e. where an entrepreneur operates several businesses simultaneously) (Carter 1998) and 'serial entrepreneurship' (i.e. where the entrepreneur sets up one businesses after another) (Scott and Rosa 1996) (Note 4). By introducing a time dimension, it also draws attention to the different 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)

As the entrepreneur engages in networking, s/he is changing both the network structure and its flows. Given this constitutive role, it is particularly important to understand any depiction of an entrepreneurial network as a 'snapshot', mapping the current state of an ongoing process. For example, in two recent empirical studies, a sequence of network maps is used to illustrate different episodes in the development of small firms (Blundel 2000; Brunninge 2000).

Figure 4.1 Personal networking and the creation of ventures



Source: Johannisson (2000: 374)

4.2.2 The growth and evolution of entrepreneurial networks

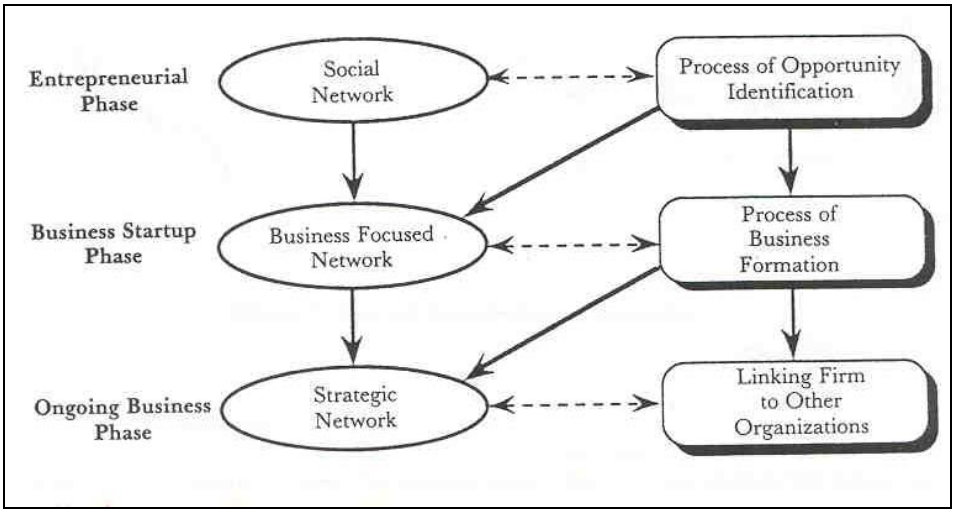
How do entrepreneurial networks change, as entrepreneurial opportunities turn into 'flesh and blood' businesses? Butler and Hansen's (1991) study of 'premium wineries' in Washington State presents and assesses a simple model of entrepreneurial network evolution (see: Figure 4.2). It begins, as suggested in Section 4.2.1, with a process of opportunity identification, in which the diversity of entrepreneurs' social networks plays an important role. This network continues to operate, but becomes combined with a new set of linkages at the start-up stage, in what the authors call the 'business-focused network':

> This business network should reflect links to individuals and organizations that directly serve the more immediate needs of the new business. Thus the business network is a *hybrid* that includes both individuals from the pre-existing social network and new individuals and organizations with direct business links. (Butler and Hansen 1991: 4 – emphasis added)

In the final stage, the 'strategic network', the focus shifts from establishing the venture to securing the firm's position in relation to larger competitors. In their own study, there was evidence of wineries co-operating with grape growers, industry associations and other wineries in the region. The shape and content of the network is clearly influenced by the nature of the product-market (i.e. differentiated / niche), but its existence can be explained as a rational response to competition in the wine industry, with 'older' (i.e. more established) firms being the most strategically aware:

> Because this product tends to have a regional reputation, higher average levels of quality were seen as important to the success of all producers. Respondents saw their success as linked to that of the industry, though entrepreneurs who had been in the business longer [n.b. most of the firms studied had been established in the 1980s] placed a higher value on the benefits that flowed from a strongly linked and cohesive industry. (Butler and Hansen 1991: 11)

Figure 4.2 A model of entrepreneurial network evolution



Source: Butler and Hansen (1991: 3)

There is another, more complex, model of entrepreneurial network evolution, also comprising three stages of networking activity (Larson and Starr 1993). This transforms an initial set of dyadic links into what the authors term a 'crystallised' network. The model can be summarised as follows:

Stage I: Focusing on the 'essential dyads': Through a process of trial and error, the entrepreneur seeks and assesses 'opportunistic' ties. Again, these initial links are mostly 'social/affective' (i.e. family and friends), but increasingly they take on (or are converted into) an 'economic/instrumental' orientation (e.g. an old friend working in a venture capital firm becomes a potential source of finance). Focusing involves the entrepreneur in 'culling' some old ties, acquiring new ones and developing others.

Stage II: Converting dyadic ties to socio-economic exchanges: As the venture begins to trade, the entrepreneur seeks to intertwine the social and economic aspects of their business relationships, increasing trust, reciprocity, investment and interdependence. This process, based on well-established 'social exchange theory' (Homans 1950, 1958, Gouldner 1960, Blau 1964), is evident in other business networks, such as supply chains (Blundel and Hingley 2001).

Stage III: Layering the exchanges: The 'idiosyncracies' of the entrepreneur's personal network are now overlaid by inter-organisational links and established 'ways of doing things'. These norms and expectations provide a structure to the relationships, and their management can be delegated to other staff.

The 'successful' outcome of these three stages is the 'crystallisation' of the network. At this point, the authors argue that an organisation has been formed. To summarise their argument, we have identified two central features, which distinguish the crystallised network from that seen in the earlier stages:

Stability: The network is more stable and predictable, in terms of actors and flows, than it was in the earlier stages. This results from, 'the relatively long-term commitment of those involved.' The stable structure is thus a product of the network actors' perceptions, based on their investment in the project. They realise that network ties are now difficult to

replace, and that switching costs are high, 'given the length of time it takes to develop ..' these multiplex relationships.

Mobilisation: There is also tangible evidence that critical resources are being mobilised to generate revenues via the network. This sets off a self-reinforcing process, where the 'visible proof' of successful mobilisation helps in securing new resources and stimulating new network ties.

Larson and Starr (1993: 11) argue that network crystallisation represents a starting point for a high growth rate venture (i.e. 'The organization is thus poised for growth.'). However, as in other studies, it is clear that the preceding phase of informal networking plays a decisive role. They conclude by highlighting 'substantial' differences between their model, and that applied by Butler and Hansen (1991). We suggest that, in practice, there is considerable common ground. Despite their differences, both models help us to integrate earlier ideas and have important implications for practice (Note 5).

4.2.2 How 'embedded' are entrepreneurial networks?

In Karl Marx's oft-quoted phrase, 'Men make their own history, but not under circumstances chosen by themselves.' In these concluding paragraphs, we consider how far entrepreneurial networks are 'embedded' or 'situated' in specific historical conditions (Granovetter 1985; Lawson 1997). The question is more straightforward and practical than it sounds. For example, Butler and Hansen's (1991) investigation into premium wineries in Washington State (see: Section 4.2.3) suggests that present-day networking behaviour is influenced by earlier patterns of activity:

> The level of interfirm co-operation was higher in wineries located in agricultural regions […] where co-operation had historically been viewed as enhancing competition. (Butler and Hansen 1991: 11)

The influence of contextual factors is also seen in the case of novel business ideas, which need to generate much higher levels of trust than more conventional ventures:

> Entrepreneurs creating new organizational forms face rather different conditions than those operating in the relative security of simply reproducing old forms. The "reproducers" operate in a vast sea of trust, compared to the "innovators" [...] The "trust" dilemma they are preoccupied with is a very different sort of issue than the one faced by the early founders of biotechnology companies, for example. (Aldrich 2000: 218)

However, the influence of social factors on entrepreneurs can be exaggerated (Granovetter 1985). Taking an extreme case, the few truly 'Schumpeterian' entrepreneurs not only 'make history', but can also change the 'circumstances'. For example, firms introducing major technological innovations are capable of initiating radical changes to industries and markets (see: Section 5). Other entrepreneurs may lack the resources and time to exert this kind of influence. However, this discussion has identified as defining characteristics of entrepreneurs: their ability to identify and exploit productive opportunities; and their skill in creating and shaping networks which support their objectives. Like all of us, entrepreneurs find themselves both constrained and enabled by existing social structures. However, their distinctive ability to seek out and engage with external actors is a powerful force for innovation and change (Lipparini and Sobrero 1994). As a consequence, entrepreneurs do have the potential to break out of the constraints of their context.

4.3 Policy implications

4.3.1 Support networking activity rather than specific firms

Perhaps the most contentious implication of recent research, is public agencies should focus support for new venturing on emerging networks rather than on individual firms (Johannisson 1998). The long-running search for *ex ante* indicators of high growth rate firms (i.e. 'picking winners') has proved fruitless (Hakim 1989). Networks may therefore offer a broader target. However, it is not obvious how networks can best be encouraged. We have already noted that direct intervention may sometimes prove counter-productive, and it is clear that further research is required if networks are to become the main focus of support. In the meantime, the following guidance may be helpful.

4.3.2 Recognise and celebrate their inherent uncertainty

Entrepreneurial networks develop in strange and unpredictable ways. Some networks towards 'crystallise' in the form of an organisation (Larson and Starr 1993: 7), whilst others appear to thrive in a repeated cycle of re-invention (Henry and Pinch 2000). Policy interventions need to be constructed in a way that is sensitive to this inherent uncertainty, and which allows for unanticipated outcomes. For example, policy initiatives such as a training course or seminar may turn out to stimulate entrepreneurship through new and entirely fortuitous relationships formed by participants, rather than for any 'officially' sanctioned outcomes. The key insight comes from the process perspective on entrepreneurial networking. Turbulent change at the level of the individual venture can mask a greater degree of stability at the level of the personal contact network (Johannisson 1992, 1996; Henry and Pinch 2000). This hidden stability is illustrated in Figure 4.1, where the same basic personal contact network hosts three successive entrepreneurial ventures.

4.3.3 Match policy to temporal and spatial constraints

Recognise that building networks takes time and depends on an accumulation of 'social capital' (n.b. the term 'capital' is somewhat misleading; as we have seen, social capital is not readily transferred and can have negative consequences). Researchers and policy-makers also need to be keenly aware of the complex contexts in which networks are created.). As noted in the discussion of spatial networks, some localities appear to lack the fundamental building blocks for the formation of entrepreneurial networks (see: Section 2). Though some entrepreneurial ventures will grow into global businesses, it seems reasonable to assume that a high proportion of entrepreneurial networking continue to take place in fairly concentrated localities. Hence, the lessons of the industrial districts research are also applicable here.

Notes

1 Some critics have argued that Granovetter's (1985) term 'social embeddedness' is itself misleading, implying a highly structured world in which little can be changed. This leads to explanations that underestimate the capacity of individuals, and entrepreneurs in particular, to transcend the boundaries of their social context.

2 Personal contacts may also play an important role in network linkages between entrepreneurs and larger organisations. For example, when a small-medium supplier engages with a large customer firm, one individual contact, typically a buyer or technical specialist, can act as a catalyst or a gate-keeper, facilitating or barring progress towards a more developmental relationship (Blundel and Hingley 2001, Blundel 2000).

3 We have already seen evidence that, in general, small firms in England engage in very limited localised networking (Blackburn and Curran 1994, Penn 1992) (see: Section 2). In contrast, recent entrepreneurship research has highlighted the importance of networking. Johannisson's (2000: 373) view of the entrepreneurial process as, 'organizing through personal networking offers one plausible explanation for this apparent anomaly.

4 Portfolios may be part of an entrepreneurial process, but they can also act as a defensive measure. Farm diversifications (or 'pluriactivity'), for example, can provide multiple income streams to farmers experiencing uncertainty and insecurity in their primary enterprises (Carter 1998).

5 Their main critique of the model used in Butler and Hansen (1991) is that it makes a false distinction between types of networking:

> A more accurate portrayal of entrepreneurial activity shows these three networks – the social, the business, and the strategic – to be combined at the outset and throughout the organizational formation process. (Larson and Starr 1993: 12)

However, the differences are perhaps somewhat overstated. Butler and Hansen present (1991) the business and strategic stages as 'hybrids', which include individuals from preceding stages. Their own paper also endorses the many studies which indicate that informal personal/social networks are particularly important in the pre-formation stages (Larson and Starr 1993: 7).

5 Innovation networks

Would-be innovators must also go out and look, ask and listen. (Drucker 1985: 70)

This section examines the extent to which inter-firm networks facilitate innovation. Changing ideas about the nature of innovation are briefly examined, as are the benefits that networks can offer in terms of successful innovation. Two examples are used to illustrate the forms that innovation networks can take. Three key features of innovation networks emerge from the examples: the role of institutions, the self-sustaining nature of networks and the importance of the pools of knowledge upon which innovators draw through network arrangements. Policy implications include the need to review institutional support for innovation.

5.1 Background

5.1.1 Innovation requires external collaboration

Writers on innovation have long stressed that this process is not confined to the internal workings of an organisation. Drucker (1985), for instance, emphasises the importance of monitoring the organisation's wider environment. Similarly, Freeman (1991) notes how early studies of innovation in the 1950s highlighted the importance of external collaboration. In successful innovations, collaboration was shown to extend to end-users and to external sources of technical expertise. More recent studies (Rothwell 1992) have continued to show the importance of external links.

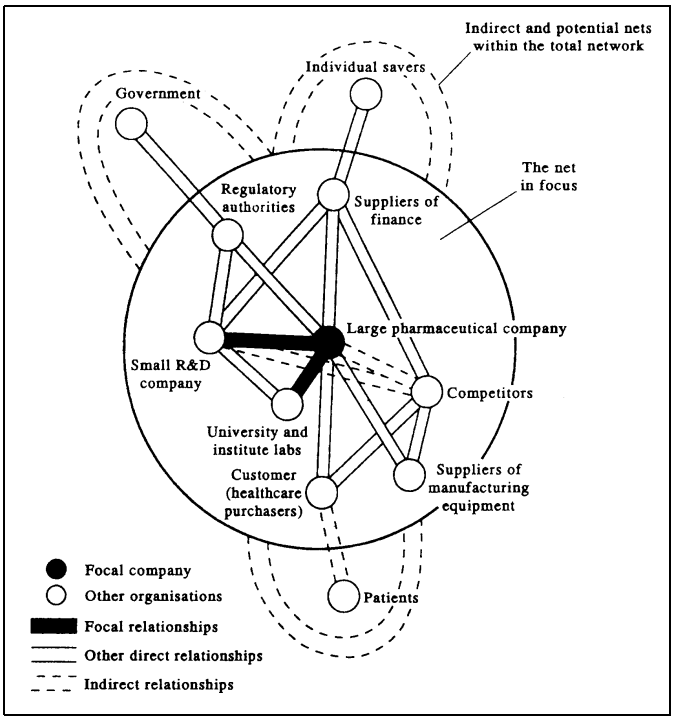
Since networks represent a means by which an organisation can tap external sources of expertise, covering both marketing and technological aspects, it is perhaps not surprising that innovation networks should have begun to emerge as a distinct form of network. Such networks are ones where a number of organisations and/or individuals contribute to the process of innovation. Typically, such a network will involve a focal organisation as innovator, drawing on external sources of scientific, technical and marketing information. The providers of such information may be other firms, typically suppliers, but they may also be government agencies, research institutes and private individuals. Furthermore, it appears that belonging to a network comprising several organisations of this kind can foster innovative capacity in a company (Stockman and Doctor 1987). Bower's (1993) analysis of supply networks in the global pharmaceutical industry illustrates the diversity of firms involved, including a small research and development company. These firms are often entrepreneurial start-up ventures, which undertake the initial clinical development of a new drug prior to commercialisation by one of the large pharmaceutical companies (Figure 5.1) (n.b. Figure 1.2 provides a contrasting example of an innovation network).

5.1.2 Innovation networks: distinctive features?

Whereas some forms of network are tight-knit with strong contractual bonds, innovation networks are often more open and more flexible. DeBreeson and Amesse (1991: 364), for example, define innovation networks as:

> Relatively loose, informal, implicit, decomposable and recombinable systems of inter-relationships.

Figure 5.1 A pharmaceutical industry innovation network



Source: Reprinted from Bower (1993), with permission of Elsevier Science.

However, though some networks may be temporary, successful ones can last for several decades. A key feature of innovation networks is the creation of synergy. When bringing independent resources together through a network, there should be a 'super-additive' gain, over and above what might pertain if the resources remained in isolation. This raises the question of the type of resources that an innovation network might contribute. Some of the resources are material, including: physical materials (i.e. raw materials or components), financial capital and a distribution system. Rothwell (1989) suggests that large firms, in particular, are likely to contribute resources of this kind. Small firms tend to contribute less tangible, 'behavioural' resources, such as flexibility, entrepreneurial flair or creativity. However, one of the key resources that both large and small firms are likely to contribute, is 'know-how'. Many studies have identified knowledge as a key ingredient in the innovation process (Nonaka and Takeuchi 1995; Whipp and Clark 1985; Rothwell 1989). Networks provide a means by which the innovating firm, especially if it is small, can tap into the expertise (i.e. 'tacit' knowledge) resident in external organisations.

Teece (1992) argues that, for innovating firms, networking has significant advantages over hierarchical internal organisation. According to Teece, networking provides for close co-ordination of investments and avoids duplication of effort. Trust-based collaborative relationships can also overcome the 'appropriability' problems associated with technological spillovers. In addition, networking provides two advantages which are particularly relevant for innovation: strong incentives and quick and efficient feedback mechanisms. DeBresson and Amesse (1991) highlight other advantages for networking, as opposed to internalisation, in innovation contexts. They suggest that networking offers greater variety, in terms of product and process combinations, as well as enabling quicker development of technology.

5.1.3 Renewed interest in innovation networks

Many studies point to increased popularity of innovation networks since the 1980s (Conway and Steward 1998; Freeman 1991; Hagedoorn and Schakenraad 1990), leading some to suggest that they have now become fashionable (DeBresson and Amesse 1991). This is evidenced by a flurry of interest in academic circles. During the 1990s, three leading journals, the *Strategic Management Journal*, the *International Journal of Innovation Management*, and *Research Policy*, ran special editions on the theme of innovation networks. However, as Freeman (1991) reminds us, innovation networks are in fact nothing new. For example, he points out that the British war-time radar programme involved a network of innovators that comprised industrial firms, universities, government research establishments and the armed forces. Despite this historical pedigree, there are a number of factors that help to explain the increased popularity of innovation networks in the closing years of the twentieth century:

- The commercial environment in which organisations operate has become more dynamic, driven by global competition and de-regulation. In many countries, the 1980s marked a step change. Miles and Snow (1986), for example, suggest that changes in the environment led to organisational changes in this period. Hence, they link the increased use networks to the development of a more dynamic and competitive environment.

- There has been a rapid development and diffusion of generic technologies. Foremost among these is information and communications technology (ICT). Freeman (1991) notes how ICT, as a generic technology, has found applications across both manufacturing and service sectors, affecting all the functional areas of business. Convergence of information and telecommunications systems has facilitated the growth of inter-firm networking by providing, 'the technological means for improving communications networks.' (Freeman 1991: 509). In other words, ICT has made it much easier for firms to establish links with external organisations and to exchange information with them reliably and efficiently.

- From the 1980s, there has been an increased awareness of Japanese approaches to new product development (Freeman, 1991; Imai *et al*. 1985). This is based on overlapping, rather than sequential processes, relies heavily on information sharing (Womack *et al*. 1990), and involves strong linkages between firms (Shaw, B. 1998). These linkages are not simple sub-contracting arrangements with dependent suppliers just providing additional capacity. Japanese firms, especially in the automotive sector, work in close partnership with their suppliers over many years, offering advice and supplying necessary technology so as to enhance their technological competence (Freeman 1991). Firms adopting this approach often rely on external organisations to provide special capabilities in new systems and new component development.

- There has been an emergence of new ideas about the nature of the innovation process itself. In the 1950s, it was seen in straightforward terms, as:

  > A more or less linear process beginning with scientific discovery, passing through industrial R & D, engineering and manufacturing activities and ending with a marketable new product or process. (Rothwell 1992: 221)

By the 1980s, the process was seen as much more integrated, and consequently less linear. Studies conducted in a number if industries (e.g. the German machine tool industry) had highlighted the importance of communication and external links in successful innovation. Hence, in the early 1990s innovation could be re-defined as:

> A complex net of communication paths, both intra-organisational and extra-organisational, linking together the various in-house functions and linking the firm to the broader scientific and technological community and to the marketplace. (Rothwell 1992: 222)

Thus, with external relationships recognised as an important feature of successful innovation, it is perhaps not surprising that the 1990s should have been a decade in which innovation networks sprung to prominence.

5.2 Emerging themes

5.2.1 Industrial and spatial innovation networks – contingent factors

Studies of innovation networks point to two different contexts in which such networks are found: industrial and spatial. Some networks are a feature of particular industries. The pharmaceutical industry provides a widely researched example of such a network (Albertini and Butler 1995; Bower 1993; Buckley and Chapman 2000; Della Valle and Gambardella 1993; Jones 2000; Whittaker and Bower 1994). A major change in the environment, namely the onset of the biotechnology revolution in the 1980s, contributed to a plethora of new networks; large pharmaceutical companies linked up with small, innovative biotechnology companies, universities and research institutes in order to tap into the new science. These industry-based innovation networks can be contrasted with spatially-based ones, consisting of agglomerations of firms found in particular locations. A classic example of this kind of innovation network is Silicon Valley, a dense web of inter-firm relationships south of San Francisco. Silicon Valley first hosted heavy concentrations of semiconductor firms, and latterly computer software firms (Saxenian 1991) (see: Section 2 for a discussion of spatial clustering and industrial districts). In the following paragraphs, two examples of innovation networks are used to explore the differences between industrial and spatial networks.

(a) Medical equipment: an industry-based network

The pharmaceutical industry provides a well-researched example of an industry-based innovation network. However, from the perspective of studying SMEs, it has the disadvantage that networks are usually dominated by large pharmaceutical companies. This contrasts with the medical equipment industry, where innovation networks are widespread and SMEs rather than large companies are of central importance (Hutton 1991). Although it has not been subjected to anything like the same level of academic scrutiny, at least one major study has shed light on the nature and operation of innovation within the industry. Shaw's (1986) study of the medical equipment industry did not address the issue of networks directly, indeed it hardly mentioned them at all. However, it examined the innovation process in detail and found that inter-firm relationships formed a crucial aspect at various stages in the process (Shaw 2001). These relationships were centred around equipment manufacturers, 11 of which formed the basis of Shaw's study. The manufacturers were linked to a variety of organisations and individuals, ranging from consultants and clinicians (i.e. users), universities, government agencies, the Medical Research Council and hospitals. Innovation in the industry was largely a 'demand-pull'

process that began with consultants seeking new aids to diagnosis or therapy (Shaw 1986: 278). In such cases the consultant would either develop an initial prototype in conjunction with hospital engineers and technicians, then approach potential manufacturers, or alternatively approach manufacturers directly. Many of the equipment manufacturers were small concerns. Shaw shows how they were dependent on a network of organisations, termed 'intermediaries', for successful innovation. A government agency, the DHSS, provided manufacturers with advice, for instance on safety issues as well as providing sponsorship in the form of funding for feasibility studies and the development of prototypes (Shaw 1986: 234). The Medical Research Council (MRC) also provided sponsorship, often in the form of research grants, as well as extensive technical advice and expertise. Another government agency (now privatised), the British Technology Group (BTG), provided advice on patents as well as acting as a link between users and manufacturers. Hospitals played an important role, providing facilities for the assessment and evaluation of new equipment. Universities provided more specific testing facilities.

The benefits provided by the network were extensive. The involvement of users provided market information and sponsoring bodies like the MRC provided finance. The overlapping nature of the process, which Shaw (1986: 276) describes as 'continuous user manufacturer interaction', helped speed up the innovation process. The involvement of hospitals ensured intensive testing, while the involvement of consultants provided credibility for the product in the marketplace through conference presentations and the publication of papers in medical journals.

(b) Motorsport Valley: a spatial innovation network

An example of a geographically-based innovation network is provided by what has come to be known as Motor Sport Valley, an area stretching diagonally across North Oxfordshire and Northamptonshire. This has also been the subject of only a small number of research studies (Aston and Williams 1996; Pinch and Henry 1999; Henry and Pinch 2000), but is supported by a large specialist literature which provides 'a wealth of background detail and technical information' (Henry and Pinch 2000: 184).

The term 'Motor Sport Valley' is used to describe a cluster of more than five hundred mainly small and medium-sized firms (Aston and Williams 1996) employing in excess of 30,000 people (Henry and Pinch 2000), who design, develop and manufacture a large proportion of the world's most successful racing and rally cars. In the words of Henry and Pinch (2000: 192) this cluster, 'represents a classic example of a world-leading agglomeration of small firms.' Racing cars, by their very nature, are at the forefront of rapidly changing automotive technology. Hence, Motor Sport Valley provides a classic instance of an innovation network and one that comprises mainly small firms, whose close links are geographically-based.

In terms of the network, racing car constructors are at the hub. They draw on a variety of locally-based suppliers, who provide not only a variety of components but also major sub-systems such as engines and gearboxes. However, this is not simply a rationalised and cost-efficient supply chain network. As Aston and Williams (1996: 9) note, innovation is the key industry success factor:

> As winning is everything in motor sport, suppliers had to be both technically and organisationally innovative.

In addition, the constructors draw on a variety of other nearby sources of expertise. These include racing circuits, such as Silverstone in Northamptonshire, which is used extensively for testing, the Royal Aircraft Establishment at Farnborough, Hampshire, which is a source of skilled labour (Henry, 1991), aerospace manufacturers such as British Aerospace at Weybridge, Surrey, who provide technical expertise in fields such as fabrication techniques (Cooper 1999: 35) and universities, like Cranfield, Bedfordshire and Southampton, whose wind tunnel facilities are used for aerodynamic work (Henry 1991: 103). There are also links to sponsors, who provide the necessary financial support and the major automotive manufacturers who not only sponsor teams but increasingly have a significant ownership stake in the constructors (Aston and Williams 1996: 5; Tremayne 2001: 7). This is a complex network of organisations supplying the constructors with a wide range of highly specialised goods and services. This form organisation stands in marked contrast to the vertically integrated racing car constructors, such as Alfa Romeo and Mercedes-Benz, which dominated the industry in the 1950s (Aston and Williams 1996). We now consider some of the factors that may explain the evident success of this approach to 'organising' innovation.

5.2.2 Innovation and 'institutional thickness'

A major theme in the literature on innovation networks and the examples cited is the importance of institutional, social and cultural structures that support innovation networks and facilitate their operation. As noted earlier, this support has been analysed using the concept of 'institutional thickness' (Amin and Thrift, 1992: 417) (see: Section 2.2). In the medical equipment industry, it comprises a variety of public sector institutions, including government departments, non-government agencies, universities and hospitals. As Shaw's (1986) work shows, these bodies not only form a part of the network, but play a vital role in the innovation process, acting as a source of resources, extending to technical knowledge, finance, quality certification and marketing information. As well as highlighting the importance of institutional support mechanisms, some studies also stress that support can adopt various forms. In their work on Motor Sport Valley, Pinch and Henry (1999: 826) show how institutional thickness takes the form of a shared culture within the Valley. The culture, they suggest, is manifest in the flexible working practices, informal collaboration and reliance on reciprocity and trust that have become a recognised feature of Motor Sport Valley. Pinch and Henry argue that culture engenders a sense of common purpose and also plays an important role in providing a pool of knowledge upon which network actors can draw.

5.2.3 Resilience of innovation networks – renewal not preservation

Research suggests that innovation networks exhibit resilience in the face of forces for change. Indeed, they are often more resilient than vertically integrated structures. Why should this be? Aston and Williams (1996: 18) suggest that, in Motor Sport Valley, sustainability is a function of the relative ease with which organisations can move in and out of the industry. This frequently takes the form of new firms being created through a spin-off process as individuals break away from established organisations and set up on their own (Henry and Pinch 2000: 197). This is helped by the absence of entry barriers and the presence of growth paths that permit gradual entry; newly-formed motorsport businesses can begin by servicing equipment, which leads to development work and finally to manufacturing. At the same time, less competitive firms either close or leave the industry. The result is a turbulent process of continuous renewal that helps to sustain a high rate of innovation activity. In medical equipment sustainability appears to be less a

function of ease of entry into the industry and more a function of continuous adaptation. Shaw (1998: 443) supports this, citing the ability of networks to continuously adapt to changing technological and market demands and government policy, as one of the key features of the industry. In both the medical equipment and the motorsport cases, network structure provides a basis for renewal, leading to a high degree of resilience in the face of change. However, resilience is achieved in different ways. In motorsport, the network is loose-knit, comprising close but constantly changing links that facilitate rapid staff turnover and new firm formation. In medical equipment, innovation is less a function of new entry and more a result of close collaboration by a variety of partners.

5.2.4 The role of knowledge – 'churning' and diversity

Successful innovation networks not only enable organisations to tap into a pool of collective knowledge, but also help to feed and enhance the pool. For example, network linkages in the medical equipment industry generate benefits 'through the shared use of rich, intensive information' (Shaw, B. 1998: 443). Pinch and Henry (1999: 823) similarly note that 'knowledge is critical in motor sport'. Firms tap into this knowledge by recruiting designers, engineers and mechanics, many of whom will be acquired specifically for their experience within the industry. But networks also enhance the pool. Pinch and Henry (1999: 823) pinpoint a number of ways in which this happens: the rapid turnover of staff, information leakage from suppliers, informal collaboration, high rate of firm failure and formation and knowledge gained through personal contact on and off the track. Whatever the mechanisms, the key point is that the structure and dynamics of a network like Motor Sport Valley facilitates the circulation and enhancement of this pool of knowledge. In this case, the 'continual 'churn' of people and information provides, '[…] a wealth of expertise that no other region can replicate at present.' (Henry and Pinch 1999: 825). Geographical clustering of firms within Motor Sport Valley provides shared labour markets that support these processes (see: Section 2.2). Knowledge creation is also the result of a diversity of ties. This diversity applies both to actors and relationships (Conway and Steward 1998: 228), a view that is supported by the two examples cited above. In medical equipment and motorsport networks, the *actors* include public and private sector organisations, profit-making and mutual organisations, SMEs and multinational corporations. They also bring together manufacturers and service providers. A similar diversity can be found in the *relationships*, which range from personal contacts to formal contractual relationships and even joint ventures. The key point is that network structures facilitate diversity, which is closely associated with successful innovation.

5.2.5 Are networks necessary for innovation? - a critique

We have already discussed the more sceptical view that, though it may be a 'fashionable' topic within the SME literature, in reality small firms devote little time to networks or networking (Curran *et al*. 1993). This view appears to conflict with evidence from the two industries used as illustrations. In these cases, business networks are very much in evidence and play an important part in contributing to the innovation process. However, as in the case of entrepreneurial networks, the differences may be resolved (see: Section 4.2).

Firstly, it appears that the context or setting in which an innovation network occurs is significant. For example, Pinch and Henry (1999: 826) point out that the motor sport industry has 'some unusual features'. It is characterised by very strong emphasis on *performance*, mainly in the form of winning races, which inspires a very high level of dedication from staff. It is dominated by advanced technology, which is the main route to

improved performance. The industry is the antithesis of mass production, with output organised around very small batches. Nor is medical equipment so different. Batch sizes are usually small. Medical advances can be dramatic and changes rapid. Technology is an important feature and again is linked to improved performance. Under these circumstances the network type of organisation offers potential advantages over hierarchical, vertically integrated structures, because of the scope for rapid transformation and re-structuring to meet changing conditions and the capability to tap multiple external sources of technology. Hence industry characteristics would seem to be a key factor in resolving this conflict. In contrast to the highly specialised medical equipment and motor sport industries, the study by Curran *et al.* (1993) was much more broadly based, comprising interviews with 350 owner-managers in a wide range of service sector businesses. In short, it becomes clear that business networks like the ones described, are the exception rather than the rule. Such networks are only to be found in specific circumstances. This exceptionalism was also found in the previous section, where we noted that, since most SMEs do not engage in entrepreneurial activity, it is unlikely that entrepreneurial networks are going to be a widespread phenomenon (see: Section 4.2). Similarly, innovation networks are less likely in 'run-of-the-mill' industries, which deal in commoditised, mass market products, and where production is organised on a large scale.

5.3 Policy Implications

5.3.1 Foster healthy competition and renewal

If the resilience and sustainability of an innovation network is linked to its ability to decompose and recombine its constituent parts (DeBresson and Amesse 1991), then it is essential to maintain healthy competition. For networks to compete effectively, there has to be frequent renewal of the participants, otherwise there is a real danger that the network will ossify and its performance decline. This, in turn, means that maintaining ease of entry and exit - always a strong feature of networks like Motor Sport Valley - must be a major policy objective. Institutional developments, such as the acquisition of a number of leading constructors by major motor manufacturers (Tremayne 2001) and changes in the regulations which govern the sport, should be monitored carefully with appropriate policy interventions where necessary. The aim should be the maintenance of an environment that minimises entry barriers and similar restrictions on competition.

5.3.2 Encourage appropriate institutions

Although it takes different forms, the presence of a supportive institutional framework surrounding each network, is clearly something else that policymakers should recognise and endeavour, if not to enhance, then at least to protect. The policy measures themselves will clearly have to differ according to the circumstances in each case. Indeed Pinch and Henry (1999: 826) observe that where the 'institutional thickness' (Amin and Thrift 1992: 417) is less concrete and more cultural, as in Motor Sport Valley, it is likely to require greater attention from policy makers in future, precisely because it is more ethereal and less amenable to conventional policy measures.

In both of the networks cited as examples, the level of technical skill available to turn ideas into workable products is critical (Aston and Williams 1996: 54). This has important implications for education and training. In public policy terms, it is not simply a matter of ensuring a sufficient supply of suitably qualified engineers. As Aston and Williams (1996:

54) point out, it is also necessary to ensure adequate *breadth* of education to ensure that all those entering the labour market have had some experience of practical problem-solving. The availability of such skills will not necessarily give rise to successful innovation networks, but it will help them once started to prosper and grow. In a similar vein, Aston and Williams (1996: 54) argue that there is also a requirement for policy-makers to ensure the availability of appropriate physical facilities. Many studies of business networks (Barnatt and Starkey 1994; Bower 1993) have noted that innovation networks are often highly reliant on the professional and technical expertise of individuals or groups of individuals in 'spin-offs' from established organisations. These individuals often operate on a freelance basis, or build a small firm around their own expertise and interests. They require 'appropriate physical facilities' to enable them to operate on this basis, including incubation units and business parks (Aston and Williams 1996). However, to avoid wasted resources any policy implementation (e.g. location decisions, infrastructure specifications, project financing) should be based on a careful assessment of the implications for networking.

6 Conclusion: collaboration in perspective

The recent proliferation of network organizational forms that don't fit neatly into either the market or hierarchy frameworks […] has resulted in some scrambling to explain how such organizations are governed. (Larson 1992)

This section draws out some of the key features of business networks to emerge from the literature. These include the diverse nature of networks and the fact that networks, though increasingly popular as a form of organisation, only occur in very specific contexts. The implications of networks as a form of business organisation are then explored, both from the perspective of SMEs and from that of policy-makers. The section concludes by identifying three key areas for future research, noting their application to the Small Business Service and the small business community in general.

6.1 Themes amidst diversity?

6.1.1 The nature of business networks

The main objective of this review was to provide an insight into the nature of business networks. The mechanism for achieving this has been to examine four different types of network and to review the literature associated with each. Inevitably this is a selective approach and raises a number of questions. Why these four categories? How representative are they? These are but two of many questions one might pose. While recognising the importance of these questions, the answer would be that the selectivity is intentional. We focused on four types of network in order to provide examples that would allow us to explore and illustrate the nature of business networks.

From these examples it is apparent that diversity is a key feature of business networks. The examples of industrial districts and innovation networks contrast the different ways in which networks are formed. While the former rely on spatial clustering, the latter are primarily sector-based. The range of institutions that can form part of a network is well illustrated by the networks found in the medical equipment industry (Shaw 1986). The networks cited in the supply chain examples illustrate the nature of the links binding the institutional actors in a network, ranging as they do from the traditional arm's length contractual relationship at one extreme, to long-term risk sharing partnerships at the other. As well as showing how networks operate in different ways, the works cited also show how networks can evolve differently, ranging from the decline of industrial districts in parts of the UK textile industry (Penn 1992) to highly effective renewal and re-birth in Caifornia's Silicon Valley (Saxenian 1991). Thus, while the literature associated with the four types of network does not necessarily provide for a comprehensive categorisation of all the types of business network, it does help to convey some sense of the sheer diversity of networks to be found in business, as well as illustrating how they operate.

In addition to their diversity, business networks also appear to be very context-specific. In other words, they only seem to thrive in certain conditions. On the basis of the literature, it seems premature to suggest, as some authors have (Piore and Sabel, 1984; Miles and Snow, 1986; Thorelli, 1986), that a *general* transformation is taking place on the scale of earlier movements towards functional structures and multidivisional firms. The evidence still seems to point to inter-firm networks as a special case. Most of the contexts in which networks arise are specialist fields or niches. Medical instruments, for instance, is a small

and specialised sector. Hence, it would seem that those (e.g. Curran *et al*. 1993) who have tended to be sceptical about the extent of the transformation of commercial life brought about by increased use of business networks are, as yet, probably nearer the truth.

6.1.2 Business networks and SMEs

While they may not be a universal phenomenon, evidence from several of the industries cited suggests that networks are currently enjoying a revival. Furthermore, the renewed interest in networks is creating new opportunities for SMEs. For instance, Cox *et al*.'s (1999) study of networks in the chilled meals sector of the food industry shows how technology, especially ICT, has helped to make the network a viable alternative to more conventional approaches to organising business activities in situations where coordination is vital. This, in turn, has created opportunities for small, entrepreneurial firms. Similarly, Barnatt and Starkey's (1994) work on the UK television industry shows how industry restructuring, in the form of de-regulation, can usher in network forms of organisation. These networks have also created opportunities for SMEs that are able to provide a range of services needed by the new breed of independent producer.

Where does this leave the SME? What are the implications for firms and their advisers? Firstly, the scale of the changes brought about in some industries (e.g. television and media production) indicates that practitioners need to be aware of the nature of networks as a form of business organisation. They particularly need to recognise the strategic implications, in terms of the range of relationships that can prevail within networks. Partnership relationships, for example, impose very different obligations compared to traditional arm's length contracting. Similarly, the role of the subcontractor differs markedly from that of the partner. With increasing awareness, SME owners and managers can benefit from the novel situations created by network changes. For instance, where networks are linked to re-structuring – especially if it takes the form of vertical dis-integration – there can be new opportunities for independent small firms in the form of spin-off companies and new start ups. Similarly, supply chain networks can provide opportunities for SMEs, as the producers of final products progressively expand their procurement activities, buying-in an increasing proportion of the value of their final product. Of course, network changes can also bring major challenges to smaller firms. Again, the best defence is to increase 'network-awareness' amongst practitioners.

6.1.3 Implications for policy

By their nature, networks give rise to complex governance issues. As yet, this topic has received scant attention from policy-makers, although it is an aspect of networks where one might expect to find a role for policy. Given that most of the examples of networks have highlighted the importance of untraded dependencies, a key issue for network governance is the extent of commercialisation. While increasing commercialisation presents new opportunities for SMEs, through spin-offs and management buy-outs, it also raises questions over network governance. Without large organisations to provide training, how will the skills base be maintained? Similarly, if universities and other public agencies increasingly commercialise their activities and charge for services – will this impede the flow of knowledge and information that is so vital to the process of effective innovation? Hence, getting the measure of commercialisation may well be a key issue for policy-makers. If there is too little emphasis on commercial aspects, opportunities will be lost; too much and mutual interdependence between network partners will be stifled.

Institutions form another aspect of networks likely to be of concern to policy-makers. The examples presented in this report show how the institutional thickness of a network can vary greatly, between locations and over time. The nature and extent of institutional support varies between sectors. For example, in the health sector, the medical equipment industry relies on a wide variety of public, private and voluntary institutions. By contrast, in motor sport, institutions of various types, while present, are much less in evidence. In some cases, intervention may be beyond the scope of public agencies. However, networks are sustained by appropriate governance mechanisms and an adequate mix of institutions. These are matters for debate and selective interventions could play an important part in the policy-making agenda.

Specialisation, through linking together a number of specialist SMEs, is one of the strengths of business networks. It can also be one of their vices, with embedded relationships making them inflexible, complacent and inward-looking. Insularity has been a common feature in the decline of traditional industrial districts, which have failed to recognise, or to meet, the competitive challenge of emerging networks in other regions. One might take a fatalistic view, arguing that declining spatial clusters simply cannot be saved. However, there is some evidence for 'phoenix'-like recoveries and renewal of failing districts. Recoveries and re-directions are likely to be characterised by new, entrepreneurial network-building. Ultimately, the survival of any network is balanced between its distinctive features and the competing pressures arising from global flows (Storper 1995). Given these complexities, policy-makers could usefully take a much broader view of network evolution. By assessing a variety of 'local' and 'global' factors, they could develop a longer-term strategic perspective. This might lead to policies that channel support to networks where there is scope for growth or renewal. In this way, informed policy-making might have a valuable role to play in guiding and protecting the long-term future of particular business networks.

Perhaps the biggest issue for policy-makers is to ensure the *appropriateness* of interventions. The self-sustaining nature of healthy networks highlights the dangers of heavy-handed initiatives. These are delicate organisational forms which can easily be damaged. The diverse nature of networks, which is apparent from the examples used, indicates that policy interventions are likely to be difficult, even where they justified. In many situations, the role for direct interventions may be extremely limited. On these occasions, policy-makers may have to remain on the sidelines, promoting the health of networks by ensuring ease of entry and exit for firms and facilitating the development of social capital through assistance with training and development.

6.2 Future directions for network research

We end this review by identifying three key areas requiring further research. Two of these have been selected for their direct application to the Small Business Service, and to the small business community as a whole. The first is primarily an academic issue, albeit one with important implications for practice.

6.2.1 Get a clearer perspective on business networks

As we noted in the introduction, inter-firm collaboration has become a 'management fad' over the last decade, with all the attendant dangers. One of the roles of academic research is to place 'topical' questions in a broader and more critical perspective. This review has

identified many of the more useful insights emerging from the literature. However, it may now be time to establish a consistent set of approaches to business networks:

> [The network] model of organising, if it is to move beyond the metaphorical stage, requires a coherent framework and accompanying methods of analysis that are capable of capturing both prescribed and emergent processes.' Tichy *et al*. (1979: 507)

Network researchers have repeatedly expressed concern over this, 'terminological jungle in which any newcomer may plant a tree.' (Nohria 1992: 3) The problem is not so much recognising the need for integration and clearer specification, as doing something about it! This requires cross-disciplinary dialogue, and an honest recognition of those areas where, 'we are pretty much in the dark.' (Foss 1999: 2) However, a great deal of confusion remains:

> [T]he 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)

Literature reviews can play a useful role, encouraging researchers to reflect on what has been learned, and to propose new syntheses. We would also encourage greater dialogue between network researchers and small business support agencies (e.g. through seminar programmes and publications), in order to test and refine new approaches to business networks. One thing is clear: the network perspective has a great deal to tell us. Above all, it helps to correct the serious distortions that can occur when firms are studied in isolation (Note 1).

6.2.2 Understand specific networking processes

Future research studies also need to focus on the *processes* involved in inter-organisational networking. In this review, we have highlighted several studies that have explored process (e.g. the way that personal contact networks influence the formation of entrepreneurial networks; or the role of large-firm restructuring and technological changes in the development of supply chain networks). However, further 'processual' research is needed to assess the effects of policy interventions, for example. As two of the leading researchers have noted, it is time to make greater, and better use of qualitative research methods, such as case studies. Without them, researchers are unlikely to capture many subtle, yet potentially important interactions:

> 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)

Future research into SMEs and business networks is likely to involve spatial and sector-specific case studies, taking full account of the historical background and various contextual factors discussed in this review.

6.2.3 Explain how networks influence the performance of SMEs

We also need to know more about the role that inter-firm networks play in the overall performance of SMEs. In a recent *Strategic Management Journal* Special Issue, the guest editors highlighted a lack of research into the impact of networks on firm-level profitability:

> We felt that relative to research that attempted to explain the antecedents of network formation, there was relatively little research that systematically explored the performance consequences of the strategic networks in which firms are embedded. Though we have many answers to the question: 'why do alliances and networks exist?' we have fewer answers to the question: 'Do alliances and networks really matter when it comes to firm performance?' (Gulati *et al*. 2000a: 199)

There are some things we know about networks and performance. For example, a firm that is well positioned in a network – more specifically, one that occupies a 'structural hole' – can enjoy economic advantage (Burt 1992) (see: Section 4.2). It is also clear that the nature of the inter-firm link (e.g. its strength or multiplexity), 'has clear implications for a firm's strategic behaviour and performance.' (Gulati *et al*. 2000a: 208). However, as this review has emphasised, there is also a 'dark side' to relational resources, notably the tendency for close ties to lock firms into unproductive relationships, or to preclude alternative partnerships (Gulati *et al*. 2000b, Gulati and Lawrence 1999). The whole question of business networks and SME performance merits a more 'critical' investigation, incorporating *qualitative* aspects of growth and performance (e.g. managerial style, production methods, environmental sustainability), as well as the usual quantitative measures (i.e. those based on financial and employment data). These issues are also concerned with process, and would lend themselves to the research methods outlined in the previous paragraph.

Notes

1 It seems obvious that the behaviour of a firm cannot be understood when it is isolated from its context. However, many studies of small firm growth, for example, take little or no account of their external relationships. We therefore endorse the view that:

> By taking a relational, rather than an atomistic approach, we can deepen our understanding of the sources of differences in firm conduct and profitability.' (Gulati et al. 2000b: 203)

Bibliography

Abercrombie, N., Lash, S., Lury, C. and Shapiro, D. (1990) Flexible Specialisation in the culture industries, *Discussion paper for the workshop 'Flexible Specialisation in Europe'*, 25-26 October, Zurich.

Albertini, S. and Butler, J. (1995) 'R&D networking in a pharmaceutical company: some implications for human resource management.' *R & D Management*, **25**, 4, 377-393.

Aldrich, H.E. (1995) 'Entrepreneurial strategies in new firm populations.' Reprinted in R. Swedberg (ed.) (2000) *Entrepreneurship: the social science view*. OUP, Oxford.

Aldrich, H.E. (1999) *Organizations evolving*. Sage Publications, London.

Aldrich, H.E. and Zimmer, C. (1986) 'Entrepreneurship through social networks,' in D. Sexton and R. Smilor (eds.) *The art and science of entrepreneurship*. Ballinger, New York. (3-23).

Aldrich, H.E., Reese, P.R. and Dubini, P. (1989) 'Women on the verge of a breakthrough: networking in the United States and Italy.' *Entrepreneurship and Regional Development*, **1**, 339-356.

Aldrich, H. and Whetten, D.A. (1981) Organization-sets, networks, action sets, and networks: making the most of simplicity, in P.C.Nystrom and W.H.Starbuck (eds.) *Handbook of Organizational Design*, Oxford University Press, New York, **1**, 385-408.

Amin, A. and Thrift, N. (1992) 'Neo-Marshallian nodes in global networks.' *International Journal of Urban and Regional Research*. 16, 571-587

Antonelli, C. (1992) *The Economics of Information Networks*, North Holland, Amsterdam.

Aston, B. and Williams, M. (1996) *Playing to win: the success of UK motorsport engineering.* Institute of Public Policy Research, London.

Bagansco, A. (1977) *Tre Italia: la problematica territoriale dello sviluppo italiano*. Il Mulino, Bologna.

Bamfield, J. (1994) 'The adoption of Electronic Data Interchange by retailers.' *International Journal of Retail and Distribution Management,* **22**, 2, 3-11

Barkham, R., Gudgin, G., Hart, M. and Hanvey, E. (1996) *The determinants of small firm growth: an inter-regional study in the United Kingdom 1986-90 (Regional Policy and Development Series 12)*. Jessica Kingsley / Regional Studies Association, London.

Barnatt, C. and Starkey, K. (1994) 'The emergence of flexible networks in the UK television industry.' *British Journal of Management*, **5**, 4, 251-260

Barth, F. (1978) 'Economic spheres in Darfur.' Reprinted in R. Swedberg (ed.) (2000) *Entrepreneurship: the social science view*. OUP, Oxford.

Best, M.H. (1990) *The new competition: institutions of industrial restructuring*. Polity Press, Cambridge.

Birkinshaw, J. and Hagström, P. (eds.) (2000*) The flexible firm: capability management in network organizations*. OUP, Oxford.

Birley, S. (1985) 'The role of networks in the entrepreneurial process.' *Journal of Business Venturing*, **1**, 107-17.

Birley, S., Cromie, S. and Myers, A. (1991) 'Entrepreneurial networks: their emergence in Ireland and overseas.' *International Small Business Journal*, **9**, 4, 56-74.

Birley, S. and Stockley, S. (2000) 'Entrepreneurial teams and venture growth.' in: Sexton, D.L. and Landström, H. (eds) *The Blackwell handbook of entrepreneurship,* Blackwell, Oxford.

Blau, P.M. (1964*) Exchange and Power in Social Life*, Wiley, New York.
Chell, E., Howarth, J.M. Brearley, S.A. (1991) *The Entrepreneurial Personality: Concepts, Cases and Categories,* Routledge, London.

Blundel, R.K. (2000) 'Networks and the growth of small-medium firms: exploring the supply chain dynamics of specialist food producers.' *First Regional Enterprise Networks Conference*, EIASM / Prague School of Economics, Prague, 21st-22nd November.

Blundel, R.K. and Hingley, M.K. (2001) 'Exploring growth in vertical inter-firm relationships: small-medium firms supplying multiple retailers.' *Journal of Small Business and Enterprise Development***.** – forthcoming.

Bozdogan, K., Deyst, J., Hoult, D. and Lucas, M. (1998) 'Architectural innovation in product development through early supplier integration.' *R & D Management*, **28**, 3, 163-173

Bower, D.J. (1993) 'New Technology Supply Networks in the Global Pharmaceutical Industry.' *International Business Review*, **2**, 1, 83-95

Brass, D. (1984) Being in the Right Place: A Structural Analysis of Individual Influence in an Organisation, *Administrative Science Quarterly*, **29,** 518-539.

Brooks, I. and Reast, J. (1996) 'Re-designing the value chain at Scania Trucks.' *Long Range Planning,* **29**, 4, 514-525

Brown, M. (1997) 'Outsourcery.' *Management Today*, January, 56-60.

Brown, J.E. and Hendry, C. (1997) 'Industrial districts and supply chains as vehicles for managerial and organizational learning.' *International Studies of Management and Organization,* **27**, 4, 127-57.

Brunninge, O. (2000) 'SMEs in strategic networks: the example of Swedish entrepreneurs re-organising insurance distribution.' *Research in Entrepreneurship and Small Business XIV*, Prague, 23rd-24th November (27-31).

Brusco, S. (1982) 'The Modena model: productive decentralization and social integration.' *Cambridge Journal of Economics*, **6**, 167-184.

Brusco, S. (1990) 'The idea of the industrial district: its genesis.' in Pyke, F., Becattini, G. and Sengenberger, W. (eds*.) Industrial districts and interfirm co-operation in Italy*. International Institute for Labour Studies, Geneva.

Buckley, P.J. and Chapman, M. (2000) 'The Management of Cooperative Strategies in R & D and Innovation Programmes.' in Buckley, P.J. (ed.) *Multinational firms, cooperation and competition in the world economy.* Macmillan, Basingstoke.

Burt, R.S. (1992) *Structural holes*. Harvard University Press, Cambridge, MA.

Butler, J.E. and Hansen, G.S. (1991) 'Network evolution, entrepreneurial success and regional development.' *Entrepreneurship and Regional Development*, **3**, 1-16.

Carter, S. (1998) 'The economic potential of portfolio entrepreneurship: enterprise and employment contributions of multiple business ownership.' *Journal of Small Business and Enterprise Development***, 5**, 4, 297-306.

Carter, S. (2000) 'Gender and enterprise.' in Carter, S. and Jones-Evans, D. (eds.) (2000) *op. cit.*

Carter, S. and Jones-Evans, D. (eds.) (2000) *Enterprise and small business*. FT Prentice Hall, Harlow.

Chandler, A.H. (1977) *The visible hand.* Harvard University Press, Cambridge, Mass.

Chell, E. and Baines, S. (2000) 'Networking, entrepreneurship and microbusiness behaviour.' *Entrepreneurship and Regional Development*, **12**, 195-215.

Checkland, S.G. (1981) *The Upas tree: Glasgow 1875-1975*. University of Glasgow Press, Glasgow.

Christopher, M.G. (1992) *Logistics and supply chain management.* Pitman Publishing, London.

Clark, P.A. (2000) *Organisations in action: competition between contexts*. Routledge, London.

Coleman, J. (1990) *Foundations of social theory*. Belknap Press, Cambridge MA.

Competition Commission (2000) *Supermarkets: a report on the supply of groceries from multiple stores in the United Kingdom*, Cmnd. 4842 (Summary). The Competition Commission / The Stationery Office), London.

Conway, S. (1994) *Informal boundary-spanning links and networks in successful technological innovation.* Unpublished PhD thesis, Aston University, Birmingham.

Conway, S. (1997) 'Strategic personal links in successful innovation.' *Creativity and Innovation Management,* **6**, 4, 226-233.

Conway, S. (2000) Employing Social Network Mapping to Reveal Tensions Between Informal and Formal Organisation in Jones, O. and Conway, S. (eds.) *Social Interaction and Organisational Change*, Imperial Press, London.

Conway, S. and Steward, F. (1998) 'Mapping innovation networks.' *International Journal of Innovation Management,* **2**, 2, 234-254.

Cooper, A. (1999) 'The material advantage: the first carbon-fibre Grand Prix car.' *Motor Sport*, **75**, 3, 32-37.

Cottereau, A. (1997) 'The fate of collective manufactures in the industrial world: the silk industries of Lyons and London, 1800-1850.' in Sabel, C.F. and Zeitlin, J. (eds.) *op cit*.

Cox, H., Mowatt, S. and Prevezer, M. (1999) 'From frozen fish fingers to chilled chicken tikka: organisational responses to technological change in the late twentieth century.' *Centre for International Business Studies Working Paper Series No.18-99*. South Bank University, London.

Cravens, D.W., Piercy, N.F. and Shipp, S.H. (1996) 'New organisational forms for competing in highly dynamic environments: the network paradigm.' *British Journal of Management*, **7**, 203-218.

Cromie, S. and Birley, S. (1992) Networking by female business owners in Northern Ireland, *Journal of Business Venturing*, **7**, 237-252.

Curran, J., Jarvis, R., Blackburn, R.A. and Black, S. (1993) 'Networks and small firms: constructs, methodological strategies and some findings.' *International Small Business Journal*, **11**, 2, 13-25.

Curran, J. and Blackburn, R.A. (1994) *Small firms and local economic networks: the death of the local economy?* Paul Chapman, London.

DeBresson, C. and Amesse, F. (1991) 'Networks of innovators: A review and introduction to the issues.' *Research Policy*, **20**, 363-379.

Della Valle, F. and Gambardella, A. (1993) 'Biological revolution and strategies for innovation in pharmaceutical companies.' *R & D Management*, **24**, 3, 249-260.

Delmar, F. (2000) 'The psychology of the entrepreneur.' in Carter, S. and Jones-Evans, D. (eds.) (2000) *op. cit.*

Dhaliwal, S. (1997) 'Silent contributors: Asian female entrepreneurs.' 20th ISBA National Small Firms Policy and Research Conference. (November), 505-521.

Donckels, R. and Lambrecht, J. (1995) 'Networks and small business growth: an explanatory model.' *Small Business Economics*, **7**, 273-289.

Drucker, P.F. (1985) 'The Discipline of Innovation.' *Harvard Business Review*, May-June 62-72.

Dubini, P. and Aldrich, H. (1991) 'Personal and extended networks are central to the entrepreneurial process.' *Journal of Business Venturing*, **6**, 305-13.

Dussauge, P. and Garrette, B. (1999) *Cooperative strategy: competing successfully through strategic alliances.* John Wiley and Sons, Chichester.

Dyer, J.H. and Singh, H. (1998) 'The relational view: co-operative strategy and sources of interorganizational competitive advantage.' *Academy of Management Review*, **23**, 4, 660-79.

Dyson, J. (1997) *Against the odds: an autobiography*. Orion Business Books, London.

Ebers, M. (ed.) (1999) *The formation of inter-organizational networks*. Oxford University Press, Oxford.

Fearne, A. and Hughes D. (1999) *Success factors in the fresh produce supply chain: some examples from the UK.* Food Industry and Management, Wye College, University of London, Kent.

Fletcher, D. (1998) 'Organisational Networks as 'Becoming' – Business and Family Networking Patterns of the Self-Employed: A Social Constructionist Perspective' *European Group for Organizational Studies: 14th Colloquium*, 9–11 July 1998, Maastricht.

Foss, N.J. (1999) 'Capabilities, confusion and the costs of coordination: on some problems in recent research on inter-firm relations.' *Cooperation Industrielle: Diversité et Synthese*, Paris, 3rd-4th May [Revised version: published as DRUID Working Paper 99-7, 10 May].

Freeman, C. (1991) 'Networks of innovators: a synthesis of research issues.' *Research Policy,* 20, 499-514.

Gartner, W., Bird, B. and Starr,J. (1992) Acting as if: Differentiating Entrepreneurial from Organiizational Behaviour, *Entrepreneurship Theory and Practice*, **16**, 3, 13-31.

Gates, B. (1996) *The road ahead.* Penguin, London.

Gouldner, A.W. (1960) The norm of reciprocity: a preliminary statement, *American Sociological Review,* pp160-178.

Grandori, A. and Soda, G. (1995) 'Inter-firm networks: antecedents, mechanisms and forms.' *Organization Studies*, **16**, 2, 183-214.

Granovetter, M. (1973) 'The strength of weak ties.' *American Journal of Sociology.* **78**, 1360-80.

Granovetter, M. (1985) 'Economic action and social structure: the problem of embededness.' *American Journal of Sociology*. **91**, 481-510.

Granovetter, M. (1992) 'Problems of explanation in economic sociology.' in: N. Nohria and R.G. Eccles (eds.) *op cit*.

Grant, R.M. (1998) *Contemporary strategic analysis: concepts, techniques, applications.* 3rd edition. Blackwell, Oxford.

Gray, C. (1998) *Enterprise and culture*. Routledge, London.

Griffin, A.R. (1971) *Mining in the East Midlands 1550-1947*. Cass, London.

Gulati, R., Nohria, N. and Zaheer, A. (2000a) Introduction to the special issue: strategic networks, *Strategic Management Journal*, **21**, 199-201.

Gulati, R., Nohria, N. and Zaheer, A. (2000b) Strategic networks, *Strategic Management Journal*, **21**, 203-15.

Gulati, R. and Lawrence, P. (1999) Organizing vertical networks: a design perspective, paper presented at the *SMJ* special issue confeence on Strategic Networks.

Hagedoorn, J. and Schakenraad, J. (1990) 'Strategic partnering and technological cooperation.' in Freeman, C. and Soete, L. (eds.) *New Explorations in the Economics of Technical Change,* Pinter, London.

Håkansson, H. (ed.) (1982) *International Marketing and Purchasing of Industrial Goods: An interaction approach.* Wiley, London.

Håkansson, H. (1996) 'Organization networks.' in M. Warner (ed.) *International encyclopaedia of business and management*, 3857-3865. International Thompson Business Press, London.

Hakim, C. (1989) 'Identifying fast growth small firms.' *Employment Gazette*, 2941 (January), Department of Employment, London.

Hansen, E.L. (1995) 'Entrepreneurial networks and new organization growth.' *Entrepreneurship Theory and Practice,* **19**, 4, 7-29 (Summer).

Hardill, I. Fletcher, D. and Montagne-Villette, S. (1995) Small firms, 'distinctive capabilities' and the socio-economic milieux, *Entrepreneurship and Regional Development***, 7**, 167-186.

Harland, C. (1996) 'Supply chain management: relationships, chains and networks.' *British Journal of Management,* **7** (Special Issue), S63-S80.

Hayes, R.H. and Wheelwright, S.L. (1994) *Regaining our competitive edge.* Wiley, London.

Hendry, C. and Brown, J. (1995) 'Industrial districts and supply chains as vehicles for managerial and organisational learning.' *British Academy of Management Conference*, Sheffield, (11^{th} –13^{th} September).

Hendry, C., Brown, J. and DeFillipi, R. (2000) 'Regional clustering of high technology-based firms: opto-electronics in three countries.' *Regional Studies*, **34**, 2, 129-144.

Henry, A. (1991) *Williams: the business of Grand Prix racing.* Patrick Stephens, Sparkford.

Henry, N. and Pinch, S. (2000) 'Spatialising knowledge: placing the knowledge community of Motor Sport Valley.' *Geoforum*, **31**, 2, 191-208.

Hogarth-Scott, S. and Parkinson, S.T. (1993) 'Retailer-supplier relationships in the food channel, a supplier perspective.' *International Journal of Retail & Distribution Management*, **21**, 8, 11-13.

Homans, G. (1950) *The human group* Harcourt Brace and Company, New York.

Homans, G. (1958) Social behaviour as exchange, *American Journal of Sociology*, **9**, 31-41.

Home Office (1988) *Broadcasting in the '90s: competition, choice and quality – the Government's plans for broadcasting legislation.* HMSO, London.

Hudson, P. (1986) *The genesis of industrial capital.* Cambridge University Press, Cambridge.

Hutton, J. (1981) *The Economics of the UK Medical Equipment Market.* ISER, University of York.

Imai, K., Nonaka, I. and Takeuchi, H. (1985) 'Managing the new product development process: How Japanese companies learn and unlearn.' in Clark, K.M. Hayes, R.H. and

Jarillo, J.C. (1988) 'On strategic networks.' *Strategic Management Journal*, **9**, 31-41.

Johannisson, B. (1986) Network strategies: management technology for entrepreneurship and change, *International Small Business Journal*, 5, pp19-30.

Johannisson, B. (1998) 'Personal networks in emerging knowledge-based firms: spatial and functional patterns.' *Entrepreneurship and Regional Development*, **10**, 4, 297-312.

Johannisson, B. (2000) 'Networking and entrepreneurial growth.' in: Sexton, D.L. and Landström, H. (eds) *The Blackwell handbook of entrepreneurship,* Blackwell, Oxford.

Johannisson, B. and Monsted, M. (1997) 'Contextualizing entrepreneurial networking.' *International Studies of Management and Organization*, **27**, 3, 109-36 (Fall).

Jones, C., Hesterly, W.S. and Borgatti, S.P. (1997) 'A general theory of network governance: exchange conditions and social mechanisms.' *Academy of Management Review*, **22**, 4, 911-45.

Jones, C. (2000) 'Of entrepreneurs, networks and markets: the co-evolution of the US film industry 1895-1930.' Unpublished paper presented at University of Birmingham, March.

Jones, O. (2000) 'Innovation management as a post-modern phenomenon: the outsourcing of pharmaceutical R&D.' *British Journal of Management*, **11**, 341-356.

Jones, O. and Conway, S. (2000) 'The social embeddedness of entrepreneurs: a re-reading of "Against the Odds".' Aston Business School Research Papers RP0023, Aston University, Birmingham.

Kanter, R.M. (1983) *The change masters*. Allen and Unwin, London.

Kanter, R.M. and Eccles, R.G. (1992) 'Making network research relevant to practice.' in: N. Nohria and R.G. Eccles (eds.) *op. cit*.

Keane, M.J. (1990) 'Economic development capacity amongst small rural communities.' *Journal of Rural Studies*, **6**, 3, 291301.

Keeble, D. (1998) 'Practising collective learning: processes of knowledge development in European regional clusters of technology-intensive SMEs.' *ESRC/TSER Networks and Collective Learning Conference,* Cambridge (7th December).

Keeble, D. (*et. al.)* (1992) *Business success in the countryside: the performance of rural enterprise*. Department of the Environment / PA Cambridge Economic Consultants, London.

Keeble, D. and Lawson, C. (eds) (1998) 'Collective learning processes and knowledge development of high technology SMEs in Europe.' ESRC Centre for Business Research, University of Cambridge.

Keeble, D. and Wilkinson, F. (2000) 'Collective learning and knowledge development in the evolution of regional clusters of high technology SMEs in Europe.' *Regional Studies*, **33**, 4, 295-303.

Kirzner, I. (1973) *Perception, Opportunity and Profit: Studies in the Theory of Entrepreneurship*, University of Chicago Press, Chicago.

Kirzner, I.M. (1980) *The prime mover of progress: the entrepreneur in capitalism and socialism.* Institute for Economic Affairs, London.

Krafcik, J. (1988) 'Triumph of the lean production system.' *Sloan Management Review*, Fall 1988, 41-52.

Larson, A. (1992) 'Network dyads in entrepreneurial settings: a study of the governance of exchange relationships.' *Administrative Science Quarterly*, **37**, 76-104.

Larson, A. and Starr, J.A. (1993) 'A network model of organization formation.' *Entrepreneurship Theory and Practice*, **4**, 5-15 (Winter).

Lawrence, D.H. ([1913] 1992) *Sons and lovers.* Penguin Books, Harmondsworth.

Lawson, C. and Lorenz, E. (1999) 'Collective learning, tacit knowledge and regional innovative capacity.' *Regional Studies*, **33**, 4, 305-317.

Lazerson, M. (1995) 'A new phoenix?: modern putting out in the Modena knitwear industry.' *Administrative Science Quarterly*, **40**: 34-59.

Leonard-Barton, D. (1984) 'Interpersonal communication patterns among Swedish and Boston area entrepreneurs.' *Research Policy*, **13**, 2, 101-114.

Lipparini, A. and Sobrero, M. (1994) The Glue and the Pieces: Entrepreneurship and Innovation in Small Firm Networks, *Journal of Business Venturing***, 9**, 125-140.

Liu, R-J. and Brookfield, J. (2000) 'Stars, rings and tiers: organisational networks and their dynamics in Taiwan's machine tool industry.' *Long Range Planning*, **33**, 3, 322-348.

Loasby, B.J. (1999) *Knowledge, institutions and evolution in economics: the Graz Schumpeter lectures*. Routledge, London.

Lorenz, C. (eds.) (1996) *The Uneasy Alliance – Managing the Productivity - Technology Dilemma.* Harvard Business School Press, Boston.

MacMillan, K. and Farmer, D. 'Redefining the boundaries of the firm.' *Journal of Industrial Economics*, **27**, 3, 277-285.

Marshall, A. ([1920] 1986) *Principles of Economics*, Macmillan.

Marx, K. ([1887] 1979) *Capital: a critique of political economy*, vol. 1. Random House, New York.

Miles, R.E. and Snow, C.C. (1986) 'Organisations: new concepts for new forms.' *California Management Review*, 28, 3, 62-73 (Spring).

Mintzberg, H., Jorgensen, J., Dougherty, D. and Westley, F. (1996) 'Some surprising things about collaboration: knowing how people connect makes it work better.' *Organizational Dynamics*, **25**, 1, 60-71.

Mitchell. J. (1969) 'The concept and use of social networks.' in Mitchell, J. (ed*.) Social networks in urban situations*. Manchester University Press, Manchester. (1-50)

Monsted, M. (1995) Processes and Structures of Networks: Reflections on Methodology, *Entrepreneurship and Regional Development***, 7**, 193-213.

Morgan, G. (1986) *Images of organisation*. Sage, London.

Neal, D.J. (1999) 'SMEs in the changing defence/aerospace industry – a case of simplification or strangulation?' *4th International Conference on the Dynamics of Strategy*, 22-23 April 1999, University of Surrey, Guildford.

New, S. and Mitropoulos, I. (1995) 'Strategic networks: morphology, epistemology and praxis.' *International Journal of Operations and Production Management*, **15**, 11, 53-61.

Nohria, N. and Eccles, R.G. (1992) *Networks and organisations: structure, form and action*. Harvard Business School Press, Cambridge MA.

Nohria, N. (1992) 'Is a network perspective a useful way of studying organizations?' in: N. Nohria and R.G. Eccles (eds.) *op. cit*.

Nonaka, I. and Takeuchi, H. (1995) *The knowledge creating company: how Japanese companies create the dynamics of innovation*. OUP, Oxford.

Oliver, A.L. and Ebers, M. (1998) 'Networking network studies: an analysis of conceptual configurations in the study of inter-organizational relationships.' *Organization Studies*, **19**, 4, 549-83 (Fall).

Penn,R. (1992) Contemporary Relationships Between Firms in Classic Industrial Locality: Evidence from the Social Change and Economic Life Initiative, *Work, employment & Society,* **6**, 2, 209-227.

Penrose, E.T. (1959, 1995 (3e)) *The theory of the growth of the firm*, OUP, Oxford.

Peters, T.J. and Waterman, R.H. (1982) *In search of excellence: lessons from America's most admired companies.* Harper and Row, London.

Pinch, S. and Henry, N. (1999) 'Paul Krugman's geographical economics, industrial clustering and the British motorsport industry.' *Regional Studies*, **33**, 9, 815-827.

Piore, M.J. (1992) 'Fragments of a cognitive theory of technological change and organisational structure.' in N. Nohria and R.G. Eccles (eds) *op. cit*.

Piore, M. and Sabel, C. (1984) *The second industrial divide*. Basic Books, New York.

Porter, M.E. (1987) 'Managing value – from competitive advantage to corporate strategy.' *Harvard Business Review*, May-June 1987.

Powell, W. (1990) Neither market nor hierarchy: Network forms of organization, *Research in Organizational Behaviour*, **12**, 295-336.

Provan, K.G. (1993) 'Embeddedness, interdependence and opportunism in organizational supplier-buyer networks.' *Journal of Management*, **19**, 4, 841-856.

Pyke, F. and Sengenberger, W. (Eds.) (1992*) Industrial Districts and Local Economic Regeneration,* IILS, Geneva.

Ram, M. and Barrett, G. (2000) 'Ethnicity and enterprise.' in Carter, S. and Jones-Evans, D. (eds.) (2000) *op. cit.*

Ramachandran, K. and Ramnarayan, S. (1993) 'Entrepreneurial orientation and networking: some Indian evidence.' *Journal of Business Venturing*, **8**, 513-524.

Richardson, G.B. (1972) 'The organisation of industry.' *Economic Journal*, **82**, 883-96. [Reprinted in Foss, N.J. (ed.) (1997) *Resources, firms and strategies*. OUP, Oxford.]

Rothwell, R. (1989) 'SMFs, inter-firm relationships and technological change.' *Entrepreneurship and Regional Development*, 1, 275-291.

Rothwell, R. (1992) 'Successful industrial innovation: critical success factors for the 1990s.' *R&D Management*, 22, 3, 221-239.

Sabel, C.F. and Zeitlin, J. (eds.) (1997*) World of possibilities: flexibility and mass production in western industrialization*. Cambridge University Press, Cambridge.

Sadler, D. (1999) 'Internationalization and specialization in the European automotive components sector: implications for the hollowing-out thesis.' *Regional Studies*, **33**, 2, 109-119

Saxenian, A. (1991) 'The origins and dynamics of production networks in Silicon Valley.' *Research Policy*, **20**, 423-437. [Reprinted in R. Swedberg (ed.) (2000) *Entrepreneurship: the social science view*. OUP, Oxford.]

Scarborough, H. (1998) 'Path(ological) dependency?: core competencies from an organisational perspective.' *British Journal of Management*. **9**, 219-232.

Schmitz, H. and Knorringa, P. (1999) *Learning from global buyers.* IDS Working Paper 100. Institute of Development Studies, University of Sussex, Brighton.

Schumpeter, J.A. ([1911]1934) *The Theory of Economic Development,* Harvard University Press, Cambridge, Mass.

Scott, A. (1993) Technopolis: high technology industry and regional development in Southern California. University of California Press, Berkeley, CA.

Scott, A.J. (1997) 'The geographic foundations of industrial performance.' in Chandler, A.D Jr., Hagström, P. and Sölvell, O. (eds.) *The dynamic firm: the role of technology, strategy and regions*. OUP, Oxford.

Scott, M. and Rosa, P. (1996) Opinion: has firm level analysis reached its limits? Time for a re-think, *International Small Business Journal*, July-Sept, **14**, 4, 81-90..

Shaw, B.F. (1986) *The role of interaction between the manufacturer and the user in the technological innovation process*. Unpublished D.Phil. thesis, University of Sussex.

Shaw, B.F. (1988) 'Gaining added value from centres of excellence in the UK Medical equipment industry.' *R & D Management*, **18**, 2, 121-130.

Shaw, B.F. (1998) 'Innovation and new product development in the UK medical equipment industry.' *International Journal of Technology Management*, **15**, 3/4/5, 433-445.

Shaw, B.F. (2001) Personal communication.

Shaw, E. (1998) 'Social networks: their impact on the innovative behaviour of small service firms.' *International Journal of Innovation Management*, **2**, 2, 201-222.

Slack, N., Chambers, S., Harland, C., Harrison, A. and Johnston, R. (1995) *Operations management.* Pitman Publishing, London.

Smallbone, D.J., Leigh, R. and North, D. (1995) 'The characteristics and strategies of high growth firms.' *International Journal of Entrepreneurial Behaviour and Research*, **1**, 3, 44-62.

Smith, D.J. and Tranfield, D.R. (2000) 'Strategic suppliers: strategic change in the aerospace equipment industry.' *Proceedings of the 3rd Global Change Conference*, Manchester Metropolitan University, 14th-15th December 2000, 229-239.

Stanworth, J. and Curran, J. (1976) 'Growth and the small firm: an alternative view.' *Journal of Management Studies*, **13**, 95-110.

Stockman, C. and Doctor, J. (1987) 'Innovation in Manufacturing in SMFs.' in Rothwell, R. Bessant, J. (eds.) *Innovation, Adoption and Growth.* Elsevier Science Publications, Amsterdam.

Storper, M. (1988) 'The transition to flexible specialisation in the U.S. film industry: external economies, the division of labour and the crossing of industrial divides.' Cambridge Journal of Economics, **13**, 273-305.

Swedburg, R. (ed.) (2000) *Entrepreneurship: the social science view*. Oxford University Press, Oxford.

Teece, D.J. (1992) 'Competition, cooperation and innovation: organisational arrangements for regimes of technological progress.' *Journal of Economic Behaviour and Organisation,* 18, 1-25.

Thoburn, J.T. and Takashima, M. (1993) 'Improving British industrial performance: lessons from Japanese subcontracting.' *National Westminster Bank Quarterly Review*, February 1993, 2-12.

Thorelli, H.B. (1986) 'Networks: between markets and hierarchies.' *Strategic Management Journal*, **7**, 37-51.

Tichy, N., Tushman, M. and Fombrun, C. (1979) 'Social network analysis for organizations.' *Academy of Management Review*, **4**, 4, 507-519.

Tremayne, D. (2001) 'Ecclestone ready to cede control of Formula One.' *The Independent*, 2nd February.

Trinder, B.S. (1983) *A history of Shropshire*. Phillimore, Chichester.

Uzzi, B. (1997) 'Social structures and competition in interfirm networks: the paradox of embeddedness.' *Administrative Science Quarterly*, **42**, 35-67.

Vyakarnam, S., Jacobs, R. and Handelberg, J. (1999) Exploring the Formation of Entrepreneurial Teams: the key to rapid growth business? *Journal of Small Business and Enterprise Development,* **6,** 2, 173-182

Weber, M. (1930) *The Protestant ethic and the spirit of capitalism* (Trans: Talcott-Parsons). Harper Collins, London.

Wenerfelt, B. (1984) 'A resource-based view of the firm.' *Strategic Management Journal,* **5**, 171-180.

Whipp, R. and Clark, P.A. (1986) *Innovation and the auto industry: product, process and work organisation*. Francis Pinter, London.

Whitley, R. (1998) 'East Asian and Anglo-American business systems.' in Thompson, G. (ed.) *Economic dynamism in the Asia Pacific: the growth of integration and competitiveness*. Routledge, London.

Whittaker, E. and Bower, D.J. (1994) 'A shift to external alliances for product development in the pharmaceutical industry.' *R&D Management*, **24**, 3, 249-260.

Williamson, O.E. (1975) *Markets and Hierarchies*, Free Press, New York.

Williamson, O. E. (1985) *The Economic Institutions of Capitalism*, Free Press, New York.

Womack, J.P., Jones, D.T. and Roos, D. (1990) *The machine that changed the world*, Rawson Associates, New York.

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