



Understanding innovation in small and medium-sized enterprises: a process manifest

Tim Edwards*, Rick Delbridge, Max Munday

Cardiff University, Aberconway Building, Colum Drive, Cardiff CF10 3EU, UK

Abstract

This paper proposes new directions in researching innovation in small and medium sized enterprises (SMEs) based on a process perspective. We proceed by (a) reviewing advances in mainstream innovation research, (b) considering the nature of studies of innovation in SMEs, and (c) outlining new directions that take into consideration the conceptual arguments illustrated in the previous sections. We propose that our current level of understanding is restricted due to the theoretical and methodological biases that have informed existing research. A better understanding is more likely to be achieved by rejecting normative-variance approaches and assessing innovation in the context of strategic conduct within institutional processes and structures. This should contribute to a better appreciation of innovation in SMEs by focusing on the *process* of change.

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1. Introduction

Encouraging innovation in small and medium sized enterprises (SMEs) remains at the heart of policy initiatives for stimulating economic development at the local, regional, national and European levels (Jones and Tilley, 2003). In the UK, this can be traced back to the emergence of the New Right in the 1980s and the demise of the corporatist perspective of 'big is beautiful' and its replacement with the logic of entrepreneurship in stimulating economic growth (Hutton, 1995). At a theoretical level, innovation has also replaced efficiency as the crucial focus of much theory building and policy analysis with efficiency becoming a necessary adjunct to innovation (Clark and Staunton, 1989). Yet, despite increasing attention being given to the role of SMEs and innovation there is a hiatus between what is understood by way of the general innovation literature and the extant literature on innovation in SMEs. Although there is the absence of a common theoretical basis for innovation research more generally (Drazin and Schoonhoven, 1996) it is apparent that, notwithstanding this, studies of innovation in SMEs have largely failed to reflect advances in the innovation literature. This failure to improve our basic

understanding of innovation in SMEs is disappointing given that, in the UK, SMEs (including sole traders) amount for 99% of businesses, 55% of non-governmental employment and 51% of turnover (SBS, 2001). Our main contention is that a revision of existing research perspectives is not only theoretically overdue in the context of SMEs it is of practical relevance, given the continued focus of public policy and money on improving the innovative potential of SMEs, particularly in mature Western economies.

Our aim in this paper, building on Child's (1997) conception of strategic choice, is to propose a theoretical framework of innovation in SMEs that is sensitive to the micro-processes of innovation and the institutional processes reflect the mediating role of dominant institutions. This is consistent with institutional theory, as innovation is believed to involve the relational interplay of the firm context with the political efforts of actors to accomplish their own ends (see Beckert, 1999; Kostova and Roth, 2002). We begin to develop this process perspective by: (a) reviewing recent developments in innovation research, (b) considering the nature of studies of innovation in SMEs, and (c) outlining new directions that take into account these conceptual arguments. Adopting an integrative approach provides an opportunity to contextualise existing studies and to assess the implications of our preferred view in the context of existing trends in theory development.

* Corresponding author. Tel.: +1-29-2087-6385; fax: +1-29-2063-4419.
E-mail address: edwardsstj@cardiff.ac.uk (T. Edwards).

2. Challenging normative-variance approaches of innovation

At present, and despite the voluminous literature, our understanding of innovation—the commercial exploitation of ideas—is quite limited (Wolfe, 1994). Making sense of this failure demands closer scrutiny of the theoretical assumptions of the existing innovation literature, especially the innovation in SMEs literature. Efforts to improve the explanatory reach of innovation research have led to increasing interest in the process through which ‘new ideas, objects and practices are created and developed or reinvented’ (Slappendel, 1996:108). Such efforts reveal how ongoing debates in sociology (Giddens, 1995) and organizational studies (Clark and Staunton, 1989; Clark, 2000) have informed ideas of innovation in relation to the role of agency and structure in processes of social change and reproduction.

These debates have been based on theoretical and philosophical revisions that mark a radical shift from previous perspectives that tended to objectify and treat knowledge trading as simply an economic transaction (Williamson, 1975, 1985, 1986). Emphasis is now given to the social shaping of innovation (Scarbrough, 1995) with the orthodox research based on ‘science-push’ (Schumpeter, 1934) or ‘market-pull’ (Schmookler, 1966) interpretations being rejected in favour of process models. The development of process models reflect challenges to earlier perspectives, which were considered as conceptually and methodologically suspect. The chronology of perspectives follows: (i) the *diffusion* of innovation; (ii) the *determinants* of organizational innovation and (iii) the *innovation process* (Wolfe, 1994). Such revisions have challenged the guiding principles in theory building and empirical research that tended to follow *objectification*. Notably, prior to the advent of process models the reliance on invariant interpretations had significant implications for the nature of innovation research studies. These can be summarised as follows: (i) the use of the ‘before change’ and ‘after change’ format as a standard research design to examine objectified innovations; (ii) the search for a single scale of technology; (iii) the split between administrative and technological innovations; and (iv) an attempt to identify those variables that correlate with the adoption of objectified innovations (Clark and Staunton, 1989). In the first instance, the propensity to focus on single events (purchase or adoption) is limiting and ensured that longitudinal accounts of innovation were missing. In turn, the practice of objectification also ensured that the ‘knowledge’ aspect of technology was neglected, which lead many studies to perpetuate a deterministic notion of technology (Grint and Woolgar, 1997). In contrast, it has only been through process approaches that the way technology mediates other dimensions including organizational structure and process has been assessed (Barley, 1986, 1990). Elsewhere, classifying organizational innovations according to *technical, administrative* and *ancillary dimensions*

has been misleading as it misrepresents how technologies cross technical-administrative boundaries (Clark and Staunton, 1989).

The consequences of the rejection of objectified approaches are apparent in Rogers (1962, 1983, 1995) study of the *Diffusion of Innovations*. In Rogers (1962), attention was given to the supply side of the diffusion of innovations. The resulting model gave a causal map for arranging the efforts of change agents for the successful diffusion of different types of innovation. In this case, the objective was to promote best practice among farmers associated with the American agricultural extension agency. Implicit in the model were various assumptions: innovation is an object; innovation is the best policy; the user is a passive agent in the whole process; the supplier designs the innovation and offers objective data about it; and the innovation remains static (Clark, 1987). Subsequent editions included important revisions that in total incorporated a limited analysis of the generation of innovation, an appreciation of the organizational context and an indication of how this influences the decision making process. Rogers also questioned why the user, in a process of re-invention, modified innovations and what implications this had organizationally. Arguably, this later work began to reveal the relevance and import of the micro-processes of innovation.

Such revisions reflect theoretical developments often associated with the advent of process methods when scholars began to prioritise explanations of innovation that considered the connections between agency and structure. With this, emphasis has shifted from static interpretations of innovation towards theory developments around the links between strategic choice and the mediating effects of existing institutional structures and processes (see Barley and Tolbert, 1997; Child, 1997). Rather than prioritizing the individual or the structural characteristics of an organization to explain innovation (as has been the case using variance methods), research is increasingly concerned with examining the interactive and temporal contextualities of the process (Slappendel, 1996). In the next section we consider these themes in greater detail in the context of the existing SME literature prior to developing a process model that is based on these developments around ‘interactivity’.

3. The Study of Innovation in SMEs

To date, little has been said about the multi-level dimensions and often paradoxical links between agency and structure in studies of innovation in SMEs (for exceptions see Edwards, 2000; Jones et al., 2000). Thus, despite the voluminous literature on innovation in SMEs (for reviews see Chanaron, 1998 and Motwani et al., 1999, also see Acs and Audretsch, 1990; Cobbenhagen, 2000) the aggregate benefits has, it might be argued, been marginal in explaining the innovation process in SMEs. We suggest that

this situation reveals limitations in the theoretical and methodological underpinnings of the majority of the literature, which remains wedded to normative-functional studies based on variance methods. For example, many existing studies limit analyses of innovation and the environment to the study of entrepreneurial traits or structural characteristics (for a review see Hoffman et al., 1998). These studies also continue to follow orthodox organizational philosophy maintaining the agency-structure dualism (Burrell and Morgan, 1979). There remain very few studies that examine the embeddedness of innovation in SMEs (Oakey, 1993; Shaw, 1998; Paniccia, 1998). Instead, the literature is dominated by those studies endeavouring to predict success by identifying the determinants of innovation. Examples include those studies that try to identify the critical success factors for innovative strategy in SMEs (Riedle, 1989; Dodgson and Rothwell, 1991; Bowen and Ricketts, 1992), and those that specify successful technology and innovation practice in SMEs (Rinhol and Boag, 1987; Bracker et al., 1988; Boag and Rinholm, 1989; Carland et al., 1989; Radosevic, 1990; Oakey and Cooper, 1991; Berry, 1996). Also, such approaches misrepresent innovation because they fail to examine the process through which innovations emerge, in effect, treating innovation as invariant. Notably, recent research on the adoption of continuous improvement practices in SMEs (Chanaron, 1998) has treated such practices as unproblematic ignoring the likelihood of varying degrees of appropriation within the firm. This is a crucial oversight as other research has demonstrated the varied levels of adoption and performance implications of such practices at the operational level in SMEs (CBS, 2003).

Similarly, much debate has been given to assess those variables that are thought to differentiate innovation in organizations (see Rothwell, 1985, 1989; Rothwell and Dodgson, 1991; Nooteboom, 1994). For example, large and small firms are often depicted as diametrically opposed with large firms showing innovative advantage in terms of material or resource factors while small firms are attributed with behavioural advantages (Rothwell, 1985). Although this perspective has been well rehearsed we would concur with Vossen (1998:88) that 'small and large firms are likely to play complementary roles in the process of technical advance, in the sense that they are better at different types of innovation'. The role of SMEs cannot be appreciated outside of the contextual characteristics of the innovation process, including the technology and industry and the marketplace. Assuming that SMEs benefit from behavioural factors has limited explanatory value unless we understand how such factors come into play (or not) within a specific context over time.

The relationship between firm-level practice and the external environment represents an important focus of research, which has remained underdeveloped in the existing literature of innovation in SMEs. Although it is generally recognised that 'innovative SMEs have dense

external networks involving other firms (mainly SMEs) in a variety of...relationships and involving infra-structural institutions such as universities and private research institutes' (Rothwell, 1991:93), little is said about these connections over time. We argue that a correction to such oversights is overdue and demands some critical insight into the micro-processes of innovation and networking. Moving away from overly mechanistic representations of innovation management in SMEs (Atherton and Hannon, 2000) will demand an assessment of the political nature of the innovation process. In this sense, Burns and Stalker's (1961) seminal study on the management of innovation is instructive, although in ways that are less readily recognised. In particular, this study revealed how Ferranti Ltd, which was allied with several electronics SMEs during the 1950s effectively exploited these SMEs when pooling and exchanging ideas. The authors comment that 'the role of Ferranti Ltd was not entirely that of fairy godmother' (Burns and Stalker, 1961:51). Thus, the network relationships that bind SMEs into innovative ties can be controversial. Interestingly, it is only in their most recent edition (1994) of their work that they recognise the role of controversy when they suggest that 'internal politics' as much as the environment mediates the adoption of organic or mechanistic structures by firms (see Jones and Stevens, 1999).

Acknowledging the connections between firm-level activities and the wider processes connected with such networks is significant given that the innovation process is now increasingly distributed across multiple actors (Coombs and Harvey, 2001). As new technologies become more complex and information and communication technology more pervasive firms of all sizes are much less likely to innovate by themselves (Powell et al., 1996). Firms are now working with academic institutions and other firms through innovation networks in and between sectors, regions and nation-states (Coombs et al., 1996; Hakansson, 1989; Hagedoorn and Schakenraad, 1992; Soeters, 1993; also for a review of the role of networks see Pittaway et al., 2003). Investigating the material and cognitive resources of the immediate environment of SMEs (see Preti, 1991) reveals that SMEs' practices are mediated through their environment in often complex and contradictory ways (Delmestri, 1997). For example, studies of modern supply chain management demonstrate that SME survival demands closer integration (see Macpherson and Wilson, 2003). As it is, however, managers of SMEs do not always understand the demands of suppliers because they are unaware of the skills and competencies needed to operate in high performing supply chains. This is made more difficult as they are unable to analyse their own capabilities or assess the available support of state agencies (Monkhouse, 1995; Macpherson and Wilson, 2003). Given such complexity, we tend to agree with Johannisson and Monsted's (1997:113) contention that 'the individual entrepreneur, her or his venture, and the context can only be understood if considered jointly'. Thus, SMEs are often implicated in

institutionally mediated forms of selective co-operation between actors where membership of localised social and economic networks enable them to compete in the marketplace (Frybourg, 1997; Raco, 1999). Yet, it is also the case that such networks can present significant barriers as the strong ties formed across such entrepreneurial networks (see Jones and Tilley, 2003) act to close out various opportunities and alternatives (Granovetter, 1973; Leonard-Barton, 1984; Aldrich and Zimmer, 1986).

We argue that a necessary focus for future research is the relationship between the practices of managers and the nature of how these managers and their firms are embedded within their institutional context. In the next section we endeavour to open this discussion by proposing a theoretical framework that enables us to develop a much greater understanding of innovation in SMEs.

4. New directions in researching innovation in SMEs

The complexity of innovation (as alluded to by Rogers and Burns and Stalker in later revisions) can usefully be considered in terms of recent theories of the innovation process (Robertson et al., 1997). In the case of technical innovation, this process consists of several episodes that are recursively rather than sequentially organised that include: invention, diffusion and implementation. Invention is a personalised process where individuals form relations based on expertise and skills for the purpose of translating ideas into concepts and models (Nonaka, 1991). Building such understanding and trust among individuals and groups relies on networking across the organization (for a review see Pittaway et al., 2003). Diffusion involves boundary-spanners negotiating the exchange of 'know-how' between the designers and users of such 'knowledge solutions'. Professional bodies (e.g. consultants) play a key role in legitimating the diffusion of new technologies. In turn, appropriation will involve a 'community' approach to embed the technology within the organization (Newell et al., 2002). At each episode, individuals are involved in 'constructing' meaning and the physical character of the technology within existing organizational and institutional structures. This is apparent in not only technical innovation but also the creation and adoption of new services and practices. For example, the adoption of *best practices* cannot be appreciated without revealing the often powerful normative pressures of institutions such as professional bodies in legitimating such practices within the firm (DiMaggio and Powell, 1983). Yet, in turn, implementation is an occasion when such practices can be transformed and new interpretations and physical manifestations can emerge. Organizational and social reproduction reflects agency and the choice of individuals and the existing structures and processes that mediate such practices.

This view is consistent with Nooteboom's (2000) theorisation of the 'cycle of discovery' when he argues

that structures develop (exploration) from application (exploitation) in new contexts. Ideas, innovations, and routines settle into a 'best practice' or a 'dominant design' that serves as a prototype for applications and variations in new contexts. This leads to opportunity for novel combinations, breaking down existing structures, which may converge to a dominant design (although Nooteboom recognises the possibility of inertia). In this case, there is an alternation of variety of content and variety of context:

Exploitation requires the maintenance of existing identity, knowledge and practices, with a certain amount of control and co-ordination, in a dominant design. Exploration requires their change, with a loosening of control and co-ordination. (Nooteboom, 2000:8)

Such approaches reveal that innovation is a social process where the strategic choices of agents are not simply an outcome of economic transactions but involve reconciling both the exercise of control and knowledge communication (Scarbrough, 1995). This alludes to the 'innovators' dilemma' and the paradox of maintaining both stability and change (Christensen, 1997). In this case, such processes are mediated by the 'social network' that informs whether a new idea is viable (Drazin and Schoonhoven, 1996). This social network also represents a complex pattern of institutions, which mediates the development of the 'coordinating, learning and reconfigurational capabilities' of the firm (Whitley, 2003:669). Such a complex pattern can also result in strong ties that restrict organizations from adapting to radical technological and market change (Uzzi, 1997). Notwithstanding this risk, the institutional realm includes inter-firm networks, systems of production, industrial relations, industrial capital, corporate governance that support firms to engage in closer relations with business partners and employees by helping to generate trust and offset opportunistic and short-term behaviour through changing business partners (Whitley, 2003).

Improving our understanding of innovation in SMEs does not necessarily demand a total rejection of previous research. Instead, we contend that advances can be made in directions that reflect on the insights of previous research but that also actively try to connect strategic choices with the mediating pressures of the firms immediate and wider institutional context. Our view is close to Smith and Meiksins (1995) work that cites system, societal and dominance effects of institutional domains. In their thesis Smith and Meiksins assess how the environment (that is, the economic mode of production; national legacies and institutional processes; and 'best practice' or universal modernisation practices) sets parameters or constraints on organizational choice. This bridges different levels of analysis, and overcomes the enduring problem of many innovation studies in creating oppositions—comparing large and small firms (Rothwell, 1985) or market versus technology (Berry, 1996).

Strategic choice analysis provides a process approach within which to locate the paradoxes represented by exploitation and exploration, choice and constraint that acknowledges:

...the possibility of a continuing adaptive learning cycle, but within a theoretical framework that locates ‘organizational learning’ within the context of organizations as socio-political systems (Child, 1997:44).

Power holders within firms will decide upon courses of action while simultaneously decisions are mediated by the performance standards against which wider economic constraints are evaluated and a firm’s structure is interpreted. An individual’s choices are also bounded by informational deficiencies and by their in-built preference and information processing systems (Whittington, 1988). Yet individuals may also adopt other initiatives, contradicting conventional wisdom, demonstrating the ‘potential to choose actions deliberately, and to carry them through effectively, even in defiance of established rules and prevailing powers’ (Whittington, 1992:696). The relationship between agency and the environment is pro-active and re-active. Individuals employ devices to help external initiatives, including social networks (Nohria and Eccles, 1992), while these ‘networks’ mediate activities according to the performance expectations of ‘firms-in-sector’ (Child and Smith, 1987).

Innovation is a process of (temporary) accomplishment; existing activities constrain action, while it is also likely that they will become the objects towards which change is directed (Scarborough, 1995). From a strategic choice perspective, the problem of ‘control’ and ‘appropriation’ is framed in terms of inner and outer structuration (Child, 1997). Crucial to managers is their ability to ensure stability in existing practices while managing the unpredictability of innovation. In this respect, *inner structuration* infers how ‘organizational actors seek to work upon, and are simultaneously informed or constrained by the existing structures and routines of the organization including its technologies and scale’. Scale (including size) and technology are both significant but not deterministic, as is often inferred in SME research. *Outer structuration* refers to the environment where organizational actors are ‘simultaneously informed of the opportunities for action which environmental conditions present and of the constraints which external circumstances place upon their room for action’ (Child, 1997:70).

This dynamic is shown in the way managers try to attain strategic objectives. Connecting inner and outer structuration are core interdependencies with an *economic dimension* relating to the markets and actors that populate the environment; a *social dimension*, including the shared prescriptions and identities of actors in close proximity; and a *relational dimension* signified by the networks that mediate links across the firm. Assessment of innovation within individual firms and populations of SMEs should

allow for each of these dimensions, which demands specific methodological approaches. In terms of levels of analysis, the relational and social dimensions reflect the micro-processes of innovation projects that demand an assessment of agency or how intentionality leads to outcomes. In particular, the relational dimension reveals a situational element (Tsoukas, 1996) of structuration or the examination of the actual practicalities of innovation within for example, teams or project groups. The relational aspects also indicate the temporal and distributed aspects of these practices that can operate within and across groups of firms. In this instance, the strategic conduct of individuals offers insights into the way employees and managers ‘experience’ or ‘play-out’ innovation (Barnett and Storey, 2000). In turn, such practices reveal the distinctive social dimension or the ‘contextualities of interaction’ (Giddens, 1995).

The context alludes to the complex interplay of past experiences in trying to make sense of the innovation and the skills and motivations of individuals involved in turning the ideas into reality. How individuals relate to each other within and across firms is also reliant on the economic character of such relations including, for example, supplier–customer ties or group–subsidiary linkages. As noted, supplier relations can present significant challenges for SMEs when attempting to integrate and operate supplier development relations. Also, managers may perceive little incentive to introduce innovative practices if the process is highly routinised and low value added. This economic dimension also takes the form of wider institutional processes that include supply chains, customers, firms-in-sector, and other institutions such as educational and professional bodies. These civil and professional bodies often play an important mediating role in the innovative potential of SMEs. This is apparent in the ongoing low skill/low quality equilibrium debate (see Finegold and Soskice, 1988; Keep and Mayhew, 1999), where the low skill form of work organization within the UK and especially SME sector is generally linked not only to short-term financial markets and adversarial industrial relations but also the failure of the vocational education and training system to provide adequate training provision (Finegold, 1999). As Whitley (2000) argues, the innovation strategies adopted by firms will relate to the firm in the context of its existing customer base and institutional structures. The influence of such structures is most readily apparent in a low value economy (such as the UK) where the competitive advantage of the majority of firms is tied to the low skills levels and competencies of the immediate labour market.

5. Discussion

We suggest that a process view allows for (limited) comparative generalisations and moves beyond simple investigations that focus purely on the innovation project

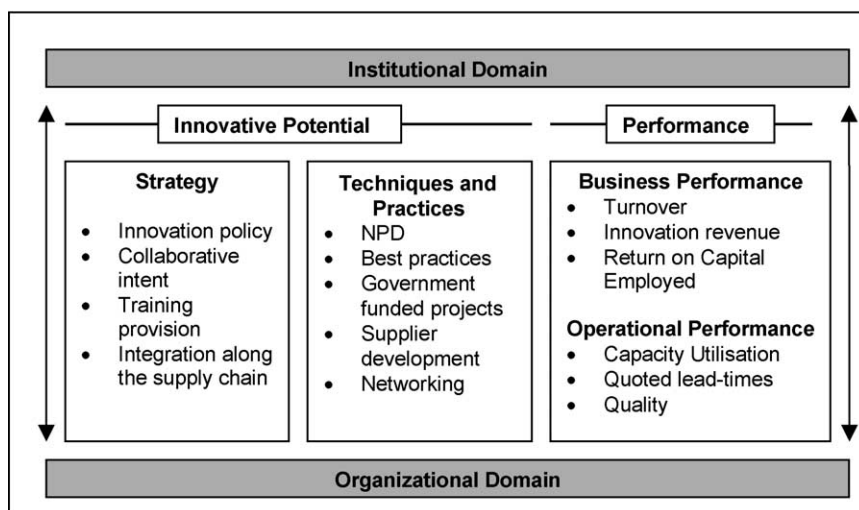


Fig. 1. Theorising Innovation in SMEs.

in SMEs. Exploring the innovation process will require longitudinal studies based on qualitative methods designed to make sense of the socio-political processes that underpin innovation within SMEs. Our proposal is to view innovation in terms of the constraining and enabling aspects of existing competencies, dispositions, resources and firm's structures that include the strategic orientation and the core practices and techniques of managers. Such attributes are likely to reflect the firm's ability to deal with uncertainty and novelty and its relations to customers and other institutions.

For the purpose of clarity we argue that innovative SMEs are those that identify, interpret and apply knowledge (both embodied and disembodied) effectively and as appropriate throughout the organisation. We propose a heuristic (Fig. 1) to capture this relationship between strategy and institution; this is not definitive but illustrative of the strategies, practices and performance measures that might be the subject of investigation. Here we define 'innovative potential' as the linkage between strategic intent and the techniques and practices that are adopted in the firm. It is necessary to ascertain the drivers 'behind' such strategies and the nature of these techniques and practices. This should reveal the level of appropriation of new practices or the distributed nature of organizational, product and service development. The institutional domain refers to the wider processes that inform the legitimacy and characterisation of such practices and strategies. Crucially, an investigation of practice must account for the mediations of 'firm-in-sector' or other structural arrangements.

Although previous SME research studies have identified critical factors or practices for successful innovation such studies fail to offer an appreciation of the temporal dimensions of such practices. Here we argue that an understanding of strategy and techniques and practices must also incorporate an appreciation of 'process' in order to appreciate how the links between agency and

the environment reveal both pro-active and re-active moments. Finally, we also argue that such an approach should include an understanding of objective measures of innovation. Arguably, assessing the performance measures used (or not, for that matter) to ascertain success offers another important component to understanding the economic, social and relational dimensions of the innovative activities within SMEs.

6. Concluding remarks

Our current understanding of innovation in SMEs is relatively poor. In part, our level of understanding will be improved by assessing intra- and inter-organizational firm links. However, higher levels of understanding will ultimately depend on making more sense of the mutual interdependence between agency and social processes. Child's (1997) theory of social action (strategic choice) offers the potential to make links across the diverse approaches found in the institutional literature. This approach also begins to rectify the under-theorisation of agency in institutional accounts (Dacin et al., 2002). This is not to deny the importance of the organising context, rather, our main aim is to recognise the possibility for a plethora of managerial 'logics of action' (Karpik, 1978). It is within this context that we suggest that studies of innovation in SMEs need to accommodate the complex connections between inner and outer structuration. Crucially, such an assessment will necessarily include an assessment of managerial processes and the extent to which these practices are measured and inform future action. How readily such practices become the dominant way of life will become apparent in the way they are embedded in the firm.

These proposals provide a backdrop to simultaneously assess capability and the level of appropriation. If such work is conducted around a similar firm then arguably we can build a better picture of the process of organizational innovation within populations of comparable SMEs. In this sense, it should be possible to demonstrate within certain contexts how ‘individuals as active human agents are both influenced by pre-existing forms of structuring, yet at the same degree...[are]... empowered to interpret what should be done in the future’ (Clark, 1987:9). This is a necessary pre-requisite to improving our understanding of innovation in SMEs.

References

- Acs, Z.J., Audretsch, D.B., 1990. *Innovation and Small Firms*, The MIT Press, Cambridge.
- Aldrich, H., Zimmer, C., 1986. Entrepreneurship through social network. In: Sexton, D., Smilor, R. (Eds.), *Art and Science of Entrepreneurship*. Ballinger, Cambridge, MA.
- Atherton, A., Hannon, P.D., 2000. Innovation processes and the small business: a conceptual analysis. *International Journal of Business Performance Management* 2/4, 276–292.
- Barley, S.R., 1986. Technology as an occasion for structuring: evidence from observations of CT scanners and the social order of radiology departments. *Administrative Science Quarterly* 32, 78–108.
- Barley, S.R., 1990. The alignment of technology and structure through roles and networks. *Administrative Science Quarterly* 31, 61–103.
- Barley, S.R., Tolbert, P.S., 1997. Institutional links and structuration: studying the links between action and institution. *Organisation Studies* 18/1, 93–117.
- Barnett, E., Storey, J., 2000. Managers accounts of innovation processes in small and medium-sized enterprises. *Journal of Small Business and Enterprise Development*, 7/4.
- Beckert, J., 1999. Agency, entrepreneurs and institutional change. The role of strategic choice and institutionalized practices in organizations. *Organization Studies* 20/5, 777–799.
- Berry, M., 1996. Technical entrepreneurship, strategic awareness, and corporate transformation in small high-tech firms. *Technovation* 16/9, 187–198.
- Boag, D., Rinholm, B., 1989. New product management practices of small high technology firms. *Journal of Product Innovation Management* 6/2, 109–122.
- Bowen, A., Ricketts, M., 1992. *Stimulating Innovation in Industry: the Challenges for the United Kingdom*, NEDO, London.
- Bracker, J., Keats, B., Pearson, J., 1988. Planning and financial performance among small firms in a growth company. *Strategic Management Journal* 9/6, 591–603.
- Burns, T., Stalker, G.M., 1961. *The Management of Innovation*, Tavistock, London.
- Burrell, G., Morgan, B., 1979. *Sociological Paradigms and Organizational Analysis*, Heineman, London.
- Carland, J.W., Carland, J.A., Aby, C., 1989. An assessment of the psychological determinants of planning in small business. *International Small Business Journal* 7/1, 23–34.
- Chanaron, J.-J., 1998. *Managing Innovation in European Small and Medium-Sized Enterprises*, Apeldoorn, Antwerpen.
- Child, J., 1997. Strategic choice in the analysis of action, structure, organisations and environment: retrospect and prospect. *Organisation Studies* 18/1, 43–76.
- Child, J., Smith, C., 1987. The context and process of organizational transformation—Cadbury limited in its sector. *Journal of Management Studies* 24/6, 565–593.
- Clark, P.A., 1987. *Anglo-American Innovation*, Walter de Gruyter Berlin, New York.
- Clark, P.A., 2000. *Organisations in Action: competition between contexts*, Routledge, London.
- Clark, P.A., Staunton, N., 1989. *Innovation in Technology and Organisation*, Routledge, London.
- Learning, C.B.S., 2003. *Companies: Innovative Potential of Welsh Manufacturing SMEs*, Cardiff Business School, ISBN-0-902810-08-1.
- Christensen, C., 1997. *The Innovator’s Dilemma*, Harvard Business School, Cambridge.
- Coombs, R., Harvey, M., 2001. *Analysing Distributed Innovation Processes*. Centre for Research on Innovation and Competition, May, No, 43.
- Coombs, R., Richards, A., Savioti, P.-P., Walsh, V., 1996. *Technological Collaboration: The Dynamics of Co-operation in Industrial Innovation*, Edward Elgar, Cheltenham.
- Cobbenhagen, J., 2000. *Successful innovation: towards a new theory for the management of SMEs*, Edward Elgar, Cheltenham.
- Dacin, T.M., Goodstein, J., Scott, W.R., 2002. Institutional theory and institutional change: introduction to the special research forum. *Academy of Management Journal* 45/1, 45–57.
- Delmestri, G., 1997. Convergent organizational responses to globalisation in the Italian and German machine-building industries. *International Studies of Management and Organisation* 27/3, 86–108.
- DiMaggio, P.J., Powell, W.W., 1983. The iron cage revisited: Institutional isomorphism and collective rationality in organisational fields. *American Sociological Review* 48, 147–160.
- Dodgson, M., Rothwell, R., 1991. Technology strategies in small firms. *Journal of General Management* 17/1, 45–55.
- Drazin, R., Schoonhoven, C.B., 1996. Community population, and organization effects on innovation: a multilevel perspective. *Academy of Management Journal* 39/5, 1065–1083.
- Edwards, T.J., 2000. Innovation and organizational change: developments towards an interactive process perspective. *Technology Analysis and Strategic Management*, 12/4.
- Finegold, D., 1999. Creating self-sustaining high-skill ecosystems. *Oxford Review of Economic Policy* 15/1, 60–81.
- Finegold, D., Soskice, D., 1988. The failure of training in Britain: analysis and prescription. *Oxford Review of Economic Policy* 4/3, 21–53.
- Frybourg, M., 1997. Conflict and co-operation between a global market and local innovations. *Innovation: the European Journal of Social Sciences* 10/3, 217–230.
- Giddens, A., (1995) *The Constitution of Society*, Cambridge, Polity Press.
- Granovetter, M., 1973. The strength of weak ties. *American Journal of Sociology* 78, 1360–1380.
- Grint, K., Woolgar, S., 1997. *The Machine at Work: Technology, Work and Organisation*, Polity Press, Cambridge.
- Hagedoorn, J., Schakenraad, J., 1992. Leading companies and networks of strategic alliances in information technologies. *Research Policy* 21/2, 163–190.
- Hakansson, H., (1989) *Corporate Technological Behaviour: Co-operation and Networks*. London: Routledge.
- Hoffman, K., Parejo, M., Bessant, J., Perren, L., 1998. Small firms R & D, technology and innovation in the UK: a literature review. *Technovation* 18/1, 39–55.
- Hutton, W., 1995. *The State Were In*, Jonathan Cape, London.
- Johannisson, B., Monsted, M., 1997. Contextualising entrepreneurial networking. *International Studies of Management and Organisation* 27/3, 109–137.
- Jones, O., Stevens, G., 1999. Evaluating failure in the innovation process: the micro-politics of new product development. *R & D Management* 29, 2.

- Jones, O., Tilley, F. (Eds.), 2003. *Competitive Advantage in SMEs: organizing for innovation and change*, Wiley, Chichester.
- Jones, O., Edwards, T.J., Beckinsale, M., 2000. Technology management in a mature firm: structuration theory and the innovation process. *Technology Analysis and Strategic Management* 12/2, 161–177.
- Karpik, L., 1978. In: Karpik, L., (Ed.), *Organisation and Environment: Theory Issues and Reality*, Sage, Beverley Hills.
- Keep, E., Mayhew, K., 1999. The assessment: knowledge skills, and competitiveness. *Oxford review of Economic Policy* 15/1, 1–15.
- Kostova, T., Roth, K., 2002. Adoption of an organizational practice by subsidiaries of multinational corporations: institutional and relational effects. *Academy of Management Journal* 45/1, 215–233.
- Leonard-Barton, D., 1984. Interpersonal communication patterns among Swedish and Boston-area entrepreneurs. *Research Policy* 13/2, 101–114.
- Macpherson, A., Wilson, A., 2003. Supply chain management: improving competitive advantage in SMEs. In: Jones, O., Tilley, F. (Eds.), *Competitive Advantage in SMEs: Organizing for Innovation and Change*, Wiley, Chichester.
- Monkhouse, E., 1995. The role of competitive benchmarking in small to medium-sized enterprises. *Benchmarking for Quality Management Technology* 2, 41–50.
- Motwani, J., Dandridge, T., Jiang, J., Soderquist, K., 1999. Managing innovation in French small and medium-sized enterprises. *Journal of Small Business Management* 37/2, 106–114.
- Newell, S., Robertson, M., Scarbrough, H., Swan, J., 2002. *Managing Knowledge Work*, Palgrave, Hampshire.
- Nohria, N., Eccles, R.G. (Eds.), 1992. *Networks and Organisations, Structure, Form, and Action*, Harvard Business School Press, Boston.
- Nonaka, I., 1991. The knowledge-creating company. *Harvard Business Review*, November–December, 96–104.
- Nooteboom, B., 1994. Innovation and diffusion in small firms: theory and evidence. *Small Business Economics* 6, 327–347.
- Nooteboom, B., 2000. *Learning and Innovation in Organisations and Economies*, Oxford University Press, Oxford.
- Oakey, R., 1993. Predatory networking: the role of small firms in the development of the British biotechnology industry. *International Small Business Journal* 11/4, 9–22.
- Oakey, R., Cooper, S., 1991. The relationship between product technology and innovation performance in high technology small firms. *Technovation* 11/2, 79–91.
- Paniccia, I., 1998. One, a hundred, thousands of industrial districts. Organizational variety in local networks of small and medium-sized enterprises. *Organization Studies* 19/4, 667–699.
- Pittaway, L., Robertson, M., Munir, K., Denyer, D., Neely, A.D., 2003. *Networking and Innovation in the UK: A Systematic Review of the Evidence*, A Report for the DII.
- Powell, W., Koput, K., Smith-Doerr, L., 1996. Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology. *Administrative Science Quarterly* 41/1, 116–145.
- Preti, P., 1991. *L'organizzazione della piccola impresa [The Organisation of SMEs]*, Milan, Egea.
- Raco, M., 1999. Competition, collaboration and the new industrial districts: examining the institutional turn in local economic development, *Urban Studies* 36(5–6), 951–968.
- Radosevic, S., 1990. The role of small firms in technological development: an interpretative survey. *International Journal of Technology Management* 5/1, 89–99.
- Riedle, K., 1989. Demand for R & D activities and trade-off between in-house and external research: a viewpoint from industry with reference to large companies and small and medium-sized enterprises. *Technovation* 9, 213–225.
- Rinholm, B., Boag, D., 1987. Controlling new product development in the small technology-based firm. *American Journal of Small Business* 12/1, 12–19.
- Robertson M, Scarborough H, Swan J., (1997), *Knowledge, Networking and Innovation: A comparative study of the role of inter- and intra-organisational networks in innovation processes*. A paper submitted to the 13th EGOS Colloquium, Organisational Responses to Radical Environmental Changes, Budapest, July 3–5.
- Rogers, E.M., 1962. *Diffusion of Innovations*, Free Press, New York.
- Rogers, E.M., 1983. *Diffusion of Innovations*, Free Press, New York.
- Rogers, E.M., 1995. *Diffusion of Innovations*, Free Press, New York.
- Rothwell, R., 1985. *Innovation and the Smaller Firm*, First International Technical Innovation and Entrepreneurship Symposium, Utah Innovation Foundation, Salt Lake City.
- Rothwell, R., 1989. Small firms, innovation and industrial change. *Small Business Economics* 1/1, 51–64.
- Rothwell, R., 1991. External networking and innovation in small and medium-sized manufacturing firms in Europe. *Technovation* 11/2, 93–112.
- Rothwell, R., Dodgson, M., 1991. External linkages and innovation in small and medium-sized enterprises. *R & D Management* 21/2, 125–137.
- SBS, 2001. *Small and medium-sized enterprise (SME) statistics for the UK*, Small Business Service, press release, 21 June.
- Scarbrough, H., 1995. Blackboxes. Hostages and Prisoners, *Organization Studies* 16(6), 991–1019.
- Schmookler, J., 1966. *Invention and Economic Growth*, Harvard University, Boston.
- Schumpeter, J.A., 1934. *The Theory of Economic Development*, Harvard.
- Shaw, E., 1998. Social networks: their impact on the innovative behaviour of small service firms. *International Journal of Innovation Management* 2/2, 201–222.
- Slappendel, C., 1996. Perspectives on innovation in organizations. *Organization Studies* 17/1, 107–129.
- Smith, C., Meiksins, P., 1995. System, society and dominance effects in cross-national organizational analysis. *Work, Employment and Society* 9/2, 241–267.
- Soeters, J., 1993. Managing Euro-regional networks. *Organization Studies* 14, 639–656.
- Tsoukas, H., 1996. The firm as a distributed knowledge system: a constructionist approach. *Strategic Management Journal* 17, 11–25.
- Uzzi, B., 1997. Social structure and competition in inter-firm networks: the paradox of embeddedness. *Administrative Science Quarterly* 42, 35–67.
- Vossen, R.W., 1998. Research note—relative strengths and weaknesses of small firms in innovation. *International Small Business Journal* 16/3, 88–94.
- Whitley, R., 2000. The institutional structuring of innovation strategies: business systems, firm types and patterns of technical change in different market economies. *Organization Studies* 21/5, 855–886.
- Whitley, R., 2003. The institutional structuring of organizational capabilities: the role of authority sharing and organizational careers. *Organization Studies* 24/5, 667–696.
- Whittington, R., 1988. Environmental structure and theories of strategic choice. *Journal of Management Studies* 25, 521–536.
- Whittington, R., 1992. Putting Giddens into action: social systems and managerial agency. *Journal of Management Studies* 29, 693–712.
- Williamson, O.E., 1975. *Markets and Hierarchies: Analysis and Antitrust Implications*, Free Press, New York.
- Williamson, O.E., 1985. *The Economic Institutions of Capitalism*, Free Press, New York.
- Williamson, O.E., 1986. *Economic Organization: Firms, Markets and Policy Control*, Wheatsheaf, Brighton.
- Wolfe, R.A., 1994. Organizational innovation: review, critique and suggested research directions. *Journal of Management Studies* 31, 405–431.

Tim Edwards lectures in Organization Behaviour and Human Resource Management at Cardiff Business School. His research interests include strategic choice, the management of innovation and institutional change. Tim has published in these areas and has undertaken research for a number of bodies including the European Regional Development Fund (ERDF) and the UK Advanced Institute of Management where he has been a lead scholar. He is currently acquired research funding from the British Academy to continue his work on innovation and strategic choice in the super yacht industry.

Max Munday is Reader in Economics at Cardiff Business School and Director of the Welsh Economy Research Unit. He has research interests in regional policy, the economics of the multinational, and regional economic modelling. Recent publications in these areas have appeared in *Journal of International Business Studies*, *Fiscal Studies*, *Regional Studies* and *Policy Studies*. Max has also undertaken research for a number of national institutions and the EU. Very recently he was part of a team, which completed an evaluation of the EU structural funds programmes in Wales. He also undertook (with the co-authors on this paper) an examination of the innovative potential of SMEs in Wales which was supported by the European Union.

Rick Delbridge is Professor of Organizational Analysis at Cardiff Business School and a Fellow of the UK Advanced Institute of Management Research. He is the author of 'Life on the Line in Contemporary Manufacturing' and co-editor of 'Manufacturing in Transition'. He has published in the *Academy of Management Review*, *Human Relations*, *Industrial Relations*, *Journal of Management Studies*, *Organization Studies* and *Sociology* amongst others. He is an Associate Editor of *Organization* and co-editor of the *Routledge Studies in Employment Relations* series. His research interests include the management of innovation and the implications for organizational and institutional change.