# Assessing the Innovative Potential of Small and Medium Sized Enterprises: A Working Model of Innovation in Manufacturing

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## Introduction

This paper reports on a programme of research considering the *innovative potential* of small and medium sized manufacturing enterprises (SMEs) in Industrial South Wales (UK)[1]. We consider and assess innovative potential as the configuration of management practices, capabilities, internal and external links facilitating the generation and appropriation of ideas. In the project we are interested in whether current trends in large firm manufacturing - including an emphasis on innovations in product and process technologies and the role of employees and external institutions in problem solving and knowledge creation (Cooke and Morgan, 1998) - is consistent with the experiences of managers in manufacturing SMEs. To date, studies considering the notion of 'learning factories' (Leonard-Barton, 1992; Fruin, 1992; Womack *et al* 1990; Kenney and Florida, 1993; Delbridge *et al*, 1998) and Japanese manufacturing principles (Oliver and Wilkinson, 1992; Elger and Smith, 1994) have primarily focused on multinational enterprises in the automotive and consumer electronics sectors. Some have advocated 'lean' in all circumstances (for example, Womack *et al*, 1990) while others offer a more reflective perspective arguing that adoption is mediated by factors such as local institutional context and strategic choice (Abo, 1994).

In contrast to the growing literature on 'innovation-mediated production' (Kenney and Florida, 1993) in MNEs, the current literature on innovation in SMEs is limited and characterised by a number of core gaps and

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weaknesses. Perhaps the most striking characteristic of the current literature is the number of studies that fail "to measure comprehensively, and then to link, innovative inputs to innovative outputs…[or] explore whether innovative effort has had a measurable impact on firm performance" (Hoffman *et al*, 1998:42). Our research explores the degree to which manufacturing SMEs have adopted those attributes closely associated with the 'learning factory' and the extent to which 'adoption' has led to enhanced performance.

The intentions in this paper are threefold: first, to briefly consider innovation as a research subject; second, to outline the learning factory concept and some previous research on SMEs and innovation; and thirdly to propose a working model of an innovative SME. This model has been developed from existing sources and is currently being tested in a programme of research in Industrial South Wales.

**Innovation: a brief overview**

There have been a number of important developments over the past ten years or so in the study of innovation which have undermined orthodox perspectives. Opinions have gradually coalesced around common themes where previously there were significant contradictions. Innovation, for example, has meant different things to different scholars. In its most inclusive form it was thought to include "the new markets, the new forms of industrial organisation that capitalist enterprise creates" (Schumpeter, 1943:83). At its least inclusive it referred to a new object such as a computer (Swan, 1996). At present, innovation is seen to represent "the development and implementation of new ideas by people whom over time engage in transactions with others within an institutional order" (Van de Ven *et al*, 1989:590). This interpretation reflects a growing interest in the process through which "new ideas, objects, and practices are created and developed or reinvented" (Slappendel, 1996: 108). Of particular interest are the socio-economic activities that encompass the various phases or episodic activities, recursively rather than sequentially related, through which different bodies of knowledge are constructed, communicated and exchanged (Robertson *et al*, 1997:1-2). Innovations are

seen as socially made (not objective entities), the product of the knowledge creation process (Nonaka and Takeuchi, 1995).

Perhaps the most significant development in the innovation studies literature has been the rejection of a number of assumptions that have underpinned (arguably) much of the existing research:

- Pro-innovation bias
- Innovation as a linear process
- Innovation involving the simple imitation of ideas, products or processes
- Innovation is easily managed
- Objectification of innovation

It is now generally accepted that innovative activities are as much politically and socially motivated as a rational response to economic and business trends. In other words, without considering the origins of technology strategy it is not possible to fully understand the social processes mediating such activities (see DiMaggio and Powell, 1983). Similarly, it is recognised that the innovation process is inherently complex and dynamic, rarely involving the simple imitation of ideas or following a simple linear path. Instead innovation involves "unpacking" bundles of knowledge that have to be re-assembled within the confines of existing competencies.

It is broadly accepted that innovation is complex, involving as it does social processes to communicate knowledge (Scarbrough, 1996). Consequently, of the attempts to predict innovative behaviour in the firm, the configuration of factors affecting success and failure have been so numerous across studies that prediction has proven impossible. For those that have tried to link antecedent factors and innovation the following are the most common (Wolfe, 1994):

1. Technology strategy (e.g., follower or leader)
2. Economic factors (e.g., scale)
3. Social and behavioural factors (e.g., values, education and attitudes)
4. Information and communication factors (e.g., contacts with scientists)
5. Organisational and managerial factors (e.g., delegation of responsibility)

The reason why consideration of these factors has done little to aid attempts to develop theories of innovation is because of the problem of complexity and how it is explored. Explanations based on firm size, for example, generally give a partial view and tend to anthropomorphise the firm, obscuring the underlying processes precipitating such trends. It is now recognised that "innovatory advantage is unequivocally associated with neither large or small firms" (Rothwell, 1989:62). However, there is evidence to suggest (see below) that certain organisational arrangements within SMEs enable rather than hinder change. This may support findings that bureaucratic structures in large enterprises are antagonistic to innovation (Pugh *et al*, 1969; Blau *et al*, 1976).

Where improvements in our understanding are most likely is in the study of those practices that constitute the innovation process. This process involves a number of overlapping, recursive episodes:

- Invention,
- Diffusion and
- Implementation (Robertson *et al*, 1997).

The *invention* episode is usually thought of as a personalised process through which social interaction is focused on the construction of knowledge (Bijker *et al*, 1987). The aim is to identify potential network participants who possess the appropriate skills, information and expertise necessary to ensure organisational learning (Hube, 1991). Thus, having tapped the tacit and contextual knowledge of different individuals and groups formal and informal teams are assembled (on the basis of uncertain reciprocity and trust) to test and validate the knowledge.

Parallel to the invention episode is the *diffusion* episode. This involves formal and informal exchanges of information among members of the network (Rogers, 1962, 1983). Boundary spanning actors play a significant role in translating these ideas into locally relevant solutions (Tushman and Scanlan, 1981). Similarly, the *implementation* episode is characterised by the appropriation of knowledge by social groups (Clark, 1987). The appropriation of knowledge involves individuals and social groups engaged in activities to 'fit' the knowledge with the organisation (also see Nonaka and Takeuchi, 1995).

The invention phase is when knowledge is *constructed* and *communicated*; the diffusion phase is when knowledge is *exchanged*; and the implementation phase is when knowledge is again subject to *construction* and *communication*. The coupling of innovation and knowledge is central to an understanding of innovation. Thus, to analyse innovation is to understand the 'dynamic unfolding of the relationship between disembodied and embodied knowledge' (Clark and Staunton, 1989:59). Nonaka and Takeuchi (1995) provide a similar viewpoint in their evaluation of innovation in organisations: they state that the knowledge creation process involves the mobilisation and conversion of tacit knowledge into explicit knowledge and then back into tacit knowledge.

The significance of *tacit* and *explicit* knowledge in the analysis of innovation (Clark and Staunton, 1989; Nonaka and Takeuchi, 1995) reflects the view that economic growth and economic prosperity relies as much on tacit (disembodied, intangible assets and working practices) as explicit knowledge (embodied technologies) (David, 1992; Howells, 1995). Bessant and Buckingham (1993), in a study of the implementation of advanced manufacturing technology, see tacit knowledge as key in organisational learning. Acquisition of tacit knowledge is generally acknowledged to be difficult, requiring as it does changes in the behaviour of the acquirer. This is reflected in the many of the studies in this field: 'learning by doing' (Arrow, 1962), 'learning by using' (Rosenberg, 1982) and 'learning to learn' (Stiglitz, 1987). Tacit knowledge is acquired through the membership of multidisciplinary teams and collaborative networks usually forming part of a general process of organisational learning routines (Nelson

and Winter, 1982) that help create and diffuse firm-specific competencies and knowledge (Howells, 1995).

Given our conceptualisation of innovation as a *process* it is appropriate to consider the organisational practices, procedures and routines that are currently being adopted in manufacturing MNEs and which are intended to improve flexibility, quality and operational performance. Our aim is to consider the relationship between the abstract conceptualisations around innovation and the practices being adopted in MNE and SME manufacturers.

**Current trends in MNE manufacturing**

Leonard-Barton (1992) argues that the 'next production frontier' is the factory as a 'learning laboratory'. These 'labs' are viewed as 'complex organisational ecosystems that integrate problem-solving, internal knowledge, innovation and experimentation, and external information' (Leonard-Barton, 1992:23). Such notions coincide with what has become conventional wisdom, namely, that a firm's competitive edge no longer rests solely with static price competition rather it increasingly relies on a firm's ability 'to create knowledge a little faster than their competitors' (Maskell and Malmberg, 1995: 3). In turn, with 'change' being recognised as the one constant faced by firms of any size in the contemporary business environment, innovation is now considered essential to firm survival, economic growth and job creation (DoE, 1987; 1991; DTI, 1994, 1995; 1998; CIHE, 1987; 1988; 1992). Innovation rather than efficiency has now come to represent the prime principle for assessing the most pertinent form of organisation:

> "…the fulcrum of theory building and policy analysis [has] shifted from an implicit focus upon efficiency, with innovation as the deviant case, to innovation as the crucial focus, with efficiency as the necessary adjunct…This revision in the orthodox mainstream is necessary in order to provide the kinds of analysis which are relevant to the pressing problems of adaptation in contemporary enterprises" (Clark and Staunton, 1989:4).

Although innovation is a central concern for those researching SMEs (Cooke, 1996) it is in the MNE manufacturing sector that evidence of 'emergent tendencies' is most apparent (Cooke and Morgan, 1998). Cooke and Morgan suggest leading firms have embarked upon a process of 'experimentation' that involves a 'semi-permanent process of organisational innovation' whose common thread is 'the attempt to create a more collaborative corporate culture, both within the firm and between the firm and its principle suppliers'. These tendencies reflect the gradual but significant transformation of the operations of large manufacturers from those broadly based on the principles of 'scientific management' toward new principles that are seemingly set to represent a new 'system-in-dominance' for the Twenty-First Century (Smith and Meiksins, 1995). Not only are firms increasingly operating with low levels of inventory 'dedicated to total quality and to active participation in new product development' (Leonard-Barton, 1992), they are now changing the traditional division of labour and integrating shop floor workers more fully in the renewal and support of existing competencies.

The *innovative potential* of enterprises is increasingly believed to rely on the close integration of internal and external relations and processes (Languish *et al*, 1972; Johanson and Mattson, 1987; Clarke *et al*, 1988; Malsot, 1980; Tonnies, 1957; Contractor and Lorange, 1988; CEST, 1990; Dodgson, 1989; Freeman, 1994; Freeman and Soete 1997; Robertson *et al*, 1996; Rothwell and Dodgson, 1991; Forest and Martin, 1992). The findings of a study of UK manufacturing SMEs illustrate the apparent significance of such network ties:

> "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).

Such observations coincide with the development of an interactive model of innovation (Rothwell and Zegweld, 1985). This model has supplanted traditional perspectives emphasising "science-push" (Schumpeter, 1934, 1943) or "market-pull" (Schmookler, 1966) instead focusing on the way in which social interaction shapes innovation (Jones *et al,* 1998). Here again, interest in collaborative links

has until recently focused on collaborations with large firms. This is changing as it is recognised that SMEs can benefit from such alliances (Jones, 1997). Perhaps the best known are the research driven biotechnology and new technology-based firms on university Science Parks (Oakey, 1994). Despite inconclusive evidence about the contribution of Science Parks to local and regional growth (Massey *et al*, 1992), it is generally acknowledged that inter organisational (and intra-organisational) linkages are crucial to sustaining competitiveness. In turn, as state sponsored links between academic and commercial groups result in pre-competitive co-operative R&D, organisational arrangements are no longer limited to inter-firm networks but increasingly include activities among 'institutionally heterogeneous actors' (Laredo and Mustar, 1996).

Of the commentaries on developments in organisational design in large firm manufacturing perhaps the most influential have been those writing about the benefits of adopting lean manufacturing practices (Womack, *et al,* 1990). This Japanese-inspired model of manufacturing views the factory floor as a place where knowledge can be created as well as applied, where production workers think as well as do. As with the interactive model the Japanese model indicates that innovative organisations are distinguished by their capability to manage internal and external relations. In the latter case such capabilities are thought to reflect five key dimensions (Kenney and Florida, 1993):

(i) Transition from physical skill and manual labour to intellectual capabilities or 'mental labour'
(ii) Increasing importance of social or collective intelligence as opposed to individual knowledge or skill
(iii) Acceleration of the pace of technological innovation
(iv) Increasing importance of continuous process improvement on the factory floor
(v) Blurring the lines between the R&D laboratory and the plant

These dimensions have been adapted to provide a learning factory framework constituting the following attributes (Delbridge *et al*, 1998:227):

(i) Innovation is the central motif of the learning factory. The learning factory generates, codifies and applies knowledge to improve its various products, structures and processes

(ii) Learning factories are host to continuous improvement activities that are driven by internal sources of information such as tacit knowledge of shop-floor workers, the contextual knowledge of technicians, and the formal knowledge of professionals and craft workers

(iii) The learning factory also benefits from improvement derived from external sources of information, such as problem-solving suppliers and the supplier development programmes of customers

(iv) The learning factory is embedded in an innovation network of collaborators with whom there is information exchange and shared learning.

According to recent research there is evidence to suggest that steps have been made toward the learning factory model in MNEs (in this case, automotive components manufacturers):

> "It is clear that managers are seeking to involve shopfloor operators in both problem solving and continuous improvement activities and that in part they are also incorporating the skills and expertise of technical specialists in some form of cross functional grouping. In addition, there is ample evidence of inter-organisational interaction, particularly in the areas of product development, quality management and cost reduction" (Delbridge and Barton, 2000).

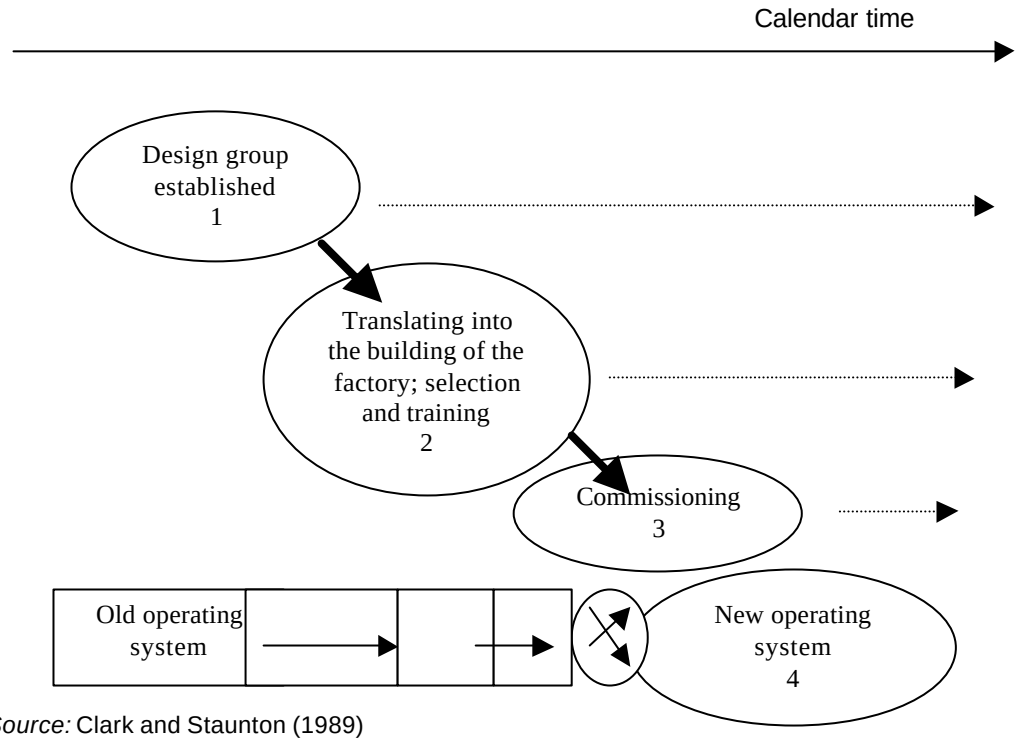
This research has indicated that there are a variety of ways a "learning factory" can be established. In particular, the organisational design of companies will vary according to the *degree of specialisation* (relating to the use of specialists or specialist groups in the organisation of problem-solving and continuous improvement activities), the *breadth of participation* (relating to the level of shopfloor inclusion in such activities), *degree of centralisation* (relating to the role of management in such activities), and finally, the *level of standardisation* or the routines and procedures governing group problem solving. Hence, this

model of operations is likely to have varied practical manifestations (Delbridge and Barton, 2000).

Such varieties in organisational design will be reflected in the company's innovation-design processes. This is because problem solving and continuous improvement activities are increasingly becoming key components of an organisation's *structural capability,* the puzzle-shaping and puzzle-solving abilities of the techno-structure (Nelson and Winter, 1982). For illustration, the design process of strategic innovation involves four states[2] (concept, translation, commissioning and operation) in three areas (design of a product or process, production process and organisation – figure 1) (Clark and Staunton, 1989).

What is significant about the learning factory model is the formalisation (in whatever guise) or gradual institutionalisation of the change activities. Such processes are effectively blurring the distinction between everyday activities and innovation.

**Figure 1 – Designing Processes**




*Source:* Clark and Staunton (1989)

[2] We refrain from using the notion of "steps" as such activities are usually iterative and are often aborted (Clark and Staunton, 1989).

A number of studies of MNEs and their approaches to manufacturing have emphasised improved performance. However, this is difficult to demonstrate empirically. The most influential of the studies by Womack et al (1990) has itself been severely criticised and had its findings regarding performance called into question (Williams et al, 1994). The lack of evidence in this regard is especially acute in studies of innovation in SMEs (Cagliano and Spina, 2000). In particular, despite the policy statements affirming the role of SMEs in contributing to economic growth and job creation little is known about these activities and their effect on performance (Hoffman *et al*, 1998).

**Researching innovation in SMEs**

Hoffman *et al* (1998) provide the most recent and comprehensive survey of the SME-R&D-innovation literature suggesting the current literature has a number of conceptual and methodological shortcomings. In particular, there has not been a comprehensive survey that adequately deals with the notion of innovation or investigates the link (if any) between innovative activity and firm performance.

> "The mixture of available research results [for SMEs] suggests that though innovative effort appears to be widespread, this does not translate directly into improved firm performance and, ultimately, greater profitability. There is plenty of evidence to show that innovative activity does not directly relate to firm growth or improved performance" (Hoffman *et al,* 1998:44).

Of recent research there are a number of articles that comment on the links between innovation and firm performance (Chaston and Mangles, 1997; Hill and Neely, 2000; Cagliano and Spina, 2000). For instance, Chaston and Mangles (1997) have sought to test core capabilities as predictors of growth potential in small manufacturing firms. This work offers a model of growth SMEs based on the linkages between organisational capability and sales revenue. Likewise, Cagliano and Spina (2000) have demonstrated, using a practice-performance link model, how the competitive success of SMEs in the Emilia Romagna Region of Italy is reliant on a certain level of formalisation of

manufacturing practices. In other words, the adoption of formal operations practices (innovation) is likely to be consequential for performance. On those occasions where performance has not been considered (output, employment, exports, market share etc) insight can still be gained about the behavioural characteristics of innovative SMEs. For instance, Hill and Neely (2000) offer some clues as to the nature of “innovative capacity”. Drawing on a range of literatures – theories of firm, organisation studies and economic geography - they propose that a firm’s “innovative capacity” depends on the firm’s *culture* (the extent to which it supports innovation), the allocation of *resources* (its financial, intellectual, human and physical capital), *competence* (the range of capabilities within a firm that support innovation), and finally *networking* (the extent to which a firm makes use of network ties for innovation).

Similar characteristics have been identified in earlier studies (e.g., Rothwell, 1989, 1991, Rothwell and Dodgson, 1991). These findings suggest that SMEs have certain ‘behavioural’ features that give them innovative advantage over larger firms. In particular, SMEs are more able to respond rapidly to external threats or opportunities, they have more efficient internal communications and they can exhibit interactive management styles. However, this same body of work also identifies a number of features hindering SMEs attempts to be innovative. Included are issues of assigning the material and technological resources necessary to enable managers to spread risk over a portfolio of new products and fund longer-term research and development. Barriers to innovation have also been linked to a lack of in-house expertise, which can be a major obstacle for SMEs that embark on collaborative arrangements (Senker and Senker, 1994). On those occasions when in-house engineers and scientists are available, Rothwell (1992; 1994) and Rothwell and Dodgson (1991) argue success depends on the managerial competence and planning and control procedures used to organise innovation. In contrast, Freeman and Soete (1997:222) argue that such recommendations have been given in the absence of any 'strong evidence of the effectiveness of such procedures'. Instead, they suggest that firms of any size have been unable to make accurate estimations of the costs and time taken, especially for development of radical

innovations. Nonetheless, in respect of the enablers to innovation, Rothwell (1989, 1991) has identified some key characteristics:

- Suitably qualified in-house engineers and scientists (especially if the type of innovative activity is technically orientated),
- Complementarity between in-house and outside knowledge gathering,
- An established technology strategy that organises the accumulation process.

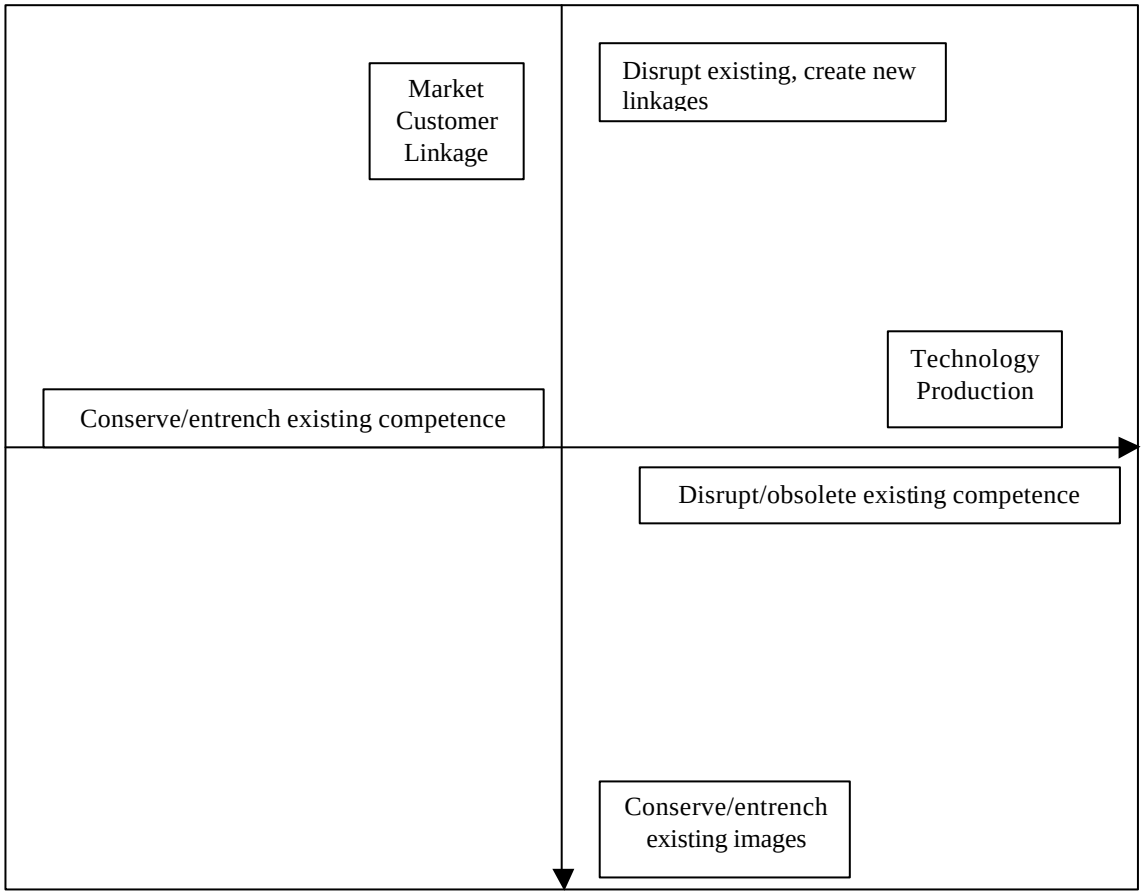
Interconnected with these capacities and the successful appropriation of new products, processes and work organisation are issues associated with the *type* of innovative activity. If thought of in terms of a continuum, radical-altering innovations would be at one end while incremental-entrenching innovations would be at the other (Clark and Staunton, 1989).

- *Radical-altering* innovations reshape the organisational configuration through the introduction of markedly different equipment, raw materials, forms of knowledge and physical contexts. The consequence of such innovations is that existing competencies become redundant and require exnovation, so established directions are reversed.
- *Incremental-entrenching* innovations build on existing directions so that equipment is modified not replaced, knowledge is extended/reinforced.

Given the dynamic nature of innovation (along this continuum) it is best perhaps to treat innovations as configurations or as ‘bundles of elements’. According to Clark and Staunton (1989) the innovation configuration consists of four features: i) its plurality and diversity, ii) its enormous growth, iii) its codification and iv) its embodiment. The *plurality* and *diversity* of knowledge is associated with the notion of 'logics of action' (Karpik, 1978). Karpik illustrates the way enterprises consist of 'firm specific knowledge' or a 'cognitive dimension' (e.g., tacit knowledge) that provides them with a competitive edge. However, an organisation may have difficulty in revising and updating this knowledge. The *growth* of knowledge in the twentieth century is reflected in the coming together

of science and technology through R&D (Freeman and Soete, 1997) while it is also apparent in the appropriation of practices such as those associated with the learning company. The *codification* of knowledge or its conversion from tacit to explicit (Nonaka and Takeuchi, 1995) is a continual process of accomplishment. Finally, the *embodiment* of knowledge represents its incorporation in equipment, raw materials, the built environment and standardised operating procedures.

**Figure 2: The Innovation Matrix**




The innovation configuration is a 'significant investment in *systems of classification* which is the precise equivalent of the investment in equipment' [italics in original] (Clark, 1995:12-13) and as indicated above the nature and outcome of such investments can be remarkably varied not just radical as is sometimes assumed (Rogers, 1986). It is likely to depend on the purpose for which the innovation is intended and the context into which it is applied

(Abernathy and Clark, 1985). As a result innovations are not only important in terms of radical-altering and incremental-entrenching they will also have an affect on two other dimensions: i) production systems and their operation and (ii) linkages between the firm and its consumers and markets. There maybe instances when innovations entrench market linkages while altering the production linkages. The main difference between entrenching and altering innovations is in the way they transform the organisation design; i.e. the extent to which configurations are reconfigured (see figure 2).

Given the nature and inherent complexity of innovations it seems all the more important to assess the economic and social "value" of innovative activities at the level of the firm. This should give us some measure of the complexity discussed above.

**The Innovative SME: A discussion**

In the final section of this paper we develop a working model of an innovative SME. As a heuristic we consider innovation not only as the introduction of new products or manufacturing processes but more generally as *practice*. We base this model on our definition that an innovative firm is one that:

> *"identifies, interprets and applies knowledge (embodied and disembodied) effectively and as appropriate throughout the organisation"*.

As already mentioned, there has been little attempt at linking innovation in SMEs and performance. Hoffman *et al's* (1998) findings suggest that there are more gaps, contradictions and shortcomings than consistencies in the literature. To summarise, they suggest that there is a tendency to 'mix service sector and industrial SMEs together in the same sample population'. A large share (70 per cent) of empirical surveys has tended to include SMEs from both the service and industrial sectors – whose fundamentals are very different. In addition, the samples frequently exhibit a bias toward micro firms usually surveyed in narrowly defined geographically areas. Second, there has

been a bias towards high-technology sectors most notably biotechnology and to a lesser extent, IT. Third, the authors suggest that studies have treated innovation inadequately (Hoffman *et al*, 1998:42).

In our current study we attempt to address some of these problems. The project will include a balanced cross-section of firms with between 10-250 employees. Although some of the sample includes electronics manufacturers and other high-technology operations, this remains a small proportion of the total sample; there are also a small number of pharmaceuticals manufacturers. While a regional focus is highlighted by Hoffman et al (1998) as a shortcoming, we feel that this gives the opportunity to hold certain exogenous factors constant across the sample. The Industrial South Wales region hosts a broad variety of operations and therefore this should not be seen as a weakness. In terms of our treatment of innovation we have endeavoured to remain faithful to the broad interpretation provided above. An interest in operational practices, not just the introduction of "new widgets", is an illustration of our commitment not to "objectify" innovation.

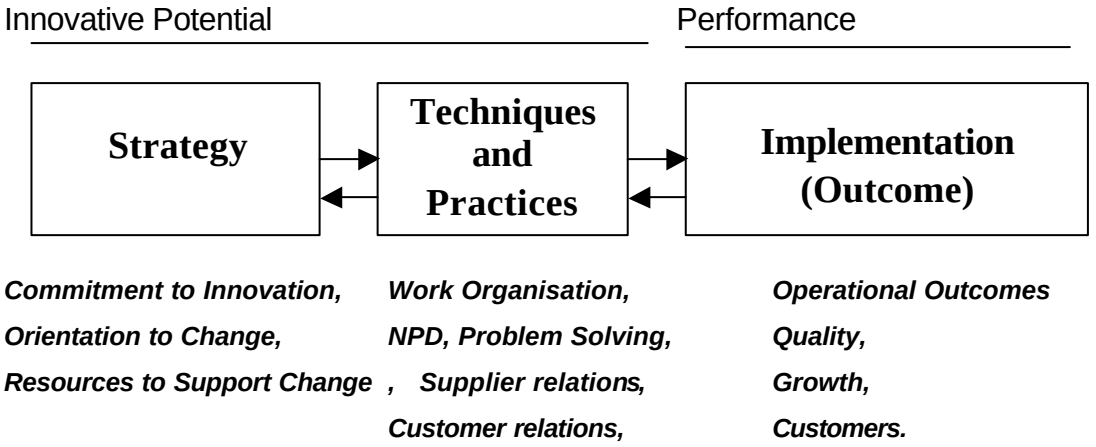
The key conclusion of Hoffman *et al* is the call for a survey that looks at the impact of innovative activity on firm performance. However, in calling for such a survey the authors fail to suggest which input/output indicators would be most suitable. Other sources, like the Science Policy Research Unit innovation database, offer suggestions for measuring innovation in SMEs. In this case, innovation is defined as any new product or process (see Pavitt *et al*, 1987; Smith *et al*, 1993; Tether *et al*, 1997). In terms of outputs, Smith *et al* (1993) define the performance of innovative small firms according to 'closure after innovation' (long-term survival), 'employment change' (increase) over time, 'total asset growth' where assets are taken to reflect not only investment but also the *wealth of the firm*, and finally 'return on total assets', calculated as the percentage of operating profit to total assets.

This approach is similar to the work done by the OECD although the OECD studies have not focused specifically on SMEs. For example, the Oslo manual (OECD, 1997) is used for surveying innovative activity in the manufacturing

sector. Innovation in this case is also defined as a new product or process with performance measured against increases in turnover. The Oslo manual concentrates on technological aspects (as do the SPRU studies) of firms' strategies while leaving aside, or covering poorly, other elements of innovative behaviour related to organisation and human resource management. To be able to consider the mechanisms and outputs of innovation it is necessary to consider these softer examples. What is of particular interest is how employee participation might have shifted with the advent of the 'responsive organisation' (Rich 1999) or 'learning factory' (Delbridge et al 1998).

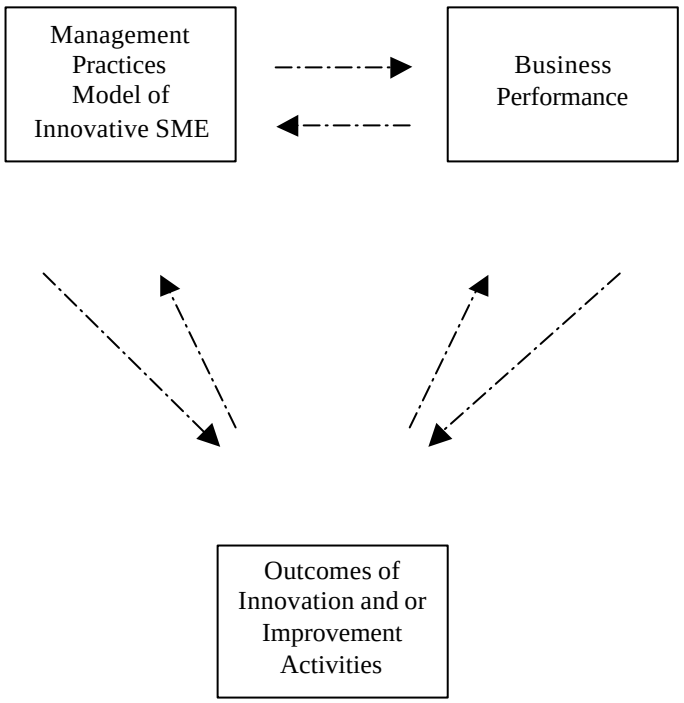
The working model (Figure 3) represents a convergence of ideas from various sources but in particular the learning factory model. The working model is a synthesis of previous research and is being used in this project to evaluate the *innovative potential* of SMEs. The key areas of interest include strategy and the techniques and practices deployed to facilitate the development and appropriation of ideas for innovation. Broadly, speaking we are interested in the commitment to innovation (strategy and allocation of resources) and management practices (the management of innovation, worker responsibility and organisation, networking, marketing and accounts, HRM, supplier and customer relations) supporting this commitment. In particular, we set out to consider the appropriateness of the learning factory model in SMEs and the claim that the unique operating features associated with small firms will ultimately hinder the adoption of structures for organisational learning (Wyer, et al, 1999). At the same time the study will assess whether the existence of certain practices is linked to improved business performance and operational efficiencies.

**Figure 3 – The Innovative SME: A Working Model**




The research involves profiling each company's practices and establishing performance levels over a three-year period. As in the work of Cagliano and Spina (2000) the profiling exercise explores the relationship (direct and indirect) between the strategies, techniques and practices adopted and actual performance over this period of time (figure 4).

**Figure 4: Analytical Matrix**



Although the profile is based around the findings of previous researchers our aim is not to prescribe or assume that one “best-model” exists. There is ample flexibility in our profile to allow us to consider a variety of configurations. For example, the profile is completed during face-to-face interviews which allows us to consider in more detail why certain performance measures are used in preference to others. This may simply be a reflection of a lack of management procedures or it may demonstrate fundamental differences between volume and jobbing operations.

Unfortunately, it has not been possible to report on the findings of the research, as this is currently ongoing. In this respect, 31 companies have agreed to participate with an anticipated 20-30 to be added in the next three months or so. The only thing that can be said is the variety of methods adopted to run manufacturing operations from lean and “management-by-eye” through to ad hoc arrangements that lack coherence or co-ordination. It will be interesting to see how the various companies compare.

**Concluding Remarks**

In this paper we have reviewed the literature with regard to innovation and in particular the nature of innovation in manufacturing organisations. From this review it is clear that there are issues that have not been adequately and fully addressed. Specifically our concerns are with the nature of innovation in SME manufacturers and the extent to which management and organisational models derived from research in MNEs are valid in smaller firms. With this in mind we have derived an working model of an innovative SME which we are currently testing empirically.

The objectives of the research project are twofold; first, to assess the presence or absence of the practices and structures detailed in our working model and, second, to seek to detect the performance implications of the relative use of the model. The data gathering stage is now well underway. We

are optimistic that this research will begin to address some of the issues highlighted within the current literature.

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