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Innovation In Wales:

Assessing the Innovative Potential of Welsh Small and Medium Sized Manufacturers

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The attraction of manufacturing investment from overseas was the main focus of regional development policy in Wales for much of the 1970s and 1980s. Whilst Wales has been particularly successful in attracting foreign enterprise, the contribution of new investors to improving longer-term regional economic prospects has been questioned at several levels. With concerns over inward investor stability, issues of commitment, and contribution to local value added, increasing weight has been given to the encouragement, and development of innovative indigenous small and medium sized enterprises (SMEs) in the Welsh economy (see Munday, 2000).

General and sectorally targeted initiatives to encourage SME development and innovation in Wales have also taken place against a background of historically low levels of new firm formation in the region (Keeble and Walker, 1995), together with the presence of factors expected to hinder enterprise and SME growth including low levels of capital availability, high levels of external control, and a poorly diversified industry and occupational structure. A recent consultation document produced by the National Assembly for Wales noted that there are a comparatively low number of businesses per capita in Wales, and an over dependence on declining and low value adding industries (NEDS, 2001). Ultimately, it is hoped that a strongly performing indigenously controlled SME sector will go some way to improving regional growth prospects, and hence play a role in reducing the persistent GDP per capita gap between Wales and the UK.

During the 1990s a series of research and consultancy studies in Wales have been undertaken seeking to audit SME activities, define needs and identify market failures in provision of information and services (Bryan and Jones, 2000). These have formed the basis of policy and planning of new resource directions emanating at the European, regional and local levels. A critical component of the 'new' agenda for regional SMEs has been attempts to improve their innovative capacity. In part this follows from the development of the Wales Regional Technology Plan (see Thomas, 1997), which designed a strategy to improve the innovative and technological capacity of the region, its firms and institutions. The Regional Technology Plan has served to inform other policy initiatives led by the Welsh Development Agency and its partners, and also informed Priorities within the European funding framework. For example, the Objective 2 Industrial South Wales programme Priority 2 'Increasing Innovative Capacity for SMEs' included measures to assist the transfer and utilisation of technology, and human resource development for innovation (see European Structural Fund Programme, 1996). Similarly, innovation is prioritised under the West Wales and the Valleys Objective 1 programme 2000-2006. Priority 2 'Developing Innovation and the

Knowledge Based Economy' includes the following objectives:

- creating a culture of innovation,
- diversifying the economic base by growing more technology and knowledge driven firms, and improving their links to the knowledge base,
- increasing investment and R&D, and
- developing higher level skills to support innovation and R&D.

Underlying the encouragement of innovation within such programmes is the broader aim of improving the productivity and competitiveness of the Welsh economy. However, there is some danger that initiatives encouraging innovative activity in Welsh SMEs are being designed and executed without a clear appreciation of the nature of innovation, and more importantly how innovative activities link to innovative outputs and then feed through to improved business/regional performance. In part these problems are apparent in the monitoring indicators underlying priority measures. Often these are posited in terms of activity indicators such as firms assisted by measures, jobs created and safeguarded, and processes developed (see European Structural Fund Programme, 1996). The nature of these indicators makes it difficult to tie 'innovation activity' to improvements in regional competitiveness.

Improving our understanding of innovation demands that our definitions go beyond the notion that innovations only refer to new technology (e.g. computers or patents) and that their introduction is easy to achieve and will surely have positive implications for the firm. This is not to deny that technology or new products are unnecessary. Far from it; it has become conventional wisdom that a firm's competitive edge no longer rests solely with static price competition but rather it increasingly relies on a firm's ability to create knowledge a little faster than their competitors (Maskell and Malmberg, 1995). Yet, to make better policy and business decisions it is essential that policy makers and business people appreciate the nature of the *innovation process* and the implications this has for assessing the value and nature of organisational change. Understanding these connections and the linkages

between different types of innovative input and outputs and business performance is an important component of policy design. If these linkages are poorly appreciated then scarce policy resources may be inappropriately targeted.

Arguably, if Welsh manufacturing and in particular SMEs are going to prosper or simply survive the recent slowdown in the UK and world economy, they will need to improve operational efficiencies and redouble their efforts to respond appropriately to the demands of a potentially shrinking and demanding customer base. In an attempt to provide better understanding of how far different innovative inputs and innovation outputs are linked to improved operational and business performance, researchers have begun assessing the innovative potential of a sample of manufacturing SMEs in Industrial South Wales. This work is significant in so far as it offers new insights into the Welsh economy and tests the notion that an innovative firm is one that *identifies, interprets, and applies knowledge effectively and as appropriate throughout the organisation.*

This article briefly outlines a working model of an "innovative firm" and specifies how it might be possible to make better sense of the link (if any) between innovation, and operational and business performance. This paper also contains some observations about the preliminary findings of the study of SMEs in Industrial South Wales.

Innovation and the link with performance in SMEs

Innovation has meant different things to different individuals, although opinions are gradually conforming to the view that innovation involves "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). These ideas may relate to new products or manufacturing processes (technological) while they may also concern changes in management practices (social).

In the case of innovative SMEs, their behavioural traits have been readily identified. For example, Hill and Newly (2000) contend that innovative capacity

is related to the following factors:

- *Culture* or the extent to which the firm supports innovation,
- *Resources* including its financial, intellectual, human and physical capital,
- *Competence* meaning the range of capabilities within a firm that supports innovation, and finally
- *Networking* or the extent to which a firm makes use of network ties for innovation.

In the case of technological innovations, Rothwell (1989, 1991) provides a more detailed appraisal of the organisational factors shaping innovative SMEs:

- Suitably qualified in-house engineers and scientists (especially if the type of innovative activity is technically orientated),
- In-house and outside knowledge gathering to be complementary,
- An established technology strategy to organise the accumulation process.

Despite these useful insights, the majority of studies considering innovation in SMEs have not explored the link between practice and performance (e.g., output, exports, employment, market share etc) (Hoffman *et al.* 1989). Most commonly, sources like the Science Policy Research Unit innovation database confines innovation to involve the introduction of a new product or process (Pavitt *et al.*, 1987; 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' over time, 'total asset growth' where assets are taken to reflect not only investment but also the *wealth of the firm*, and 'return on total assets', the percentage of operating profit to total assets. Such definitions and measures although useful tend to ignore the softer innovative activities (managerial) while omitting to quantify the operational implications of, for example, continuous improvement.

Despite the lack of relevant research there are studies that offer insight into the likely relationship between innovation and firm performance. For example, Chaston and Mangles (1997) argue, in their study of core capabilities as predictors of growth potential in small manufacturers, that growth is linked to organisational capability (i.e., goal specification, positioning strategy, planning infrastructure, resource evaluation) and the revenue performance of the firm. It is assumed the 'key characteristics exhibited by growth firms [is] a reflection of the[ir] internal capabilities' (Chaston and Mangles, 1997:48). Hence, an analysis of current capabilities can be used to define specific activities for enhancing

future performance. Chaston and Mangles (1997:49) suggest the most relevant operational management issues for growth include (i) effective new product management, (ii) an appropriate structure for motivating employees, providing job satisfaction and effective personal development, (iii) provision of satisfactory product/service quality, (iv) adequate employee productivity supported by investment in technology to aid continuous improvement, and (v) information flows to permit problem resolution and decision making. Considering organisational design and competence in terms of revenue performance provides a useful framework to measure the value-added of technological and managerial innovative activities.

The Innovative SME: towards a model of innovative potential

Innovation not only reflects the introduction of new products or manufacturing processes, it also represents the process through which ideas are translated into reality. Hence, an innovative firm is one that "identifies, interprets and applies knowledge effectively and as appropriate throughout the organisation". In other words, innovative potential refers to the skills, competencies and structures that enable "change" (Figure 1).

For the purpose of modelling a firm's innovative potential (inputs) and performance (outputs) it is necessary to consider a broad range of activities including corporate strategy, new product development, shopfloor and human resource management, business information and communications,

worker responsibility and organisation and supplier and customer relations. Considering business performance (e.g. profit) and performance at the level of operations (e.g. right-first-time) is equally important. Innovation not only involves new product development, it is also about continuously improving the organisational design so that the manufacture of new and existing products is achieved with increasing efficiency, and therefore improving margins. It is because innovation represents a process that the management of innovation (input) is as important to measure as the technological outcomes (see Figure 2):

The broken lines in figure 2 allude to the possibility that innovative activities may only indirectly influence business performance (see Cagliano and Spina, 2000). Certainly, a firm can be highly innovative in terms of operational efficiencies, however unless the firm can sell its products, cost efficiencies will not ensure its survival. That said, the analytical links depicted in figure 2 reflect commonly held assumptions that manufacturing practices, such as continuous improvement and problem solving, will be accompanied by improvements in manufacturing efficiency and quality. It remains to be seen what direct/indirect links exist between differing configurations of organisational design.

Auditing Innovative Practices and SME Performance: the case of Industrial South Wales

This section reports on the preliminary findings of research being conducted in Industrial South Wales, through a

Figure 1 – The Innovative SME: A Working Model

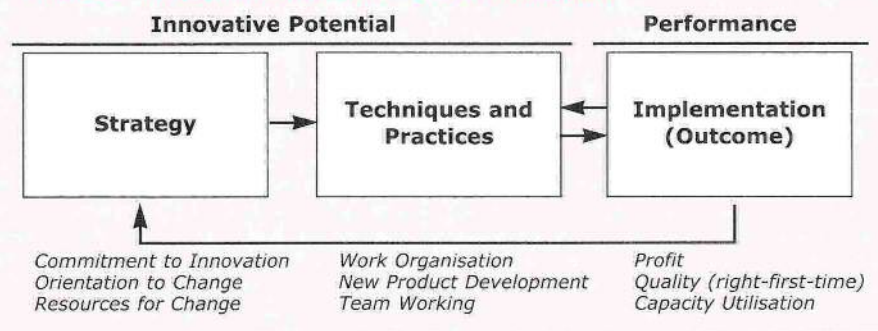
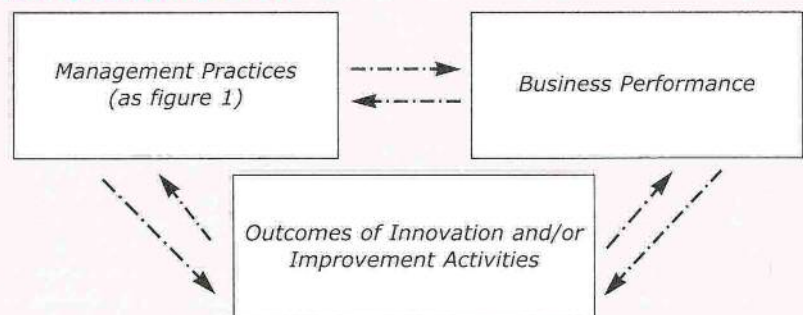


Figure 2: Analytical Links



project funded by the European Union (ERDF). The work to date has been limited to a profiling exercise, although over the autumn period of 2001 the research team will be conducting in-depth case study research with a number of the participating firms. Although the research is in progress it is possible to comment on the sample and the issues emanating from the fieldwork. To date, 79 small and medium sized manufacturers have been approached of which 26 have so far declined to participate with some 23 in negotiation and the remaining 30 agreeing to be involved (of which 26 have been surveyed). The aim is to include 50 or so firms by the Autumn of 2001. The firms that are involved represent indigenous independently owned manufacturing SMEs (employing <250) in Industrial South Wales (Objective 2 area) (Table 1).

Observations emanating from the returns generated to date provide initial insights into manufacturing in Industrial South Wales. Perhaps the most significant finding is that 67 per cent of the respondents reported an increase in profit in the last three years, with 29 per cent showing an increase of over 50%. Only a small proportion showed a fall in profit (19 per cent) with the rest (14 per cent) showing no change. On first inspection this might be viewed as a positive indication about the state of manufacturing, reflecting the relatively buoyant economy of the past few years. However, it may also represent a bias in the sample with only relatively successful companies willing to be scrutinised in the assessment exercise. Here the innovative activities of two similar firms in the sample are considered, and it is suggested that this approach to innovation (not just new products) provides important insights on the nature of a "learning factory" (see Delbridge et al. 1998). Such insights demonstrate the various ways managers have experimented in making their firms innovation driven. The two firms under scrutiny are both high performing SMEs (over 50% increase in turnover over the past three years). What seemingly differentiates these firms is their respective orientation to new product development and the management of innovation, including worker organisation and supplier and customer relations (see Table 2).

For reasons of confidentiality the true names of the firms and their manufacturing activities cannot be identified. These two examples are referred to as *Welsh Electric* and *Welsh Accessories*. *Welsh Electric's* management attributed growth to new customers, increased sales to existing customers and new products. In the case of *Welsh Accessories* growth was linked to diversification into new low cost equipment markets and continued growth in existing markets. In this case,

Table 1– Sample of Manufacturers

Standard Industrial Codes (SIC)	Refused	Negotiating	Accepted
15 – Manufacture of Food Beverages & Drinks	5	0	0
17 – Manufacture of Textiles	1	0	1
18 – Manufacture of clothing	0	1	0
20 – Manufacture of Wood and Wood Products	0	1	0
21 – Manufacture of Pulp, Paper and Paper Products	1	0	2
22 – Publishing, Printing and Reproduction	2	2	1
24 – Chemicals and Chemical Products	2*	0	2
25 – Rubber and Plastics Products	0	3	2
28 – Metal Products	3*	1	4
30 – Manufacture of Office Machinery and Computers	0	1	1
31 – Manufacture of Electrical Machinery and Apparatus	1	0	2
32 – Radio, Television and Communication Equipment and Apparatus	2*	2	1
33 – Instrument Engineering	2	0	0
36 – Furniture, including other manufacturing	1	1	2
Other SIC Code	6*	11	12
Total	26	23	30

*Includes firms gone into liquidation during survey

exports represented a high proportion of new growth having increased by more than 50% over the previous three years to represent 62% of turnover. In contrast, exports provided less growth potential for *Welsh Electric*, with a reported increase in exports (10-25 per cent) attributed to the re-location of a customer overseas. In specific terms, *Welsh Electric's* innovative activities appear to be confined to new product development and based on a follower strategy, whereby new introductions would be based on tried and tested products. In contrast, *Welsh Accessories* claimed to be entrepreneurial in its field

and willing to take the lead on new product introduction. The difference is apparent when revenue is considered. For example, during the 1999/00 financial year, *Welsh Accessories'* turnover relied on new and improved products, while *Welsh Electric's* wholly relied on unchanged or marginally modified products. In both cases, there is limited evidence of networking activities to facilitate such activities. That said, *Welsh Accessories* does conduct regular development activities with its suppliers and customers (unlike *Welsh Electric*) which will impact on new product development and introduction.

Table 2 – Key factors differentiating Innovative Potential

	Welsh Electric	Welsh Accessories
Firm Strategy	"Follower"	"Leader"
Management Of Innovation	Mgt responsibility New Product Development	Mgt Responsibility Continuous Improvement Problem solving New Product Development
Business Information, Communications, Marketing & Accounting	Networking Limited to Professional Networks – some training	Networking Limited to outside expert – New Product Development
Human Resource Management	Training Marginal Activity - <1 day	Training Moderate Activity - 1-5 days
Worker Responsibility & Organisation	Organisation Team based – No problem solving	Organisation Team based – problem solving encouraged
Supplier & Customer Relations	Development Activities None	Development Activities Regular

*Includes firms gone into liquidation during survey

Considering the management of innovation to include organisational design, further differences between the two firms can be identified. It is apparent Welsh Accessories is also geared towards continuous innovation in terms of operations. For instance, Welsh Accessories seems better positioned to drive organisational changes (if and when required) as it monitors and measures quality (its current defect rate is only 0.002 per cent). This is made possible because management has systematised the routines including continuous improvement and problem solving to sustain what has become an innovative cycle. By monitoring quality and operations, the management team is able to assess existing practices. Innovation at this level relates to the introduction of new ideas emanating from the operators working on the shop floor, which is supported by the existence of team based work organisation.

Significantly, there is an absence of problem solving activities or the systematised monitoring of operational performance on a day-to-day basis at Welsh Electric, although team based work organisation is present. Arguably, Welsh Accessories is better positioned to sustain growth while Welsh Electric is likely to find it more difficult to respond to quality issues. Such differences reflect variations in a firm's "innovative potential". Given the basic firm profile, what can be said about the link between innovation and performance? Both firms have been successful over the past three years. However, key differences, especially at the level of operations, indicate important limitations in the organisational design of Welsh Electric. This is recognised by the management team who has recently embarked on a development process to introduce measures and systems with which to monitor operational performance. This is likely to be a significant challenge as they have been working at full capacity, but given the successes of Welsh Accessories there appear to be excellent Welsh examples of "best practice". Only when companies acknowledge that innovation can be measured (e.g. quality measures) will it be possible to fully appreciate the link with performance and competitiveness. Clearly, growth can be achieved without such measures as shown by Welsh Electric. However, it is less likely that it can be sustained under more stringent economic conditions. It is at times of austerity that managers should be keeping an even closer eye on operational efficiency.

Discussion

Given the complex nature of innovation, and the difficulties of measuring the practice-performance link, it might be time that policy makers reconsider the apparently unproblematic link that is assumed between innovation and

regional prosperity. In particular, the targeting of innovative priorities should take into consideration these softer managerial issues and perhaps, more importantly, projects should be more rigorously assessed in order to differentiate between the direct and indirect benefits of specific measures. The illustrated cases show little evidence that the level of success was attributable to regional assistance or the development of skills within the firm. Rather, at least in the case of Welsh Accessories, much of the innovative advantage of the firm relied on existing suitably qualified in-house engineers and liaison with outside experts and a set of mechanisms to measure and maintain employee productivity and quality.

Perhaps where assistance is most needed is in helping managers understand the significance of measuring innovation (operational). Clearly, the results of the current project will be able to cast some light on the benefits (if any) of problem solving and continuous improvement. Yet, as demonstrated, if a high proportion of firms do not even measure quality, then a policy implication must be the need to address basic management and operational skills. In this respect, once the research has been conducted and the results analysed, the research team will be developing a self-use audit tool for managers to be able to assess their own competencies and performance.

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