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## **ENTERPRISE SUPPORT POLICIES IN DYNAMIC EUROPEAN REGIONS**

by

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## EXECUTIVE SUMMARY

1. Enterprise support in the development of a consistent theme of encouraging agencies to enhance competitive co-operation amongst SMEs. Networking has been successful.
2. Where, as in Denmark, there is a co-operation amongst SMEs, networking has been successful.
3. Industrial clusters are also found in other economies. Ranging in size from Baden-Württemberg's regionally oriented vertically and horizontally integrated clusters in interaction with public agencies to the Irish network.
4. Examples of regions where clusters have emerged are Steiermark (Austria) where clusters have emerged through public-private partnership.
5. The Irish economy has a strong emphasis on high technology especially in high technology. It has a strong domestic supply base. Individual firms need to become more innovative and perform better although performing better firms need to become more innovative and interact more with other firms.
6. There is no strong evidence of a National System of Innovation unlike notably in Scandinavia, where there is a strong learning and focused business environment.
7. It is recommended that effort be made to develop a co-operative ethic among agencies. This will have the effect of stimulating innovation and demonstrating the benefits of achieving competitive advantage.
8. A National System of Innovation should be developed. Adoption of a Technology Policy should be encouraged. Diverse scientific and technological research should assist Irish firms to improve their performance.
9. A Network Co-Operation Framework should be developed to stimulate horizontal co-operation.



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1. Enterprise support in the dynamic growth economies examined has a consistent theme of encouraging co-operation amongst firms and agencies to enhance competitiveness overall.
2. Where, as in Denmark, there was little tradition of inter-firm co-operation amongst SMEs, a programme to foster business networking has been successfully designed and implemented.
3. Industrial clusters are also a key feature of successful European economies. Ranging in scale from Italian industrial districts to Baden-Württemberg's regional engineering clusters, these are vertically and horizontally linked supply and subcontracting chains in interaction with public and private enterprise support services.
4. Examples of regions developing cluster systems are Wales, where clusters have emerged around foreign direct investment and Steiermark (Austria) where an automotive cluster is being built through public-private partnership.
5. The Irish economy has a strong foreign direct investment sector, especially in high technology, which is weakly integrated with the domestic supply base. Indigenous manufacturing is vulnerable, although performing better than hitherto in export markets. Irish firms need to become more innovative, to improve learning capacity and interact more with other firms to enhance competitiveness.
6. There is no strong evidence that Ireland has an integrated National System of Innovation unlike other smaller European economies, notably in Scandinavia, where such systems facilitate interactive learning and focused business competitiveness.
7. It is recommended that efforts should be made in Ireland to promote a co-operative ethic among firms and with State development agencies. This will have the objective of developing interactive innovation and demonstrating the importance of co-operation to achieving competitive advantage.
8. A National System of Innovation should be put in place through the adoption of a Technology Policy Concept. This will integrate the diverse scientific and technological institutions and, as appropriate, assist Irish firms to improve their innovativeness.
9. A Network Co-Operation Programme should be established to stimulate horizontal co-operation amongst the indigenous, small

firm, manufacturing sector. This programme should be modelled upon that developed in Denmark with a brokerage system and an incentives package costing no more than £20 million over three years.

10. The already proven National Linkage Programme should be expanded to include more firms seeking to become members of vertical supply-chains, especially relating to the successful foreign direct investment sector. A further £15 million over three years should be added to this budget.
11. Sections of indigenous manufacturing such as furniture, printing and publishing, engineering, knitwear and food which are reasonably strong, should be first targeted for the Network Co-Operation Programme.
12. Subsequently, enterprise support for wider cluster formation should be provided to link, where appropriate, 'networks of networks' around areas of major economic strength such as food, pharmaceuticals and electronics. All these policy measures should be closely monitored and evaluated and good practice disseminated throughout Irish industry with a view to integrating innovative governance and competitive business in an 'economic partnership' to complement Ireland's successful experiment in 'social partnership'.

The objectives of this report are matters of interest:

- To elucidate recent social mechanisms associated with
- To review the experience relevance for the case of sectors, SMEs and proac
- To explore these cases, Germany (Baden-Würt (Steiermark), with a v networked and systems economic dynamism;
- To assess, by reference policy, the receptivity of] to measures and instrum comparator economies;
- To draw conclusions and appropriate policy steps th integrative governance in

The first main chapter of the report transition towards a model of hierarchical organisational structure co-ordination. The contribution made by evolutionary economics especial prominence. It is suggested recognising the importance of co as the, perhaps, hidden dimension that economies which, like Ireland model at macro-level tend also to the level of individual and co approach innovation becomes a generally. Innovative, co-op characterised frequently by networks between firms and the system associations and intermediary in characteristic feature of both moderation of top-down state-led responsible self-governance by in

This programme should be modelled on the London Stock Exchange with a brokerage system and an annual fee of no more than £20 million over three years.

Regional Linkage Programme should be available to firms seeking to become members of the Network, especially relating to the successful foreign firms. A further £15 million over three years should be allocated.

Manufacturing such as furniture, printing, engineering, knitwear and food which are traditionally first targeted for the Network.

Support for wider cluster formation should be provided. Where appropriate, 'networks of networks' should be developed to build on existing economic strength such as food, textiles, electronics. All these policy measures should be evaluated and good practice disseminated with a view to integrating innovative business in an 'economic partnership' model. This is the most successful experiment in 'social

## PREFACE

The objectives of this report are fivefold and deal with the following matters of interest:

- To elucidate recent scholarly thinking on the underlying mechanisms associated with dynamic economic growth;
- To review the experiences of five regions or countries which have relevance for the case of Ireland, being endowed with traditional sectors, SMEs and proactive governance organisations;
- To explore these cases, in Italy (Emilia-Romagna), Denmark, Germany (Baden-Württemberg), UK (Wales) and Austria (Steiermark), with a view to assessing the importance of networked and systems integrative measures in supporting economic dynamism;
- To assess, by reference to a policy analysis of Irish industrial policy, the receptivity of Irish business and governance structures to measures and instruments such as those deployed in the comparator economies;
- To draw conclusions and recommendations regarding the most appropriate policy steps that might be taken to encourage systems integrative governance in support of Irish enterprise.

The first main chapter of the report explores the implications of the global transition towards a model of industrial co-ordination in which hierarchical organisational structures are moderated by network forms of co-ordination. The contributions to understanding of these processes made by evolutionary economics and industrial district theories are given especial prominence. It is suggested that there is a strong case for recognising the importance of co-operative relationships amongst firms as the, perhaps, hidden dimension of competitive advantage. It is stressed that economies which, like Ireland, have adopted a social partnership model at macro-level tend also to have adopted a "high-road" strategy at the level of individual and collective entrepreneurship. Within this approach innovation becomes a crucial factor to competitiveness more generally. Innovative, co-operative economic organisation is characterised frequently by network relationships amongst firms and between firms and the system of governance, including private associations and intermediary institutions. Innovative learning is also a characteristic feature of both sets of actors. This report advocates moderation of top-down state-led initiative and the stimulation of more responsible self-governance by intermediaries and firms in association.

## THEORETICAL ISSUES TO SYSTEMS

In Chapters 3 to 6, detailed case studies are provided of the regional systems of Emilia-Romagna, Baden-Württemberg, Steiermark and Wales. These regions were selected since they fulfilled the criteria of relevance to the aims of the report. To these regions is added the case of a northern European, peripheral, national economy – that of Denmark – which, despite sharing some features in common with Ireland, has performed better economically over the past decades. The regional economies combine a mixture of significant small-firm presence, traditional sectors, something of a rural, agricultural backcloth and the absence of major, metropolitan centres of advanced producer and other financial services. In different ways, each of these cases bears witness to the importance of a propensity towards partnership, networking, co-operation amongst firms both horizontally and vertically. Moreover, each reveals the importance of innovative governance in a judicious mix of public and private intervention in enterprise support, which, at its strongest results in a seamless system integration of research, training, government incentives, private intermediary activity and business linkage whereby the whole becomes an *innovative cluster*, a treasured goal of much contemporary economic policy-making.

In Chapter 7, the receptivity of the Irish economy to such thinking and policy is assessed. In a review of Irish industry policy it is shown that, from an era when great effort was put into the attraction of innovative foreign investment, the mood has shifted towards seeking to integrate the overseas and indigenous sectors more effectively. Without suggesting that the extraordinarily successful inward investment programme of the IDA should be in any way weakened, the report points to the need for upgrading of Irish domestic industry to assist it to meet the exacting targets of inward investors. While the National Linkage Programme has been successful in supporting this aim, there is moderate criticism that it may have been insufficiently inclusive in this approach. Cluster-building and network programme-type support and moves to align the Irish National Innovation System more closely to the needs of domestic and foreign industry seem to be called for if Irish industry is to become more innovative.

### 1. INTRODUCTION

New times call for new concepts, and these are introduced here, in part to regions taken in this study of the fast-moving country/regional industrial dynamics. Mechanisms deemed appropriate for sustainability in those contexts. Informal non-hierarchical, organic integration' is the approach to government partnership – minded (Abe, 1995)

Not so long ago, it was considered that mass-production in manufacturing in the first quarter of the present century was the template nor the exemplar leading into the 1980s. The question of whether it had passed into a post-Fordist era of innumerable writers (Boyer) has been made to 'post-Fordist local production' (Goodwin, Duncan & Halford, 1995) household' (Marsden, 1995). The form as the New England meeting twice a year only to hand out the contracts to private contracting firms.

So, it seems likely that the hierarchical, compartmentalised, bureaucratic co-ordination is in retreat as a model exhausted its creative possibilities (1980) (who saw bureaucracy as a development of social organisation a text-book model of how best to operate with equity. From the era of the Keynesian countries now operate on something called the 'Schumpeterian workfare

## CHAPTER 1

### THEORETICAL ISSUES: FROM NETWORKS TO SYSTEMS INTEGRATION

#### 1. INTRODUCTION

New times call for new concepts, and the two in the sub-title to this chapter are introduced here, in part to register the underlying conceptual approach taken in this study of the fast-moving field of contemporary small country/regional industrial dynamics and the enterprise support mechanisms deemed appropriate for both competitiveness and sustainability in those contexts. In brief, 'networks' refers to formal and informal non-hierarchical, organisational arrangements; 'Systems integration' is the approach to governance which is holistic, inclusive and partnership – minded (Abe, 1995).

Not so long ago, it was considered intellectually risky to posit an argument that mass-production in manufacturing, modelled on the lines introduced in the first quarter of the present century by Henry Ford, was no longer the template nor the exemplar leading-edge companies looked to in the 1980s. The question of whether Fordism persisted as neo-Fordism, or whether it had passed into a post-Fordist stage, exercised the pens and brains of innumerable writers (Boyer, 1986; Lipietz, 1987; Cooke, 1988; see the recent collection in Amin, 1995). By 1995, reference had already been made to 'post-Fordist local government', (see, for example, Goodwin, Duncan & Halford, 1993) not to mention the 'post-Fordist household' (Marsden, 1995). The former is characterised in its ultimate form as the New England meeting house at which the town council meets twice a year only to hand out the contracts for service delivery to a myriad private contracting firms.

So, it seems likely that the *hierarchical*, structured, divisionalised, compartmentalised, bureaucratic mode of organisation and economic co-ordination is in retreat as a model of best practice. It may, indeed, have exhausted its creative possibilities, despite the injunctions of Max Weber (1980) (who saw bureaucracy as the highest, most rational point in the development of social organisation) and be about to disappear, at least as a text-book model of how best to allocate resources with efficiency and equity. From the era of the Keynesian welfare state, many Western countries now operate on something a little closer to what Jessop (1993) calls the 'Schumpeterian workfare state'. The point here is that for reasons

of political ideology but also the perceived need for fiscal rectitude, many countries have been pursuing policies to rein-in welfare expenditure rather than use it as a demand management pump-priming mechanism. Schumpeter, of course, was the theoretician of entrepreneurship, enterprise and innovation as the wellsprings of capitalist competitiveness (Schumpeter, 1944). Workfare is the idea, promoted by the Clinton administration in the USA, that the right to welfare should be earned not only through contributions made while in employment, but by actual work on schemes by means of which welfare income is itself earned.

Hence, many of the structures and assumptions of the Fordist manufacturing and Keynesian welfare era, especially from 1945 to 1975, have been placed in question if not, as in the UK particularly, been seriously eroded by neo-liberal government policies. However, by no means all European member-states have experimented with state disintervention to the extent the UK has. The Republic of Ireland is a case in point where, not only does the state take the lead in wide areas of industrial policy, but latterly a quite European model of 'social partnership' between capital, labour and the state appears to have brought real gains to the budgetary and exchange-rate stability of the economy. (O'Donnell, 1995).

## 2. SOCIAL PARTNERSHIP AND THE 'HIGH ROAD' TO ECONOMIC DEVELOPMENT

There is good evidence of long-term success both economically and socially in smaller countries, such as Denmark, Norway and Austria, as well as larger ones, notably Germany, that have operated with an economic policy rooted in established institutional support for social partnership. Social partnership is taken as given for the purposes of this study of Irish prospects for emulating the rates of growth in economic well being in such countries. The alternative of a neo-liberal policy lurch of the kind experienced in the UK is far less likely than the also, hopefully, unlikely unravelling of the social partnership edifice that has so carefully, even painfully, been put into place in Ireland. And, in any case, a social partnership model of economic organisation is responsible for what, in such countries, is often referred to as a 'high road' industrial development strategy and process.

A 'high-road' strategy is one in which the aim is to develop an economy characterised by a high value-added profile in its output of goods and services, a high skills profile in its workforce and high wages amongst its citizens. The alternative of a 'low-road' strategy tends to be associated either with those Southern European developing economies that have based their competitiveness on the 'asset' of low wages, such as Portugal,

Spain (though this is changing) deregulated economies such as low-skills and low value-added that they face unwinnable competition in Asia and Latin America; economies on the doorstep in

The problem for 'high-road' countries is on a route in which innovation is a fundamental feature of the economy, high productivity and low unit costs of reliable goods and services in a competitive market. This has to be the aspect of the more dynamic growth regimes such as Denmark, have this challenge. It can be expected to achieve that competitive advantages should be well-understood and supported by policy and business action. A developmental path in the short term may be ultimately unsustainable 'low-road' growth. It is recognised that the problem of innovation for small firms simply cannot afford the marketing or technology-transfer costs of increasingly exacting customer requirements for quality, reliability, delivery and cost. Firms must compensate, but not always in the way that innovation increasingly depends on research institutes for example. Innovation must be spread amongst firms – not in a case – with the state giving incentives, not market contracts. The 'high-road' system where firms assist each other in specific areas or niches. This is well-exemplified in North Rhine-Westphalia in Germany, which has been occasioned by restructuring its industrial policy is based on incentives

- (i) to manage the growth and interactions in the private sector;
- (ii) to capitalise on close relationships with research institutions;
- (iii) and because growth is driven by innovation for the manufacture of high value-added products.

ved need for fiscal rectitude, many s to rein-in welfare expenditure ment pump-priming mechanism. eoretician of entrepreneurship, rings of capitalist competitiveness : idea, promoted by the Clinton ht to welfare should be earned not le in employment, but by actual welfare income is itself earned.

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#### AND THE 'HIGH ROAD' TO I

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the aim is to develop an economy rofile in its output of goods and force and high wages amongst its I' strategy tends to be associated developing economies that have t' of low wages, such as Portugal,

Spain (though this is changing somewhat) and Greece, or with neo-liberal, deregulated economies such as the UK. Low-wages are reflected in low-skills and low value-added. The problem for 'low-road' countries is that they face unwinnable competition from even lower-wage economies in Asia and Latin America, not to mention the newly liberalised economies on the doorstep in Central and Eastern Europe.

The problem for 'high-road' countries or regions, is that they must embark on a route in which innovation and enterprise are permanent and fundamental features of the economy. High wages must be paid for by high productivity and low unit labour costs, with innovative, high quality and reliable goods and services selling competitively on the global market. This has to be the aspiration for Ireland since it is the case that the more dynamic growth regions in Europe, not to mention countries such as Denmark, have this characteristic. That is not to say Ireland should be expected to achieve that condition overnight, but its qualities and advantages should be well-understood as an aspiration and objective both of policy and business activity. Even achieving a 'middle road' developmental path in the short-to-medium term is better than taking the ultimately unsustainable 'low road'. In high road economies, it is recognised that the problem of the SME is not only its size but its isolation. Small firms simply cannot afford sophisticated domestic, let alone global, marketing or technology-transfer in most cases. The complex demands of increasingly exacting customers pose new problems concerning quality, reliability, deliverability and so on. Governments try to compensate, but not always in sufficiently innovative ways, so SME innovation increasingly depends on closer links between firms and research institutes for example. Sometimes these risks are so great they must be spread amongst firms – as we will see in the Baden-Württemberg case – with the state giving incentives. These relationships rely on trust first, not market contracts. The 'high-road' economy is also a 'high-trust' system where firms assist each other to be competitive in their own market areas or niches. This is well-exemplified in the reconversion region of North Rhine-Westphalia in Germany where there is abundant labour occasioned by restructuring in coal, steel and textiles. Despite this, industrial policy is based on increasing workforce skills:

- (i) to manage the growing complexities of closer buyer-supplier interactions in the production chain;
- (ii) to capitalise on closer innovation links between industry and research institutions;
- (iii) and because growth is no longer anticipated in opportunities for the manufacture of standard products (Cooke, 1995).



Of course, Germany is a high-wage, high labour-cost country but the 'low-road' is not considered an option for making economic progress.

### 3. HIERARCHY TO HETERARCHY: AN EVOLUTIONARY APPROACH

A case has been made that hierarchical 'top-down' management of economy and society is in retreat, especially with respect to the question of industrial co-ordination. Firms that once reigned supreme as self-sufficient, substantially capable of meeting demand for goods and services internally – IBM, Philips and General Motors spring to mind – now routinely source from a more or less structured 'supply-chain'. This, at its most elaborate, links the final customer to a, possibly large, systems supplier at first-tier level and a number of second and third-tier components, 'A' parts and 'non-A' parts firms of diminishing size in a linkage arrangement of quite startling potential fragility. In the process, some significant element of the hierarchical power of the customer firm is lost. In some recorded instances, (e.g. Semlinger, 1992) suppliers have organised themselves into associations to exert 'supplier power', mainly defensively, to prevent divide-and-rule pricing strategies by customer firms.

If hierarchy is in retreat, then does the *market* take its place as the prime mover in economic co-ordination as economists from Coase (1937) to Williamson (1985) have suggested? Interesting research originating in the evolutionary economics approach and, independently, in some of the work of Italian theorists of neo-Marshallian industrial districts suggests otherwise. Such districts are composed of networks of small firms linked by both co-operative and competitive imperatives to the extent that they have become globally competitive (Becattini, 1989; Brusco, 1990). They are clearly 'in the market' but their relationship with other firms is not simply organised through the cash nexus and 'arms-length exchange'. They collaborate in order to overcome the weaknesses of small-size, though they are profit-maximising when they sell their products on the (increasingly global) market.

In evolutionary theory, firms are conceived of as collective organisations, with a certain degree of resource-development capacity of their own. They are not homogeneous, atomistic units of rational utility maximisation, as in neo-classical theory. Rather they are differentiated, make use of variable proportions of non-homogeneous inputs and, crucially, they are capable of *learning* through the 'double feedback loop' (Argyris & Schon, 1978) of assessing both their own experience and that of their peers. This is very similar to the view of authors such as Becattini

& Rullani (1993) that it is practices of firms and agencies in a dynamic system that ensure the sustainability of a disaggregated system. Belussi (1996) goes further to explore the relationship between evolutionary and industrial developmental lags between countries, not as a product of lack of resources or technical capabilities to apply them, but in an up-to-date way. Such capabilities are not pre-determined; they can be developed through feasible innovation opportunities.

Unlike the neo-classical world where technology and learning gains are assumed, in an evolutionary world is one in which uncertainty and chance effects occur. Through interaction with other firms and markets, a firm itself modified as well as externalities. The diffusion of both codified and tacit knowledge in an equal relationship to one another, and interaction outside their domestic base but within it, is an important source of innovation. This is why industrial districts have a competitive edge in traditional economies, high wage, less developed economies.

Such relationships are not hierarchical. Heterarchy is the condition in which firms interact on; trust, reputation, custom, reciprocity and an inclusive and empowering disposition (Coase) are essential. Heterarchy does not operate in a vacuum, but in a more than evolutionary economic and socio-cultural *milieu* (Maillat, 1993). Inter-firm organisation are embedded in a community. Here talking about community in terms of routine practices and mental models of a commercial community. As Maillat (1993) rightly appreciated, inventions and innovations are not promptly discussed; if one person suggests an idea and combined with suggestions of others, it becomes a source of further new ideas' (Mars



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## WHY: AN EVOLUTIONARY

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& Rullani (1993) that it is practical knowledge, communicated amongst firms and agencies in a district, that explains the emergence and sustainability of a disaggregated but nevertheless coherent production system. Belussi (1996) goes further in developing this convergence between evolutionary and industrial district theory, by stating that developmental lags between countries or regions should be understood, not as a product of lack of resources, but of different organisational and technical capabilities to apply practical knowledge to existing resources in an up-to-date way. Such capabilities are path-dependent (Arthur, 1994) but not pre-determined; they can be learned, thus widening the range of feasible innovation opportunities affecting economic progress.

Unlike the neo-classical world of isolated utility-maximisers for whom technology and learning gains are exogenously given (Romer, 1990), the evolutionary world is one in which innovative, imitative, unpredictable and chance effects occur. These have the consequence that, through interaction with other firms and agencies, the economic environment is itself modified as well as exerting its own modifying effects. The diffusion of both codified and tacit knowledge among firms in relatively equal relationship to one another, especially where they are competitive outside their domestic base but complementary, or even collaborative within it, is an important source of competitive advantage for small firms. This is why industrial districts have proved capable of maintaining a competitive edge in traditional sectors despite competition from low wage, less developed economies.

Such relationships are not *hierarchical*, they are *heterarchical*. Heterarchy is the condition in which network relationships pertain based on; trust, reputation, custom, reciprocity, reliability, openness to learning and an inclusive and empowering rather than an exclusive and disempowering disposition (Cooke, 1995; Boisot, 1995). However, heterarchy does not operate in a vacuum. Industrial district theory, even more than evolutionary economic theory, stresses the importance of the socio-cultural *milieu* (Maillat, 1991) within which network forms of inter-firm organisation are embedded (Granovetter, 1985). We are not here talking about community in a simplistic and generic way, rather about routine practices and mentalities of entrepreneurship in the context of a commercial community. As Marshall (1919) put it: '... good work is rightly appreciated, inventions and improvements in machinery, in processes and the general organisation of the businesses have their merits promptly discussed; if one person starts a new idea, it is taken up by others and combined with suggestions of their own; and thus it becomes the source of further new ideas' (Marshall, 1919).

Having set up this theoretical and, to a considerable extent empirically informed, exemplar of networked business co-ordination, let me now identify some, possibly debilitating, weaknesses that have recently been identified in the canonical neo-Marshallian form of the industrial district. Writing from an evolutionary economics perspective also, Varaldo and Ferrucci (1996) have identified the following developmental blockages presently visible in the district form of development. First, because of strategic co-operation between firms in districts there develops, of necessity, a common set of strategic expectations about behaviour amongst mutually dependent entrepreneurs. Institutional memory, rules, routines, ways in which mutual expectations are regulated, relationships ordered and rules governed, come to converge so that dissonance within the district becomes muted. This, the absence of dissenting voices, reproduces district culture – in the commercial sense – but may delay strategic creativity at critical points when a rapid response to the need for innovation is required.

Second, this is not a problem until the district system experiences an exogenous shock, such as a stabilisation, or even, as occurred in the global recession of the early 1990s, a contraction in demand. This can cause a number of panic responses: competition may become cut-throat and destructive; low prices make investment in restructuring impossible; reduced demand limits the high flexibility levels associated with district firms, revealing hidden costs as margins are cut and more standardised production is resorted to; firms seek cheaper offshore suppliers and even production locations; retail customers are more able to negotiate favourable contracts for themselves; new technologies may represent a threat where they are incongruent with the technical know-how of district entrepreneurs. All these reactions can be experienced in non-district settings too, and there is even limited evidence that in Italy, during the 1990s recession, district firms fared better than similar ones outside districts (Franchi, 1994).

#### 4. BEYOND THE INDUSTRIAL DISTRICT: FROM CLUSTERS TO SYSTEMS INTEGRATION

So, the question is, can we have the advantages of networks without the disadvantages of the herd instinct? This question is particularly apposite in the sense that, while many who are responsible for promoting economic development in the different countries of the world admire the Italian and other industrial districts, very few have them in their own bailiwicks. Most economic development involving enterprise support for small and medium enterprises occurs in situations far removed from the industrial

district model of development. A poignant conclusion, is that even firms relies more and more on the firms displaying strategic competitive networks of global firms. Instead for the future is of more local relationships. These may be incremental innovation made possible where close networks facilitate it. But for the more dynamic, strategic competitiveness is sustained, firms not necessarily directly, but through networks.

Mention of clusters inevitably leads to those whose work on competitive advantage in countries and regions seeking to realise their competitive potential through support. A discussion about the trend towards support by smaller firms, amongst each other as firms as suppliers, the interest in collaboration and competition. The 'lock-in' problems that bedevil *to what extent can collaborative competition be an imperative for firms to become in sustaining competitive advantage?*

Here, the view of Porter's colleague He begins by arguing that the debate between collaboration and competition that, on the one hand, collaboration share in bulk purchasing, joint marketing, other, when it comes to innovation, because they will have both foreign to meet in the market. He concludes is to identify the optimal mix of collaboration in an industry cluster (which may also identifying those activities best coordinated. Collaboration, for firms, means a resources against the potential information to competitors. For policy the support their policies may even-

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district model of development. Varaldo and Ferruci's (1996), rather  
poignant conclusion, is that even in the Italian case, the future of district  
firms relies more and more on their capacity to make links to non-district  
firms displaying strategic competitive advantage, including crucially,  
networks of global firms. Instead of tightly-defined districts, the model  
for the future is of more loosely-defined 'clusters' of inter-firm  
relationships. These may be capable of taking advantage of the  
incremental innovation made possible in periods of relative stability  
where close networks facilitate rapid information diffusion and learning.  
But for the more dynamic, strategic innovations by means of which global  
competitiveness is sustained, firms in local networks need to be in touch,  
not necessarily directly, but through the supply-chain, with global  
networks.

Mention of clusters inevitably introduces the name of Porter (1990)  
whose work on competitive advantage has been widely adopted by  
countries and regions seeking to identify and enhance their world-class  
competitive potential through supporting industry clusters. In light of the  
discussion about the trend towards networking as a competitive strategy  
by smaller firms, amongst each other as sub-contractors or towards large  
firms as suppliers, the interest in cluster theory lies in the relationship  
between collaboration and competition. Given what we have said about  
the 'lock-in' problems that bedevil industrial districts the key question is:  
*to what extent can collaborative inter-firm relationships help fulfil the  
imperative for firms to become increasingly innovative as a means to  
sustaining competitive advantage?*

Here, the view of Porter's colleague Michael Enright (1995) is helpful.  
He begins by arguing that the debate which stresses incompatibilities  
between collaboration and competition is redundant. Correctly, he asserts  
that, on the one hand, collaboration means more opportunity for firms to  
share in bulk purchasing, joint marketing and basic training, but on the  
other, when it comes to innovation, firms will also need to be competitive  
because they will have both foreign, and possibly local, competitor firms  
to meet in the market. He concludes by suggesting the way through this  
is to identify the optimal mix of collaboration and competition for a given  
industry cluster (which may also be a regional cluster). This means  
identifying those activities best conducted collaboratively and those not.  
Collaboration, for firms, means a trade-off between access to greater  
resources against the potential for loss of valuable, proprietary  
information to competitors. For policy makers, the trade-off is between  
the support their policies may even-handedly give to co-operation versus

the stimulus to growth supplied by tough local competition. The optimal mix optimises these trade-offs.

Porter's angle on clusters tends, perhaps inevitably, to highlight competition in discussing strategic advantage. However, on inspection, his concept of the cluster includes very many collaborative dimensions. Such elements as the formation of 'industry clubs', interaction with 'close-knit socio-cultural links' and 'willingness to co-operate' are key features of the model of a competitively advantaged cluster. Taking these points on board, it seems that the answer to the question raised earlier, regarding the nature of the mechanism most likely to facilitate networked collaboration and innovative competition, is something we may refer to as the *innovative industrial cluster*, or if we wish to think geographically, we might designate it an *innovative regional cluster*.

Let us briefly explore these two related, but distinctive, elaborations of the basic cluster idea and, in the process, say more about the *systems integration approach* to thinking about how these may be co-ordinated. The systems dimension arises from the 'membership' of the network comprising the cluster. Minimally, as can be seen later in the chapter on Wales, the *innovative regional cluster* will consist of firms, large and small, comprising an industry sector in which network relationships exist or can be commercially envisaged, research and higher education institutions, private R&D laboratories, technology transfer agencies, chambers of commerce, business associations, vocational training organisations, relevant government agencies and appropriate government departments. This constitutes the basis for an integrative governance arrangement. The club, forum, working party, consortium or partnership model is what typifies this *associative* approach towards enhancing the commercial community (Casson, 1995; Hirst, 1994). From such arrangements institutional learning and innovation gains may more readily be acquired. *Associative governance* involves something of a shift from state-regulation of economic affairs to a degree of self-regulation by responsible groups in economy and society. In Hirst's (1994) formulation, this means ceding some aspects of economic governance to associations (such as training or technology-transfer), supported by appropriate financial mechanisms. It also implies decentralised, transparent and consultative governance. Institutional learning is a crucial part of an associative approach. It presumes no fount and origin of all wisdom, rather it assumes the processes of economic development and especially, innovation are interactive processes in which institutions on the user-side (e.g. customers) may be as important as producers (e.g. scientists) of the innovations in question.

For the *innovative industrial cluster* defined in a region – the internet, electronic means, through video learning of a more informal kind, frequent meetings for working parties require establishment as a 'networked associationalism' may occur if the cluster requires, not managers. Members, especially firms, must be part of the network. Responsibility must be shared to ensure continuous learning-by-interacting, and so needs to be built-in to such arrangements are the essentials of 'economies

Beyond these housekeeping details of theoretical relevance which it is the question of *trust* in networks concerns the mechanisms by which they are made.

## 5. TRUST AND MICRO-COOPERATION

In hierarchies, authority flows from top to bottom and those who are authorised by exchange of information are governed purely by utility-maximising behaviour. Neither of these categories of information relationships, other heterarchic and system relationships. In pondering the usefulness of the notion of trust, I usefully introduced the notion of assuming trust to be an instinctive need to think about it and system relationships breaks down and how to learn to do it were, the product of systematic learning. It is in its infancy, though Fukuyama's general way.

Sabel's (1992) case is that trust in an exchange will exploit the other party. One will risk initiating an arrangement of co-operation to the cut-throat. If there is a sufficiently high probability of a successful supply chain, each actor will seek

local competition. The optimal

ups inevitably, to highlight age. However, on inspection, any collaborative dimensions. 'industry clubs', interaction with 'willingness to co-operate' are key advantages of a networked cluster. Taking these into account, the answer to the question raised earlier, is likely to facilitate networked clusters. This is something we may refer to as a 'geographically anchored cluster'.

At this distinctive, elaborations of clusters may say more about the *systems* approach. These may be co-ordinated. 'membership' of the network may be seen later in the chapter on clusters. All clusters consist of firms, large and small. In which network relationships exist between research and higher education institutions, technology transfer agencies, vocational training institutions, vocational training institutions and appropriate government support. For an integrative governance structure, consortium or partnership approach towards enhancing the cluster (Hirst, 1994). From such clusters, innovation gains may more likely involve something of a shift towards a degree of self-regulation in a networked society. In Hirst's (1994) terms, a shift from economic governance to a system of knowledge-transfer, supported by a networked structure, also implies decentralised, distributed learning is a crucial feature. It does not have a fount and origin of all economic development and processes in which institutions are important as producers (e.g.

For the *innovative industrial cluster* – i.e. one which is not geographically defined in a region – the interaction will require supplementation, by electronic means, through video-conferencing, electronic mail, distance learning of a more informal kind and so on, as well as, perhaps, less frequent meetings for working parties, fora and the like. Moreover, it may require establishment as a 'network of networks' whereby some local associationalism may occur if there is a critical mass of cluster members in a particular city or locality. Either way – industrial or regional – the cluster requires, not managers as such, but *animateurs* or facilitators. Members, especially firms, must take ownership by having a stake in the network. Responsibility must be taken and rotated amongst member interests to ensure continuity of meetings, information flow, learning-by-interacting, and so on. Some modest subscription system needs to be built-in to such arrangements to provide a secretariat. These are the essentials of 'economies of association.'

Beyond these housekeeping details, there are, finally, two further matters of theoretical relevance which it would be remiss not to discuss. The first is the question of *trust* in network and systems arrangements; the second concerns the mechanisms by which institutional and firm *learning* gains are made.

## 5. TRUST AND MICRO-CONSTITUTIONAL REGULATION

In hierarchies, authority flows from the top down. In markets, transactions are authorised by exchange of resources or contracts. Relationships are governed purely by utility-maximisation. In heterarchies (networks), neither of these categories of influence dominates. Rather, networks and other heterarchic and systems arrangements rely upon trust in relationships. In pondering the issue of trust, Sabel (1992; 1993) has usefully introduced the notion of 'studied trust'. That is, instead of just assuming trust to be an instinctive, difficult-to-analyse phenomenon, we need to think about it and systematically analyse why it works, why it breaks down and how to learn to make it work better. Studied trust is, as it were, the product of systematising that analysis. Research in this field is in its infancy, though Fukuyama (1995) has begun to explore it in a general way.

Sabel's (1992) case is that trust is the mutual confidence that no party to an exchange will exploit the other's vulnerability. If trust is absent, no-one will risk initiating an arrangement and everyone will sacrifice the gains of co-operation to the cut-throat or conservative pursuit of self-interest. If there is a sufficiently high probability of a breach of trust in, say, a supply chain, each actor will seek to cease trading at the last-but-one point

before breakdown point. Self-interest is furthered by withdrawing from exchanges, even those that are trustworthy. In more recent work, Sabel (1993) detaches his analysis of trust from its apparent correlate, self-interest, arguing that trust is demonstrably a prudent course of action because it integrates actors into a society which, in itself, is a preferable human condition to a Robinson Crusoe-like isolationism. Pushing this further, Ostrom (1992), Putnam (1993) and Sabel (1993) explore the 'constitutional order' (Sabel) or 'micro-constitutional regulation' (Ostrom) by which holonic 'social capital' (Putnam) is successfully deployed. Heterarchies or networks develop 'constitutions' or rules and routines of the game by which members regulate themselves and each other. We saw how these operate, mostly beneficially, but sometimes pathologically, in industrial districts. Breaches of trust betray micro-constitutional regulation mechanisms, destroying the constitutional order and devaluing the social capital of the network.

In such circumstances, the positive learning disposition of network members deflates into merely defensive learning of the 'once bitten, twice shy' variety. Sabel suggests there are only two ways to get back on track: one, if the gains from risking a breach of trust outweigh the losses; and two, where social capital of a cultural, community, ethnicity or religious kind produces sanctions great enough to prevent a breach in the first place, or supplies a strong enough basis for the breach to be repaired.

Where trust is not breached, where the network is confident and forward looking, institutional learning, by-doing, by-using, by-searching, by-exploring, by-interacting, by-learning itself, can thrive. In Johnson's (1992) interesting formulation, interactive learning (embodying most of the types of learning, e.g. by-doing, by-using etc.) results in two processes; one, of augmenting an individual, firm or institutional stock of knowledge; two, causing the forgetting of redundant knowledge. The convergence of new and existing knowledge, in the form of innovative ideas and projects, leads, after an institutional selection process, to innovation, whether of product or process.

## 6. CONCLUDING REMARKS

We are now in a position to distinguish between industrial districts, networks and clusters:

- Industrial districts tend to be mono-industrial, SME-dominated, highly localised production systems in which firms interact through dense networks of sub-contracting and with a highly differentiated division of labour. Enterprise support organisations can be located inside the industrial district;

- Networks are more-or-less agreements amongst firms product or product-range, equipment and competitor agreements and firms will. Networks may be geograph
- Clusters are voluntary arrangements through markets, networks in their general business processes, assets, probably some sector common vision of what they often regional in scale.

This has been a rather wide-ranging thinking and empirically-based weaknesses of the idea of collaboration juxtaposition to the idea of competition case has been made that both, variations nowadays, in an increasingly post-consideration of the ways of social collaboration has come to the fore.

Evolutionary economic theory, constitutional theory cluster theory are key bases for analysing competition highlighting the important role and of heterarchic or network forms partnership is, not infrequently, a economies which are also relatively Ireland, in this respect, has scant ground partnership down from the common business of economic activity.

In the succeeding chapters, a number of networked inter-firm, inter-agency integrative governance structures are concrete detail. These case-reviews the Irish situation to make a preliminary readiness and receptiveness to pursue



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- Networks are more-or-less formalised, possibly contractual, agreements amongst firms to engage in joint production of a given product or product-range. Reciprocity and exchange of skills, equipment and competencies can be the subject of network agreements and firms will share an agreed business objective. Networks may be geographically circumscribed but need not be;
- Clusters are voluntary arrangements in which firms may operate through markets, networks and aspects of hierarchy to assist them in their general business process. Firms will have complementary assets, probably some sectoral identity and are likely to share a common vision of what they are trying to achieve. Clusters are often regional in scale.

This has been a rather wide-ranging, but necessary, survey of recent thinking and empirically-based reflection on the strengths and weaknesses of the idea of collaboration as a competitive weapon in juxtaposition to the idea of competition as a competitive weapon. The case has been made that both, variably, come into play all the time but nowadays, in an increasingly post-Fordist era, the need for serious consideration of the ways of securing the basis for constructive collaboration has come to the fore.

Evolutionary economic theory, industrial district theory, micro-constitutional theory cluster theory and the theory of interactive learning are key bases for analysing competitive advantage. They converge in highlighting the important role and function, but also occasional pitfalls, of heterarchic or network forms of economic co-ordination. Social partnership is, not infrequently, an over-arching feature of political economies which are also relatively heterarchic in their business affairs. Ireland, in this respect, has scant grounds to fear the notion of pushing partnership down from the commanding heights to the day-to-day business of economic activity.

In the succeeding chapters, a number of national and regional instances of networked inter-firm, inter-agency system relationships and systems integrative governance structures and policy-actions will be explored in concrete detail. These case-reviews will be a prelude to referral back to the Irish situation to make a preliminary assessment of the country's likely readiness and receptiveness to pursue such a path.

## EMILIA-ROMAGNA, I AND THE LIMITS INNO

### 1. INTRODUCTION

Emilia-Romagna has acted as a t development organisations through difficult to identify: measured in Europe, it has had an unemployment rate compared to Italy's 11 per cent; an of Europe's highest per capita GDP this in a region which is dominated located polycentrically in industrial specialisation (Carpi for knitwear shoes, etc.) is the norm. Emilia-Romagna surviving anachronism, but of a dynamic co-ordination in which *co-operati* (Dei Ottati, 1994).

TAB  
Emilia-Romagna I

	Emilia
Population (1991)	3.1
Labour Force Participation Rate (1991)	(work)
Labour force (1991)	1.1
Employment in Agriculture	
Industry	
Services	
GDP per capita (1991; in per cent of EU average)	
Unemployment rate (1993)	(work)

Source: Eurostat.



## CHAPTER 2

### EMILIA-ROMAGNA, INDUSTRIAL DISTRICTS AND THE LIMITS OF DOWNSTREAM INNOVATION

#### I. INTRODUCTION

Emilia-Romagna has acted as a tutor to local and regional economic development organisations throughout the world. The reasons are not difficult to identify: measured in per capita income it ranks eighth in Europe, it has had an unemployment level consistently below 5 per cent compared to Italy's 11 per cent; and the regional economy recorded one of Europe's highest per capita GDP rates to the 1990s (see Table 2.1). All this in a region which is dominated by small firms (some 310,000 in all) located polycentrically in industrial districts where mono-industrial specialisation (Carpi for knitwear, Bologna for machinery, Forli for shoes, etc.) is the norm. Emilia-Romagna has the character, not of a surviving anachronism, but of a dynamic pointer to a future of industrial co-ordination in which *co-operation* results in competitive advantage (Dei Ottati, 1994).

TABLE 2.1  
Emilia-Romagna Economic Indicators

	Emilia-Romagna	EU(EUR 12)
Population (1991)	3.9 million	344.8 million
Labour Force Participation Rate (1991)	53.2% (women: 41.9%)	55.1% (women: 43.4%)
Labour force (1991)	1.8 million	142.0 million
Employment in Agriculture	8.6%	6.4%
Industry	35.1%	33.3%
Services	56.3%	60.3%
GDP per capita (1991; in per cent of EU average)	129%	100%
Unemployment rate (1993)	4.7% (women: 7.3%)	10.4% (women: 12.2%)

Source: Eurostat.

However, recent developments in the districts have led to a reappraisal of the model of localised sub-contracting and so-called 'flexible specialisation' (Piore & Sabel, 1984) not least because of innovation deficits in the district approach to production and competition. Because of the craftsman and artisan traditions in the districts, problems have usually been solved locally and internally to the district. Later it will be shown how, in the Carpi knitwear district, innovation was controlled locally and successfully though not without outside assistance. But, in general, such solutions are good examples of what may be called 'downstream' innovation. By downstream innovation is meant the kind of thinking which, in a different field, produces 'end-of-pipe' solutions to pollution problems. This occurs when pollution scrubbers are fixed to, for example, power-station chimney stacks to reduce sulphur emissions. An 'upstream' innovation would be one that resulted in a systemic redesign of power-generating technology to reduce emissions before they arrived at the end-of-pipe. Upstream innovation strongly implies advanced scientific and technological knowledge of the kind not normally found in industrial districts. Rather it resides in universities, specialist research institutes and the R&D laboratories of large companies or specialist consultancies. Emilia-Romagna is at the stage where its traditional downstream problem-solving approach, which has enabled its firms to renew their competitive edge many times, may have reached its limits.

## 2. EMILIA-ROMAGNA: UPGRADING THE DISTRICTS

Emilia-Romagna can be seen to have passed through three stages of development towards its present economic situation. This has been summarised by Brusco (1990) as the passage from a Mark 1 Marshallian (1919) industrial district model based on organic inter-firm linkages and associated 'industrial atmosphere', or cultural identity capable of transformation into collective enterprise, to a Mark 2 stage in the 1980s. In the Mark 2 stage, what had hitherto been unreflective social norms of behaviour became embodied in the 'real service' centres. These were local in origin but funded by the regional government and organised collectively. Where innovation was in demand, this was met by networking with sympathetic Italian national research institutes. Now, a third phase has been reached, because this successful system of 'real service' provision is no longer sufficient to meet the threat of competition in the 1990s.

In a different, but related analysis, Patrizio Bianchi and his NOMISMA (a Bologna political economy research institute) collaborators (e.g. Bianchi & Giordani, 1993) anatomised the development of the Emilian industrial districts in the following way:

### (i) Phase 1

This begins in the 1960s and Emilia-Romagna, like many north firms providing basic products for be agricultural machinery and reside with the large agricultural and small firms were artisan firms, offic by artisan's associations such as Artisans) or CNA (the National Co large firms inside, but mostly buffer-suppliers due to increasing the machinery industry were target quantitative instability. In textiles, main textile industrial district, had When the industry collapsed in the the main source of production – d contacts with large firms to begin Later, some began producing T-shi in the area. Later, as agricultural w on in small and medium firms expa firms, often directly or indirectly, in and medium enterprises (SMEs) in

### (ii) Phase 2

By the end of the 1970s and into th established as sub-contractors or in flexibility in both the quantity and, ir This coincided with a major crisis ir experienced a severe decline in dem signified something of a change consumer goods. It marked the end standardised, mass-produced goods sold on mass-markets. For one th forced by the debt-crisis induced l hikes of Western governments to e often of such a scale, rapidity and int they posed real problems for both latter, they posed the problem c downmarket products, forcing a mc those industrial district firms in dir also vacated markets to cheap im compete. The SMEs responded fast

districts have led to a reappraisal of the situation and so-called 'flexible' districts. At least because of innovation and competition. Because of the districts, problems have moved to the district. Later it will be clear that innovation was controlled not by outside assistance. But, in the examples of what may be called 'flexible' innovation is meant the kind of innovation that produces 'end-of-pipe' solutions. Pollution scrubbers are fixed to factories to reduce sulphur emissions. This is that which resulted in a systemic change to reduce emissions before they occur. Innovation strongly implies a knowledge of the kind not normally found in universities, specialist centres or offices of large companies or a focus is at the stage where its development is in progress, which has enabled it to be done many times, may have reached its

## MOVING THE DISTRICTS

passed through three stages of development. This has been the case from a Mark 1 Marshallian district with organic inter-firm linkages and a strong cultural identity capable of moving to a Mark 2 stage in the 1980s. The unreflective social norms of the 'service' centres. These were controlled by government and organised labour. When demand, this was met by government research institutes. Now, a successful system of 'real' districts meet the threat of competition

Bianchi and his NOMISMA (National Institute) collaborators (e.g. the development of the Emilian

### (i) Phase 1

This begins in the 1960s and lasts up to the end of the 1970s. Emilia-Romagna, like many northern Italian regions, had many small firms providing basic products for a local market. A case in point would be agricultural machinery and repairs which had long-existed side-by-side with the large agricultural and foodstuffs industries. Many of these small firms were artisan firms, officially classified as such and represented by artisan's associations such as GCA (General Confederation of Artisans) or CNA (the National Confederation of Artisans). In the 1960s, large firms inside, but mostly outside the region, were seeking buffer-suppliers due to increasing variations in demand. Artisan firms in the machinery industry were targeted by such firms seeking to deal with quantitative instability. In textiles, the trajectory was different. Carpi, the main textile industrial district, had been a centre for straw hat making. When the industry collapsed in the 1940s, agricultural homeworking – the main source of production – dried up. However, artisans used their contacts with large firms to begin selling (not making) cheap clothing. Later, some began producing T-shirts, using the homeworking tradition in the area. Later, as agricultural work declined, more labour was taken on in small and medium firms expanding into factory production. Large firms, often directly or indirectly, influenced the course followed by small and medium enterprises (SMEs) in this phase.

### (ii) Phase 2

By the end of the 1970s and into the 1980s, the SMEs that had become established as sub-contractors or independent producers began to show flexibility in both the quantity and, importantly, the quality of their output. This coincided with a major crisis in the early 1980s in which large firms experienced a severe decline in demand for their products. This recession signified something of a change in the nature of markets for final consumer goods. It marked the ending of the era when fundamentally standardised, mass-produced goods of average quality could easily be sold on mass-markets. For one thing, less developed countries were forced by the debt-crisis induced by the anti-inflationary interest-rate hikes of Western governments to engage in export-drives. These were often of such a scale, rapidity and intensity that, for clothing in particular, they posed real problems for both mass-producers and SMEs. For the latter, they posed the problem of very rapid emulation of fairly downmarket products, forcing a more up-market posture on the part of those industrial district firms in direct competition. Many larger firms also vacated markets to cheap imports where they could no longer compete. The SMEs responded faster and more flexibly to the demand

crisis. Large multinationals were not in a position to erect barriers to SME entry. The small-firm sector had gained an advantage which larger firms could neither match nor prevent.

### (iii) Phase 3

The third phase of development in the Emilian SME sector has occurred since the beginning of the 1990s. It is the most difficult period faced by the firms of the industrial districts, provoked in part by the reactions of large firms to the success of the SMEs in the 1980s. But this crisis is also a product of the emerging single European market and trends towards globalisation of production more generally.

Faced by heightened global competition, large firms have responded in ways comparable to those of the SMEs a decade earlier. They have engaged in more intensive product and process innovation and have developed more flexibility in their management of the product cycle. Instead of producing for the mass-market, they have focused upon more rapid turnaround in more diversified and quality-conscious markets. An innovation of particular importance has been the move by large firms in the machinery, garments and food-processing industries to control distribution networks. This is consistent with one of the effects of economic integration and the globalisation of production, namely the necessity to gain access to the markets of competitor firms. Not infrequently, this is achieved by the formation of complementary strategic alliances or joint ventures with other large companies. Small and medium-sized enterprises find this form of competition difficult to deal with. Fundamentally, they tend to be price and product-takers or followers. They react to the innovations of others. When the price and product leaders 'leave the room' as it were, this works. But if, as may now be the case, leaders are seeking to introduce oligopolistic rule, especially through the control of distribution chains, it is a less viable strategy. The issue for SMEs is whether they can reorganise to become innovators, if so which form is most appropriate given that there has to be a high degree of collaborative effort, and what is the best role for regional and local government institutions in assisting SME innovation.

### 3. THE ERVET SYSTEM

At the heart of the region's institutional apparatus lies ERVET (Ente Regionale per la Valorizzazione Economica del Territorio), the regional development agency established in 1974. One of the distinctive features is that ERVET has a shareholding structure which positively integrates the potential of the public and private sectors, of credit and financial

institutions, entrepreneurial associations. ERVET places great emphasis on 'real services' (*servizi reali*), which are supported by a wider support network, the core of the ERVET system. Real services are to be provided through grants (grants, loans, tax relief etc.) and other activities, e.g. R&D, market research, control and professional training, which generate structural, rather than organisational, changes in the organisation of a company. The emergence of ERVET is the result of two factors. First, the regional government and therefore it is not able to disengage itself from an attempt to make a virtue of necessity. The provision of real services has become more important than the provision of finance. Although the services are free of charge, the fees are set below the rate of the private consultancy.

The services and activities in which ERVET is engaged fall into three categories:

- **Sectoral Projects:** This category involves economic analysis and strategic research into the region's economy. By and large, the focus is on what projects will be needed to improve the region, helping to implement the 'strategies of entrepreneurial forces' (Bianchi, 1990). At the sectoral level, there tends to be a focus on business service centres, mainly in the areas of research which means that they have a direct impact on the problems of the sector.
- **Horizontal Projects:** These are targeted on the environment and are aimed at environmental control, i.e. activities that have a direct impact on the regional economy. On the Emilian side, ERVET is responsible for forging alliances between like-minded regions in the area of technology transfer and joint development programmes. As regards credit, ERVET has enormous significance to its role in providing loans to train employers and employees in management;
- **Territorial Projects:** These are aimed at promoting growth-sustaining environments.

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institutions, entrepreneurial associations and chambers of commerce. ERVET places great emphasis on the provision of what it calls 'real services' (*servizi reali*), which are either provided directly or through its wider support network, the core of which is the business service centre system. Real services are to be distinguished from financial services (grants, loans, tax relief etc.) and they cover a wide array of different activities, e.g. R&D, market research, technical consultancy, quality control and professional training etc. Real services are defined as those which generate structural, rather than temporary, changes in the organisation of a company. The emphasis placed on real services stems from two factors. First, the regional government has a very limited budget and therefore it is not able to dispense financial grants. Second, in an attempt to make a virtue of necessity, the regional authorities believe that the provision of real services has a more innovative impact on the firm than the provision of finance. Although real services are not dispensed free of charge, the fees are set below the prevailing market rate, i.e. below the rate of the private consultancy sector.

The services and activities in which ERVET is directly engaged fall into three categories:

- **Sectoral Projects:** This category of services covers sectoral analysis and strategic research for all the main sectors of the region's economy. By and large, this means taking an overview of what projects will be needed in the medium term and then helping to implement them 'in co-operation with the entrepreneurial forces' (Bianchi & Giordani, 1993). At this sectoral level, there tends to be a division of labour with the business service centres, many of which are sectorally oriented, which means that they have a much more intimate understanding of the problems of the sector;
- **Horizontal Projects:** The main lines of action in this category are targeted on the environment, European integration and quality control, i.e. activities that have an impact across all sectors of the regional economy. On the European front, for example, ERVET is responsible for forging alliances between Emilia-Romagna and like-minded regions in the EC, the aim being to promote technology transfer and joint-ventures to exploit the EC's R&D programmes. As regards quality control, ERVET attaches enormous significance to its Quality Project, which is designed to train employers and employees in the techniques of total quality management;
- **Territorial Projects:** The aim of these actions is to create a growth-sustaining environment by rehabilitating derelict land and

buildings, on the one hand, and on the other, to balance territorial needs and resources. Of growing importance here is ERVET's goal of creating a pollution-free environment.

In addition to ERVET, a crucial part of the regional innovation support function is played by the business service centres, all of which are shown in Table 2.2. These centres are of two types: (1) sectorally-focused centres, which are geared to the specific requirements of a particular sector and (2) regional centres, which are geared to economy-wide activities, like technology transfer (Aster), sub-contracting (Resfor) and export promotion (Ase). Each of these centres is financially supported by ERVET as well as by other public and private bodies, e.g. local authorities, chambers of commerce and trade associations etc. In order to involve these wider 'entrepreneurial forces', most of the centres seek to enlist them as shareholders and as members of the governing board. This strategy is not simply motivated by financial considerations.

Quite apart from their valuable feedback role, these organisations also help to establish the commercial credibility of the centres, without which it is impossible to build high-trust relationships with the private sector.

#### 4. CITER AND CITERA: DOWNSTREAM INNOVATION IN THE KNITWEAR INDUSTRY

Based in Carpi, a few miles north of Bologna, CITER is the business service centre dedicated to the textile and clothing industry. Created in 1980, this centre originated as a professional training initiative which began in 1976, funded by the European Social Fund. The initial sponsors of this 'real services' centre were ERVET, the Emilia-Romagna development agency, the municipality of Carpi and a number of trade associations. By the early 1990s, CITER had 20 full-time staff. At the beginning it was funded wholly by public sector resources, but by 1990, some 70 per cent of total income (£1.5 million) was generated from services rendered and fees from its 760 member firms.

On the technology front, one of the most interesting innovations undertaken by CITER in recent years is the Citera workstation for creative design, a computer aided design (CAD) system developed in co-operation with ENEA (the Italian National Energy Research Institute). CITER believes that local firms need to utilise CAD to a much greater extent than hitherto because of the ever-growing pressure to abbreviate 'time to market' cycles in the clothing industry. The Citera workstation is thus a good test of CITER's ability to educate the industry into moving towards a new and more sophisticated technological trajectory. Let us consider

TABLE 2.2  
Business Service Centres in Emilia-Romagna

Name	Location	User Category	Services Offered	Year of Establishment	Employees
Agencia Polo Ceramico	Faenza	Ceramics	Information, research	1988	1
ASE	Ravenna	All sectors	Promotion	1986	2
ASTER	Bologna	All sectors	Documentation, databank access, planning	1985	11
CEMOTER	Ferrara	Earth removal machines	Certification, research	1982	13
Centro Ceramico	Bologna	Ceramics	Experimentation, testing,		



e other, to balance territorial importance here is ERVET's environment.

regional innovation support centres, all of which are shown in Table 2.2: (1) sectorally-focused centres, geared to economy-wide requirements of a particular sub-contracting (Resfor) and which is financially supported by private bodies, e.g. local associations etc. In order to be effective, most of the centres seek to be approved by the governing board. This is a major consideration.

Moreover, these organisations also depend on the centres, without which they cannot cope with the private sector.

**TEAM INNOVATION IN**

Emilia-Romagna, CITER is the business centre for the clothing industry. Created in 1976 as a national training initiative which was funded by the National Fund. The initial sponsors were ERVET, the Emilia-Romagna Chamber of Commerce and a number of trade associations. It had 20 full-time staff. At the end of 1990, it had generated from 1000 member firms.

Other interesting innovations include the CITER workstation for creative design (developed in co-operation with the Centro Ceramico Research Institute). CITER is a workstation to a much greater extent than the CITER workstation is thus a major industry into moving towards a new trajectory. Let us consider

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CEMOTER	Ferrara	Earth removal machines	Certification, research	1982	13
Centro Ceramico	Bologna	Ceramics	Experimentation, testing, research, training	1976	31
CERCAL	Forli	Shoes	Fashion trends, training	1983	3
CERMET	Bologna	Metals	Documentation, analysis, technological consulting	1985	8
CESMA	Reggio Emilia	Agricultural machinery	Studies and research	1983	4
CITER	Modena	Textiles, clothing	Fashion trends, information, research	1980	17
QUASCO	Bologna	Construction	Information, research, training	1985	11
RESFOR	Parma	Mechanics sub-contracts	Information, promotion	1986	4

Source: ERVET

the potential benefits of Citera in more detail. To understand the significance of CAD, we have to appreciate the nature of the local industry into which it is beginning to diffuse. According to CITER some 11,136 clothing and knitwear firms operate within the region of Emilia-Romagna, 2,600 of which are located in Carpi itself. Of the Carpi total some 1,850 operate solely as sub-contractors, each performing a small part in the production chain, e.g. knitting fabric, overlocking or button-holing. The remaining 750 are in direct contact with the retail market and these firms are typically involved in a much wider array of operations, e.g. design, marketing, grading, pattern-making, packaging and dispatch. Cutting and making-up are sub-contracted within their own network of specialised small firms.

In markets characterised by very small order sizes (typically less than 1,000 garments) companies require several hundred styles for a given season. Companies involved in *pronto moda* (i.e. quick fashion) experience an even more dramatic turnover of styles. This can represent a high cost to the company. (In the UK context, for example, the International Wool Secretariat has estimated that each sample design costs £2,500 to produce in designers' time, machinists' wages, materials and overheads). CAD facilities can lead to faster production of new styles and samples, with significant cost savings, especially in terms of designers' time. In addition to cost savings, CAD enhances responsiveness to market trends and retailers' demands. Through CAD a company can boost its position in the market by offering retail buyers a shorter lead time into the production of new styles. Furthermore, CAD enables a company to produce the same basic garment with a much wider range of variants. Many companies perceive CAD to be a key part of any strategy to move into higher value production based on versatile responses to market trends.

Of the 760 members of CITER, 120 make use of the Citera system. To date 90 of these firms have purchased the system outright, and the remainder use it on a bureau basis. The initial minimum outlay for the purchase of Citera is roughly £40,000. However, the total cost, including training of existing staff, maintenance etc., is said to be in the region of twice this figure. The initial cost also includes access to a 'club' of users who meet regularly to discuss the development of the system with engineering and software specialists from CITER. The content of Citera disks is updated every 3-4 months and the design of the software is updated at least every 12 months. Follow-up services form an integral part of the Citera package, and these services were perceived to be excellent by all the companies interviewed (including the one non-user).

#### (i) Evaluating Citera: How Do

To gain a first-hand assessment of the system, five companies were interviewed (four users and one non-user) and five firms which were in direct contact with the system. The question here is, to what extent does the Citera system meet the needs of local firms? Before answering this question, it is clear that Citera can be used throughout the production chain from the initial concept through to grading and cutting on the machines.

The interviews suggested that the benefits of Citera are felt by all the companies. Even though Citera offers a range of computer-based line and colour design facilities, the use of images and the ability to generate patterns allows the user to use the system at the more creative end of the design process. Design ideas from external studios, using CAD, can be translated into precise cuts and patterns. This allows this process to be undertaken more efficiently, from colour and to the detail of garment construction, thus working to a much clearer set of specifications.

Significantly, all the interviewees valued the benefits of Citera with such improvements in versatility or quality of production. Producing disks which can be read by the machines of the type used by many sub-contractors allows this to happen because they feared the loss of their position away to potential competitors. Citera's position of power within the chain of production is the information that allowed them to produce such information flowed informally. The interviewees said that they sought to keep it confidential. Citera lay in the link between design and production. A fragmented production process, demands an ability to produce many styles. Many will fail to find orders. Citera allows styles more quickly for approval by the production times for successful styles. The Emilian model, so Citera does not limit the number of styles. But most companies appear not to be aware of the overall savings generated by Citera.

Each of the five companies surveyed with Citera, linked to the concentra



detail. To understand the nature of the local industry going to CITER some 11,136 are within the region of Emilia in Carpi itself. Of the Carpi sub-contractors, each performing a different task, such as cutting fabric, overlocking or direct contact with the retail market, are engaged in a much wider array of tasks, such as pattern-making, packaging and sub-contracting within their own

smaller sizes (typically less than a hundred styles for a given *moda* (i.e. quick fashion) range of styles. This can represent a significant context, for example, the fact that each sample design involves high wages, materials and the faster production of new styles and savings, especially in terms of savings, CAD enhances the industry's demands. Through CAD a benefit is offered to retail buyers by offering them a wider range of styles. Furthermore, CAD in garment production with a much wider range of CAD to be a key part of any production based on versatile

use of the Citera system. To the system outright, and the initial minimum outlay for the system, the total cost, including the time spent, is said to be in the region of £10,000. Access to a 'club' of users and the content of the system with CITER. The content of Citera is the design of the software is the services form an integral part of the system (including the one non-user).

**(i) Evaluating Citera: How Do Firms Rate the Service?**

To gain a first-hand assessment of the utility of Citera, five local firms were interviewed (four users and one non-user), all drawn from the 750 firms which were in direct contact with the retail market. The key question here is, to what extent does the Citera workstation serve the commercial needs of local firms? Before answering this question, it is worth saying that Citera can be used throughout the design process, from developing the initial concept through to grading and the programming of knitting machines.

The interviews suggested that the system is only used in part by most companies. Even though Citera offers a potentially powerful combination of computer-based line and colour forecasts, an extensive databank of images and the ability to generate endless variants of styles, not all firms use the system at the more creative stages of design. Many firms buy-in design from external studios, using Citera to 'realise' these images by translating them into precise cuts of fabric or knitting patterns. The system allows this process to be undertaken with great accuracy, both in relation to colour and to the detail of garment construction. Sub-contractors are thus working to a much clearer set of instructions.

Significantly, all the interviewees were adamant that they would not share the benefits of Citera with sub-contractors even if this led to improvements in versatility or quality. Although Citera is capable of producing disks which can be read by programmable knitting machines of the type used by many sub-contractors, companies would not allow this to happen because they feared that they might be giving too much away to potential competitors. Citera was seen as giving its users a position of power within the chain of production – providing them with the information that allowed them to be network leaders. Nevertheless, such information flowed informally, even though firms that had invested said that they sought to keep it confidential. The main benefits of using Citera lay in the link between design and marketing, rather than between design and production. A fragmented market, particularly at its highest levels, demands an ability to produce a vast number of styles even though many will fail to find orders. Citera allows companies to produce more styles more quickly for approval by retail buyers. On the other hand, short production times for successful styles have always been a feature of the Emilian model, so Citera does not lead to any great gains in this respect. But most companies appear not to cost production very systematically, and overall savings generated by Citera are rarely calculated.

Each of the five companies surveyed identified a common set of problems with Citera, linked to the concentration of expertise in the hands of one

or two highly trained operatives. These misgivings may be influenced by two 'cultural' elements of the Emilian economy:

- Firstly, it may be argued that the ability of the owner-manager (who is likely to have been trained on the shop floor) to oversee the entire production process in a more or less interventionist and hierarchical way is central to the Emilian tradition;
- Secondly, the existence of a shared technical discourse across the industry is central to its integration and to the co-ordination of a very decentralised system of production.

Both of these elements are threatened by the creation of a specialised technical realm which works against traditional and seemingly common sense patterns of co-operation, especially in a sphere so crucial to the competitiveness of firms. That the majority of trained operators – from which Citera technicians are drawn – are female adds a gender dimension to the cultural barriers to adopting the new practices.

How should CITER's role in diffusing the Citera system be assessed? What is clear is that Citera tends to be confined to the larger companies, mainly on account of the capital outlay involved. Firms operating Citera seem to doubt its ability to justify itself in financial terms alone, and this is compounded by the fact that the system is rarely used to its full capacity. Its advantage clearly lies in its ability to aid longer term diversification into high value markets, rather than because it can produce immediate returns on investment. In this sense, CITER has achieved a notable success in the promotion of Citera.

Each Citera user surveyed linked its decision to adopt the system to its existing membership of CITER and to a high degree of satisfaction with CITER service generally. CITER kept them abreast of products and technological developments on a regular basis, and Citera was presented as a logical progression of their involvement with the centre and its services. In other words, the interviewees subscribed to the view that innovation can be disseminated most effectively through existing networks which have been tried and tested. CITER's creation of a local forum, in which local industrialists can meet on a regular basis, was thought to be central to the trust and co-operation on which the dissemination of Citera has depended.

## (ii) The Firms in Context

To gain a more precise evaluation of Citera and the utility of CITER more generally, let us look at each of the firms in our panel.

### *Severa*

Severa was formed in 1935 and 1980, because the bulk of production in line with the pattern adopted for its main product lines are men's, which is destined for the Italian *pronto moda* (mainly for the Italian market) around half of which was exported.

Only samples are cut or made sub-contracted to an average of 10 sub-contractors are located in the area. An increasing number are local, but many are sub-contracting outside the region. The quality and reliability of delivery, and the speed of what constitutes an 'average' order, have been falling in size in recent years. Lead times for follow-up orders are long. The electronic point of sales (EPOS) system is used, but not of fast changing consumer trends.

Citera is used to interpret designs and plays no part in the initial design. The advantages of the Citera system over traditional cycle times in the preparation of patterns are very important in helping the company to compete in export markets. Citera's ability to play a major role in the company's production, however, had not been calculated, and the benefits achieved in terms of product quality and the greater production which resulted from the use of Citera.

The main problems identified with Citera, indeed, the factory manager clearly recognised the benefits which accrued from the system concentrated expertise (design and software specialists) transferred to young women. The company (a family business) also questioned whether the benefits of the extent to which Citera is utilised.

CITER's role in informing the company was considered helpful, but not a deterrent.

misgivings may be influenced by economy:

the ability of the owner-manager (based on the shop floor) to oversee a more or less interventionist and traditional Emilian tradition;

the spread of technical discourse across the region and to the co-ordination of a production.

the creation of a specialised additional and seemingly common language in a sphere so crucial to the priority of trained operators – from the female adds a gender dimension to work practices.

the Citera system be assessed? confined to the larger companies, involved. Firms operating Citera on financial terms alone, and this is rarely used to its full capacity. to aid longer term diversification because it can produce immediate results CITER has achieved a notable

decision to adopt the system to its high degree of satisfaction with them abreast of products and on a regular basis, and Citera was presented in agreement with the centre and its members subscribed to the view that it could be effectively through existing means. CITER's creation of a local meeting on a regular basis, was the co-operation on which the

and the utility of CITER more on our panel.

### Severa

Severa was formed in 1935 and it employs 85 people, down from 500 in 1980, because the bulk of production operations have been contracted out in line with the pattern adopted by other firms in the Carpi district. Its main product lines are men's, women's and children's knitwear, most of which is destined for the Italian market. Production was split between *pronto moda* (mainly for the Italian market) and seasonal production, around half of which was exported.

Only samples are cut or made up internally and production runs are sub-contracted to an average of 15-20 small firms per garment. These sub-contractors are located mainly in Emilia-Romagna, though an increasing number are located in other Italian regions. But sub-contracting outside the region brings serious problems related to quality and reliability of delivery. The factory manager appeared unaware of what constitutes an 'average' production run, but seasonal orders had been falling in size in recent years. Retailers were also demanding shorter lead times for follow-up orders in *pronto moda* ranges, partly because of electronic point of sales (EPOS) technology made for a greater awareness of fast changing consumer trends.

Citera is used to interpret designs commissioned from an external studio and plays no part in the initial creative process. One of the main advantages of the Citera system was that it offered significantly reduced cycle times in the preparation of new ranges. Furthermore, great advantages in terms of accuracy of detail and colour were also reported, very important in helping the company to move into higher value seasonal export markets. Citera's ability to create high quality images also played a major role in the company's marketing presentations. Cost savings, however, had not been calculated, though some gains were said to have been achieved in terms of production costs and stock levels. Above all, the company cited the greater responsiveness and ability to plan production which resulted from the use of Citera.

The main problems identified with Citera focused on cultural resistance: indeed, the factory manager clearly hated the system even though he recognised the benefits which accrued. Company managers in general felt that the system concentrated expertise in the hands of two technicians (design and software specialists) trained to operate it – both of whom were young women. The company (a relatively large enterprise by Carpi standards) also questioned whether the initial outlay was justified in terms of the extent to which Citera is utilised on a day-to-day basis.

CITER's role in informing the company's decision to adopt CAD was considered helpful, but not a determining factor. Independent consultants

were also used to assess the benefit to the company. It was also felt that CITER's ability to offer impartial advice might be compromised by its marketing of Citera. The follow-up support on Citera was considered to be excellent, especially in relation to software improvements. Training of staff on Citera was also of a high quality, 'though not specifically targeted to our needs'. Day-to-day problem solving with Citera would be undertaken by internal specialists, though CITER was at hand if needed.

Other CITER services were also used, in particular the Fashion Forecasting service, which was considered excellent. The company had a somewhat negative attitude to the training services offered by CITER and other providers, which were 'always too costly'. As regards technology transfer to its sub-contractors, the company emphatically refused to allow the latter to programme machines directly from Citera, and indeed refused to let them have access to Citera in any way at all. Managers felt that Citera offered the company a considerable advantage in terms of 'network leadership' and they did not want to lose this position by sharing information. In part they also feared the pirating of designs by their sub-contractors. The Severa case study suggests that information does not travel as freely between firms as the theorists of the 'Emilian' model have argued. In other words, proprietorial attitudes constitute an important barrier to the diffusion of new technology.

#### *Carma*

Carma was founded in 1960 and it employs 110, down from 600 in 1975, because the bulk of production operations has been farmed out to sub-contractors. Some 80 per cent of its output consisted of women's knitwear, the remaining 20 per cent made up of men's knitwear. Approximately 50 per cent of output was manufactured on a seasonal basis, the other half was *pronto moda*. In terms of value, the proportion of *pronto moda* production has fallen in recent years because seasonal ranges have become more up-market. As with Severa, only samples are cut or made up internally, since production was sub-contracted to a group of 12 firms, all of which were located in Veneto, Puglia or Calabria, because these areas had lower wage cost advantages over Emilia-Romagna. However, new sub-contractors were being sought in Slovenia and Greece, in part because the company was under considerable pressure from retailers to cut prices. Local homeworkers were used on occasion, but as little as possible because of problems with quality and reliability. Average production runs varied in size (circa 100-1000 garments) depending on the style, but the size of orders in some segments of the market was increasing due to a gradual process of retail concentration and the growth of sales through supermarket chains. Lead times were

decreasing in export markets both *pronto moda* and season.

Citera was only used for the France. Citera offered the con the range of styles and the colc for the production of new sty played only a small part in this increasingly important marketi as a substitute for the productio buyers with whom an establish as a key tool in the company's resistance was cited as a proble use had provoked new confli managers. The owner-manag relinquish 'hands-on' control of to the young women trained to o also concerned that the rate of uti outlay on the system.

The company sought advice from Citera, and seemed keen to stru independently of CITER. But its important influence in the decisio 'joining the club' of local innova CITER were considered excelle solving and implementation. CI technician to use the system. The n to be 'satisfactory', while the sty. CITER Fashion Forecasting serv though its production advice was company expressed the view that C firms, though the likely benefits w for sharing the Citera system with 'definitely not', for the same reaso

#### *Finmoda*

Finmoda was founded in 1975 and are men and women's knitwear, 55 EC countries. All production is Samples were manufactured intern routed through a complex network were located mainly though not

company. It was also felt that it might be compromised by its reliance on Citera as a source of design ideas and technical improvements. Training in the use of CITER was considered to be a necessary investment, though not specifically aimed at solving problems with Citera would be at hand if needed.

in particular the Fashion system was excellent. The company had found the services offered by CITER to be too costly. As regards the use of CITER, the company emphatically stated that it would not purchase machines directly from Citera, but would continue to use Citera in any way at all. The company did not see any considerable advantage in doing so and did not want to lose this position. The company also feared the pirating of designs by other firms. It is suggested that information from the theorists of the 'Emilian' production attitudes constitute an important part of the technology.

110, down from 600 in 1975, has been farmed out to a number of small output consisted of women's knitwear. The mix made up of men's knitwear. The company manufactures on a seasonal basis. In recent years because seasonal demand is high, only samples are produced. The company was sub-contracted to a group of firms in Veneto, Puglia or Calabria, but has not seen the advantages over Emilia-Romagna. It is being sought in Slovenia and other countries under considerable pressure. The company has used CITER on occasion, but not with quality and reliability. The company produces (circa 100-1000 garments) in some segments of the production process of retail concentration and distribution chains. Lead times were

decreasing in export markets (especially in Germany and Holland) for both *pronto moda* and seasonal ranges.

Citera was only used for the 'realisation' of designs from a studio in France. Citera offered the company much greater versatility in terms of the range of styles and the colours and patterns of each style. Cycle times for the production of new styles have been shortened, but Citera has played only a small part in this process. However, Citera was playing an increasingly important marketing role, with high quality images available as a substitute for the production of samples (at least in the case of retail buyers with whom an established relationship existed). Citera was seen as a key tool in the company's strategy of moving upmarket. Cultural resistance was cited as a problem with the introduction of Citera, and its use had provoked new conflicts between designers and production managers. The owner-manager appeared particularly unwilling to relinquish 'hands-on' control of this key area of the production process to the young women trained to operate the Citera system. Managers were also concerned that the rate of utilisation did not justify the heavy financial outlay on the system.

The company sought advice from a wide array of sources before adopting Citera, and seemed keen to stress that it had made its own decision independently of CITER. But its membership of CITER was clearly an important influence in the decision to adopt the system; the company was 'joining the club' of local innovators. The follow-up services offered by CITER were considered excellent, particularly in terms of problem solving and implementation. CITER had also trained a stylist and a technician to use the system. The manager considered the level of training to be 'satisfactory', while the stylist herself thought it was 'excellent'. CITER Fashion Forecasting service was also thought to be excellent, though its production advice was said to be of limited relevance. The company expressed the view that CITER staff should spend more time in the field with firms, though the likely benefits were not specified. As to the prospects for sharing the Citera system with its sub-contractors, the manager said 'definitely not', for the same reasons given by Severa.

#### *Finmoda*

Finmoda was founded in 1975 and it employs 230 people. Its main lines are men and women's knitwear, 55 per cent of which is exported to other EC countries. All production is seasonal rather than *pronto moda*. Samples were manufactured internally, but final production runs were routed through a complex network of more than 300 artisan firms, which were located mainly though not exclusively, in Emilia-Romagna.

Average production runs were in the range of 500-700 garments, but – unusually for Carpi firms – occasionally reached 50,000 pieces for German supermarket chains. Order sizes and lead times have not changed significantly over the last three years, partly on account of the absence of *pronto moda* production. Generally, the main problems at Finmoda revolved around the maintenance of quality control between the different stages of sub-contracting, not surprising in view of the number of firms in the network.

Citera was used principally for the ‘realisation’ of design concepts, and its use had led to reduced costs and greater versatility in the production of samples for retail buyers. Citera was also used to enhance the company’s marketing profile because of the high quality of colour printing available. The company was also using the system to create an ‘archive’ of its previous ranges as a means of resourcing a rapid response to future market trends. Resistance to the new technology appeared to be impeding the impact of Citera, and its utilisation was limited by the lack of a full-time operator. The only staff trained to use the system were also responsible for other tasks, and this reflected the ambivalent attitude of managers towards Citera.

The company saw CITER as its principal source of advice on technology, and it considered that the continuous flow of information allowed it to stay abreast of technological change in the industry. This was clearly instrumental in its decision to adopt the system, which the company saw as part of the whole CITER service package. CITER also provided the training and back-up services after the installation of Citera. CITER’s Fashion Forecasting service was also praised, and the company made regular use of CITER’s marketing seminars and related events. In particular, the company cited CITER’s role as a forum for local firms, encouraging the exchange of views and experiences. However, the company was keen to stress the need for a continuing development of software and other services relating to Citera, in part to justify its initial investment. There was also a desire for more ‘specialised, firm-targeted services’, though these were not specified. With respect to technology transfer, the company was very clear that it would not share information with its sub-contractors, for all the reasons given by its fellow adopters.

#### *Sati-Tesam*

Sati-Tesam was formed in 1957 and it employs 45 people. It manufactures men’s and women’s knitted garments on a seasonal basis exclusively for the Italian market. A separate firm was created in Carpi to produce for

the *pronto moda* market, but the other firm. Once again samples production runs were sub-contracted to low wage regions of Puglia, Veneto, and Sicily. Citera was used greatly in size, but normally fell very much in line with the other company imported a considerable amount of equipment, enabling it to operate in the *pronto moda* market. Citera was only used for a short time, but it had already led to cost savings in the production of samples for retail buyers. The importance given the small size of the firm, the equipment required to meet the needs of a *pronto moda* company. Resistance to technology was also a feature of Citera, but managers refused to overcome the resistance.

CITER was appreciated for its innovation and on new equipment helping the firm to identify in time appropriate technology. In addition to the assistance in solving day-to-day technical problems, the firm’s trust towards CITER was clearly a key factor in the decision to adopt Citera. And, in addition to back-up services were said to be essential, the service was also used, but this was not the case. The stylist ‘who needs to keep herself up to date’ in the commercial strategy, an attitude of orientation towards the lower-mid market, was a key factor to whether the company would use sub-contractors, the answer was no, for the reasons as before.

#### *Lena Moda*

Lena Moda was formed in 1957 and it employs several hundred in the middle 1970s. The firm has been farmed out to sub-contractors for the production of outerwear, produced on a seasonal basis. The firm is not involved in *pronto moda* production, but the ‘off-season’ for middle-market, fast fashion, wish to place orders far in advance, and repeat orders at short notice. Unlike other firms, this company was wholly responsible



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the *pronto moda* market, but the interviewees had no knowledge of this other firm. Once again samples were cut or made up internally and production runs were sub-contracted to 20 artisan firms in the relatively low wage regions of Puglia, Veneto and Marche. Production runs varied greatly in size, but normally fell within the 100-1000 garment range. The company imported a considerable quantity of garments from the Far East, enabling it to operate in the price-sensitive, low-end of the domestic market. Citera was only used for the interpretation of design concepts, but it had already led to cost savings and greater versatility in the production of samples for retail buyers. This was of considerable importance given the small size of orders and the large number of styles required to meet the needs of a considerable range of retail customers. Resistance to technology was also cited as a barrier to better utilisation of Citera, but managers refused to be drawn on the details of this resistance.

CITER was appreciated for its continuous flow of information on innovation and on new equipment on the market. This was of value in helping the firm to identify investment priorities and in selecting appropriate technology. In addition, CITER was able to offer rapid assistance in solving day-to-day technical problems. This general attitude of trust towards CITER was clearly very influential in the company's decision to adopt Citera. And, following the introduction, CITER's back-up services were said to be excellent. CITER's Fashion Forecasting service was also used, but this was seen as the preserve of the company's stylist 'who needs to keep herself up-to-date', rather than as a key element in the commercial strategy, an attitude which reflected the company's orientation towards the lower-middle reaches of the market. Finally, as to whether the company would diffuse the Citera technology to its sub-contractors, the answer was emphatically no, again for the same reasons as before.

#### *Lena Moda*

Lena Moda was formed in 1957 and employs 80 people, down from several hundred in the middle 1970s, because the bulk of production has been farmed out to sub-contractors. The main product line was women's outerwear, produced on a seasonal basis with a third for export. Though not involved in *pronto moda* production, the company produced 'close to the season' for middle-market, fashion conscious retailers who do not wish to place orders far in advance. The company also specialises in repeat orders at short notice. Unlike most of the other firms in the panel, this company was wholly responsible for its designs, from concept to

realisation. Apart from sample production, which is undertaken within the firm, orders are sub-contracted to 12-15 reliable small firms, some of which had family connections. Other sub-contractors are located in Abruzzi, where wages are much lower. Production costs will have to be reduced further if the firm is to remain in business because mid-market retailers in Italy were squeezing suppliers' margins. But the scope for savings was restricted by the need to maintain quality. High production costs meant that this company was currently running at a loss.

The company had decided not to adopt Citera for the following reasons:

- The cost was seen as prohibitive, especially given the financial difficulties of the firm, but also because it was unlikely to show an adequate return on investment;
- The owner-manager was not convinced by CITER as to the technical benefits of the system, indeed she saw certain disadvantages. In particular, she was concerned about the concentration of expertise in the hands of operators, and the consequent weakening of her overall control of the production process. In other words, Citera would involve a cultural change in the company (i.e. a more decentralised style of management) which she was unwilling to entertain, even though her technical staff would have welcomed the introduction of Citera.

Although this company had decided against using the Citera system, it was still an active member of CITER, using a wide range of the centre's technical and fashion forecasting services. All of these services were considered worthwhile, not least because they enhanced – and did not devalue – the role of the owner-manager in the production process.

What emerges from this case study is the prevalence of a proprietorial attitude to information, and this constitutes a major barrier to the adoption of new technology. In the case of Lena Moda, this proprietorial attitude is directed towards the internal workforce; in the case of the four adopters it was mainly directed towards the sub-contractors, though even in these cases, loss of managerial control within the firm was a resonant issue. It is difficult to know how CITER – or indeed any other organisation – can be expected to overcome a barrier which is so integral a part of a modern market economy, where information is strength. Nevertheless, it bears repeating that such information gets informally appropriated and diffuses through the system because operators get to know how it works through using it.

### (iii) Assessment of CITER and

To a surprisingly large extent, the dynamic and successful regional textile firms in all the firms in the panel, adopted CITER for a number of factors which seem to explain its success:

- Its strategic location in the clothing district;
- Its ability to attract keen, able management, exemplified by Dr Loredana Ligabue, a respected director;
- Its capacity to offer useful and understandable services;
- Its policy of being 'open' to the clothing industry;
- The involvement of key management of the centre in co-ownership – gives CITER an essential role if firms are to use it.

It is not all sweetness and light, and there are some of the problems which CITER has with local firms for any public sector role. One is that CITER is still perceived as a partnership which it has with the state, and is unable or unwilling to get involved on a continuing basis.

To these internally-defined problems, two in particular. First, the way in which CITER has altered the way in which CITER operates. Severa company made the point that the advice might be compromised by the way in which CITER operates. Second, in common with all the other firms, CITER serves a dual purpose: it is to enhance the local productive fabric and to promote consensus within the industry in sophisticated services – like the CITER's new corporate hierarchies as they move towards the more innovative firms and to promote consensus within the industry if the role of the larger players in the community is to be maintained.



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the prevalence of a proprietorial as a major barrier to the adoption of Citera, this proprietorial attitude in the case of the four adopters and subcontractors, though even in these the firm was a resonant issue. It and any other organisation – can be so integral a part of a modern strength. Nevertheless, it bears naturally appropriated and diffuses to know how it works through

### (iii) Assessment of CITER and Citera

To a surprisingly large extent, the conventional image of CITER as a dynamic and successful regional technology transfer was corroborated by all the firms in the panel, adopters and non-adopters alike. Among the factors which seem to explain its success are:

- Its strategic location in Carpi, the heart of the region's textile and clothing district;
- Its ability to attract keen, able and public spirited staff, personified by Dr Loredana Ligabue, CITER's energetic and highly-respected director;
- Its capacity to offer useful services, the need for which is readily understandable;
- Its policy of being 'open' to all the key players in the textile and clothing industry;
- The involvement of key industrial players, in the funding and management of the centre – the very important issue of co-ownership – gives CITER a commercial credibility which is essential if firms are to use its services.

It is not all sweetness and light, and CITER freely concedes as much. Two of the problems which CITER has itself identified are: (1) the distrust of local firms for any public sector role in industrial affairs, which suggests that CITER is still perceived as a public sector agent and (2) the 'stop-go' relationship which it has with the smaller firms, many of which are either unable or unwilling to get involved with CITER on a regular and continuing basis.

To these internally-defined problems we could add a number of other problems, two in particular. First, the decision to develop Citera may have altered the way in which CITER is perceived by its clients. Indeed, the Severa company made the point that CITER's ability to offer impartial advice might be compromised by the marketing of its own Citera product. Second, in common with all the other Emilia-Romagna service centres, CITER serves a dual purpose: in economic terms it was designed to enhance the local productive fabric; in political terms it was designed to promote consensus within the industry. As it begins to offer more sophisticated services – like the Citera workstation – the effect is to create new corporate hierarchies as the take-up of these services is biased towards the more innovative firms. This could well threaten the political consensus within the industry if the smaller firms see CITER as an 'agent' of the larger players in the community.

In the longer term, a number of key problems have to be overcome, problems which Emilia-Romagna shares with many neighbouring regions in Northern Italy. Amongst the most pressing problems we might cite the following:

- Italy has lost its long-held comparative price advantage through rises in wages, social security and general production costs in the 1980s, though regained some advantage with the 1992 devaluation;
- Small labour-intensive companies, the backbone of Italy's export performance, have concentrated on consumer sectors in which the newly-industrialised countries have a huge price advantage;
- Small scale family-run firms tend to be ill-equipped to confront the challenge of globalisation, with the increasing need for sophisticated marketing and after-sales services;
- Small companies have traditionally financed exports out of cash flow and, at a time of recession and high interest rates, they lack the financial muscle to cope in this cold business climate;
- Too little attention has been paid by large and small companies alike, to innovating out of mature sectors and into more profitable high technology sectors
- A key problem for the small firm sector in general is the relative absence of flexible financial instruments to finance innovation and growth because risk capital is very under-developed, especially, it seems, in Emilia-Romagna;
- Small firms in all sectors will have to pay more attention to R&D and product innovation in the 1990s because, in the 1980s, they tended to focus on cutting costs and searching for new markets.

These are just some of the problems which threaten to overwhelm the regional economy of Emilia-Romagna, with its high dependence on SMEs in mature sectors. To be fair, however, the regional government is addressing these problems as a matter of urgency and, in CITER, it has an agency which is offering credible and innovative solutions to the dilemmas of a mature industrial sector.

## 5. OVERVIEW OF EMILIA-ROMAGNA

### (i) Responsiveness to the Need for Change

The pressures in Italy, and particularly its leading small firm region of Emilia-Romagna, originate from heightened competitiveness within the

European Single Market and globalising Economies.

At present, therefore, it seems likely that greater responsibilities by Rome to these will have to be tempered by those to be spent parsimoniously and those affairs. The Emilia-Romagna government must be most carefully. Even before the advent of the Dini governments, regional industrial policy in Emilia-Romagna, against the judgement that the regional government, through had taken. Innovative business services these were argued by the industrial Chambers of Commerce in Emilia-Romagna competition to their services and that such services were not being provided by government set them up is, argues this analysis.

In any case, for a four-year period the government had wrestled with the choice of industrial policy in ways which satisfied without undermining the effectiveness of the small firm business sector had for competitiveness over the preceding government now had to defend successful, interventions to support newly resurgent business services but had not been capable of providing

The approach that has now been adopted for business support must be conducted through a tendering process. In this way, excellent will be likely to retain their funds while sub-optimally are more likely to lose them is then conceivably available to fund

Amongst the latter could be projected and agreed need for Emilian small firm innovative. Not least, this is expected small firms to engage in collaborative or research institutes. There university-industry research collaboration in 1992 it was constitutionally unacceptable but made it possible, but the learning curve

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At present, therefore, it seems likely that the Italian regions will be given greater responsibilities by Rome than they have hitherto enjoyed. But these will have to be tempered by the requirements that budgets will have to be spent parsimoniously and that business should manage business affairs. The Emilia-Romagna government thus has to walk a narrow line most carefully. Even before the advent of the Berlusconi and subsequent Dini governments, regional industrial pressures were building up, in Emilia-Romagna, against the judicious interventionary posture of support that the regional government, through its development agency, ERVET, had taken. Innovative business services centres had been established and these were argued by the industrial association *Confindustria* and the Chambers of Commerce in Emilia-Romagna to constitute unfair competition to their services and those of private consultants. The fact that such services were not being provided before the regional government set them up is, argues ERVET, conveniently overlooked in this analysis.

In any case, for a four-year period up to Spring 1994, the regional government had wrestled with the question of how to reform its regional industrial policy in ways which satisfied business interests but crucially, without undermining the effective, *collaborative* basis upon which much of the small firm business sector had successfully developed its capacity for competitiveness over the preceding three decades. That is, the regional government now had to defend its previous, in some cases highly successful, interventions to support networking and innovation against a newly resurgent business services sector which had always been hostile, but had not been capable of providing better business services to SMEs.

The approach that has now been adopted by ERVET is that funding for business support must be conducted as a project-based competitive tendering process. In this way, excellent business support service centres will be likely to retain their funding while those that have performed sub-optimally are more likely to lose it. Cash saved in the latter exercise is then conceivably available to fund further innovative projects.

Amongst the latter could be projects which meet the widely-perceived and agreed need for Emilian small firms themselves to become more innovative. Not least, this is expected to require that ways be found for small firms to engage in collaborative research projects with universities or research institutes. There is little experience of direct university-industry research collaboration in Italy generally because until 1992 it was constitutionally unacceptable. A change of law has since made it possible, but the learning curve even for large, let alone small,

enterprise is a steep one. Links with research institutes are stronger, even for Emilian small business. The successful collaboration between CITER, the textiles innovation centre at Carpi, near Bologna, and ENEA, the energy research institute, resulted in an innovative CAD-CAM system for knitwear firms, now widely marketed both inside and outside Italy.

Of great interest to the project of assisting small firm competitiveness without losing the collaborative or networking philosophy of niche-marketing, is the recent research reported by the Emilia-Romagna regional Department of Industry (Franchi, 1994). The Department of Industry asked the question: what has been going on in the industrial districts during the past three or four years, especially the recent years of economic recession? For example had there been, as the soothsayers were foretelling, an increase in the hierarchisation of firms in the districts; were there strong signs of concentration of ownership; had relationships with the economic world outside the localised districts changed; were recent developments still compatible with the policy and political goal of social integration rather than social polarisation?

The main conclusions of the research are as follows: first, firms in industrial districts performed better in terms of employment and wages than firms in the same sector not located in districts. Though it is not stated, it can be assumed that turnover performance was also better. Second, all districts increased the volume of their operations occurring outside the district, even outside the region, seeking lower labour costs. In Carpi, between 1988 and 1992 offshore production (i.e. outside Italy) increased from 7 per cent to 9 per cent of total turnover. Third, upstream and downstream diversification by district firms was only marginal, and innovation was limited. Fourth, vertical integration occurred to a limited extent as some, but relatively few, multinationals acquired district-based firms. Fifth, formation of groups of independent small firms was much the most common form of integration (or quasi-integration) between firms within the districts. Sixth, companies employing around 20 people grew strongly, while those employing five or less showed a higher death-rate than birth-rate. Seventh, there is a radical change in the management of the small firms employing up to and over 20 or so persons. A minimum efficient size seems to have emerged below which organisational demands upon the contemporary firms cannot be adequately satisfied.

In conclusion, small firms in industrial districts gain substantially from operating in a collaborative, networked business milieu. They have been able to offer better levels of employment, better wage-levels and, for the larger small enterprises, higher rates of growth than firms in the same industry not operating in a district-type setting. Firms in districts have,

like large companies, sought and found markets overseas. Lower labour costs have led to a loss of scale without losing the benefits of a different size and type.

Thus, there is evidence of convergence, but nevertheless, being confronted in many ways. The imperative of enhancing the response of greater and greater isolation is a reasoned and sensible approach means a problem halved, that option survives and gains in efficiency and

## (ii) Conclusions

There are three inter-linked conclusions. In account of recent developments in the district, in summarising these, it is important to consider parameters within which these changes are taking place. A third unfolding, generic element is *globalisation*, particularly in the sense of inter-penetration of domestic markets. A defining parameter of the present economic deregulation, it creates enormous uncertainty in a situation where, because they do it, is better than doing nothing. This (1994) has referred as 'bootstrapping' by regional governments.

A second, key, parameter of the present change is amongst the alert firms and institutions. By innovation is meant not only technological but managerial, organisational and cultural. Firms in districts begin seeking to re-examine the theme developed by Goss, Pascale (1994) 'enough' and firms must engage in processes and culture not once but periodically. The innovative firm must constantly re-examine its function successfully, but so must the

*Networking* is one name given to such processes of learning, trust-building, partnership. Emilia-Romagna has a comparative

research institutes are stronger, even successful collaboration between CITER, Ipi, near Bologna, and ENEA, the use of an innovative CAD-CAM system adopted both inside and outside Italy.

Assisting small firm competitiveness through a networking philosophy of the type reported by the Emilia-Romagna Region (Cianchi, 1994). The Department of Economic Research has been going on in the industrial districts for many years, especially the recent years of the 1980s, as the soothsayers were predicting the dissolution of firms in the districts; were they to lose ownership; had relationships with other districts changed; were recent government policy and political goal of social cohesion?

Factors which are as follows: first, firms in districts in terms of employment and wages are higher than in districts. Though it is not clear whether performance was also better. Second, the volume of their operations occurring in the region, seeking lower labour costs. Third, more production (i.e. outside Italy) in districts. Fourth, the share of total turnover. Third, upstream integration in districts was only marginal, and downstream integration occurred to a limited extent. Fourth, multinationals acquired district-based independent small firms was much less than in other regions (or quasi-integration) between firms in districts. Firms employing around 20 people in districts and five or less showed a higher performance. There is a radical change in the size of firms in districts up to and over 20 or so persons. Firms in districts have emerged below which contemporary firms cannot be

Firms in districts gain substantially from the district business milieu. They have been able to attract better wage-levels and, for the most part, higher growth than firms in the same region. Firms in districts have,

like large companies, sought and found suppliers elsewhere in Italy and overseas. Lower labour costs have been the main incentive for doing this. Small firms in districts have been able to acquire some of the advantages of scale without losing the benefits of scope, by forming groups of different size and type.

Thus, there is evidence of competitiveness problems which are, nevertheless, being confronted in new, often increasingly collaborative ways. The imperative of enhancing competitiveness is not producing the response of greater and greater isolationism or 'rugged individualism' but a reasoned and sensible approach in which, where a problem shared means a problem halved, that option is taken. In the process the small firm survives and gains in efficiency and effectiveness.

## (ii) Conclusions

There are three inter-linked conclusions to be drawn from this limited account of recent developments in regional industrial practice. Before summarising these, it is important to restate two key factors which set the parameters within which these changes operate and remind ourselves of a third unfolding, generic element which constitutes a key response. First, *globalisation*, particularly in the sense of a heightened capacity for the inter-penetration of domestic markets by foreign producers is a key, even defining parameter of the present economic conjuncture. In tandem with deregulation, it creates enormous uncertainty of the kind that leaves firms in a situation where, because they do not know what to do, doing anything is better than doing nothing. This creates a mentality to which Sabel (1994) has referred as 'bootstrapping reform' among firms, unions and regional governments.

A second, key, parameter of the present turbulent context, is the sense, amongst the alert firms and institutions, that *innovation* is the key to survival. By innovation is meant not only product or process innovation but managerial, organisational and cultural innovation. This is where firms in districts begin seeking to re-invent themselves. This follows the theme developed by Goss, Pascale & Athos (1993) that 'change is not enough' and firms must engage in 'heroic acts' to reinvent products, processes and culture not once but permanently to maintain competitive advantage. Some contexts are better than others in which to achieve this. The innovative firm must constantly interact with its environment to function successfully, but so must the innovative region.

*Networking* is one name given to such a form of interactive exchange, learning, trust-building, partnering and empowering practice. If Emilia-Romagna has a comparative (competitive) advantage, it lies

## BADEN-WÜRTTEMBERG SMALL-FIRM PROBLEMS AND RESPONSES IN THE 1990s

precisely in the rich milieu of other firms, institutions and informed personnel which constitutes the regional economy. Through the information flows made possible by the innovative regional business infrastructure found in the region, firms are able to engage in rapid response to turbulent conditions. Even when the 'institutional reflexivity' (Cooke, 1995), in which the public and private elements of the network architecture are engaged, is not synchronised with business needs, there is enough useful information flowing informally for firms to be able to experiment with their own bootstrapping solutions. These then become demonstration models for the rest.

The three key conclusions concerning the Emilia-Romagna case are as follows. First, the insight of the evolutionary economics approach, that firms are collective organisations with a degree of resource-development capacity rather than simple utility-maximisers is given support, as is the proposition that they are capable of learning new ways to solve problems successfully. In this case, technology was *endogenously* developed within the organically-linked network and tailored to the needs of the production system rather than purchased 'off-the-shelf' as implied in traditional neo-classical economic theory (although for a recent re-formulation, see Romer, 1990). Second, the 'economies of association' in a highly networked system, such as that described, clearly provide the means whereby SMEs, in a collaborative mode of economic co-ordination, can respond tactically to a threatened loss of market-share relatively rapidly. The close relationship between the Innovation Centre CITER and the multitude of firms in the same industry and locality makes for the possibility of rapid exploitation of externalities. However, and third, while the production system in the industrial districts rests on the platform of inherited 'social capital' of community solidarity, there are some political costs attached to the kind of policy intervention that results. It took four years to resolve the crisis of the regional governance system in such a way that the innovative potential of networked enterprise could be retained in the face of political demands from inside and outside the region that more scope should be given to a more deregulated system of enterprise support. Nevertheless, such paralysis does not yet seem to have harmed the Emilian system noticeably.

### 1. INTRODUCTION

Baden-Württemberg has, for the model economy (Table 3.1). With high levels of industrial investment, exports of high quality, high value and well-engineered products, the region has overcome the problem which beset other regions to establish and maintain competitive advantage; that is, the region's competitive achievement appeared to be the result of a competitive advantage; that is, Baden-Württemberg combined its strengths in the enterprise and *Mittelstand* sectors. The importance to this has been the development of capital goods, notably machine tools.

TA

#### Baden-Württemberg

Population (1991)	
Labour Force Participation Rate (1991)	
Labour Force (1991)	
Employment in Agriculture	
Industry	
Services	
GDP per capita (1991: in Per Cent of EU Average)	
Unemployment Rate (1993)	

Source: Eurostat.

## CHAPTER 3

### BADEN-WÜRTTEMBERG: SMALL-FIRM PROBLEMS AND REGIONAL RESPONSES IN MACHINE TOOLS

#### 1. INTRODUCTION

Baden-Württemberg has, for the past twenty-five years been seen as a model economy (Table 3.1). With low levels of unemployment, high rates of industrial investment, exports and incomes and a reputation for high quality, high value and well-engineered products, it seemed to have overcome the problem which besets most economies, namely how to establish and maintain competitive advantage. At the heart of that achievement appeared to be a factor that increasingly explains competitive advantage; that is, the capacity to innovate. Uniquely, Baden-Württemberg combined innovative capacity within both its large enterprise and *Mittelstand* sectors and, crucially between them. Of key importance to this has been the integration of supply and demand for capital goods, notably machine tools within the regional economy.

TABLE 3.1

Baden-Württemberg – Economic Indicators

	Baden-Württemberg	EU (EUR 12)
Population (1991)	9.9 million	344.8 million
Labour Force Participation Rate (1991)	59.4% (women: 47.2%)	55.1% (women: 43.4%)
Labour Force (1991)	4.8 million	142.0 million
Employment in Agriculture	3.4%	6.4%
Industry	46.2%	33.3%
Services	50.3%	60.3%
GDP per capita (1991: in Per Cent of EU Average)	136%	100%
Unemployment Rate (1993)	4.1% (women: 4.5%)	10.4% (women: 12.2%)

Source: Eurostat.

other firms, institutions and informed the regional economy. Through the by the innovative regional business n, firms are able to engage in rapid ven when the 'institutional reflexivity' ic and private elements of the network nchronised with business needs, there ving informally for firms to be able to rapping solutions. These then become

ning the Emilia-Romagna case are as olutionary economics approach, that with a degree of resource-development -maximisers is given support, as is the f learning new ways to solve problems gy was *endogenously* developed within d tailored to the needs of the production ff-the-shelf' as implied in traditional though for a recent re-formulation, see onomies of association' in a highly described, clearly provide the means : mode of economic co-ordination, can loss of market-share relatively rapidly. he Innovation Centre CITER and the industry and locality makes for the of externalities. However, and third, industrial districts rests on the platform ommunity solidarity, there are some d of policy intervention that results. It s of the regional governance system in ential of networked enterprise could be ands from inside and outside the region en to a more deregulated system of uch paralysis does not yet seem to have ably.



The most recent German economic recession had very marked effects on manufacturing, especially of engineering goods, particularly machine tools in Baden-Württemberg. In the past, threats to the model have been short-lived, not least because the governmental and institutional system in which the economy was embedded had also proved to be an innovative governance structure. At present, the innovativeness of both economy and governance structure are in question. In this chapter an attempt will be made to explain this, focusing particularly upon the machine tool industry, and explore some realistic options for change and renewal.

## 2. BADEN-WÜRTTEMBERG: LOSING COMPETITIVE ADVANTAGE

A special Baden-Württemberg problem is that, as Semlinger (1993) puts it, '... price competition has reached high-end markets and threatens to turn a former competitive advantage into a handicap. ... Correspondingly what was appreciated as a state-of-the-art product is now considered 'over-engineered'.' The logic of this is that there has to be a thorough rethink about the nature of products, markets and competencies rather than simply adding more variations to the solutions which worked before.

Recently, Baden-Württemberg's *Zukunftskommission* (Future Commission) compiled a report, *Economy 2000*. It concluded that the present crisis is due to:

- **International Competition:** The regional clusters based on automotive, machinery and electrical engineering are facing increased competition from Japan, Asian NICs, Eastern Europe and the European Union after the establishment of the Single Market. For instance, Japanese imports have taken 25 per cent of the German market in CNC turning machine tools; Japan has 50 per cent of Asia-Pacific machine tool imports compared with Germany's 12 per cent. Japanese machine tool firms have 30 per cent lower costs, less time-to-market, high quality and good after-sales service (Ministry for Economics, Press Release 5-2-93);
- **Innovation Deficits:** Baden-Württemberg firms are weak in semi-conductors, computers and IT communications, a problem because of the global importance of Information and Communication Technologies. Also, there are serious weaknesses in some new materials and particularly biotechnology. Baden-Württemberg is innovative in mature technologies but these are being driven out by the new sectors;

- **Production Costs:** While incentives to promote incentives to promote Economics Rexrodt and (DM2bn.) aimed at SME Hans Peter Stihl (President Commerce) suggests we deal with the crisis (Sud

The Future Commission in Econ

- **Competition Measures:** costs; time-to-market; training; business service innovation – should all b
- **Innovation Measures:** future-oriented and raise Board should be established dialogue and achieve co should engage in techno make recommendation;.
- **Production Costs:** Should gains through moving in improving locational flexibility and becoming n per cent of German exports East and South-East Asia document, *Economy 2000*)

The response to this has been some Employment Office criticised in unemployment level from reaching called for a Japanese MITI for the investment; state venture-capital fund hardware to software; and tax-relie

### (i) The Crisis in the Machine Tool

Japan is the world's largest, Germany machine tools, as is shown in Table Germany's share of world production as the USA, for example, has revived producers, including Taiwan and c share.

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## LOSING COMPETITIVE

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new sectors;

- **Production Costs:** While Economics Minister Spöri demands tax incentives to promote investments, Federal Minister of Economics Rexrodt advocates credits to promote innovation (DM2bn.) aimed at SMEs. Meanwhile industry, as represented by Hans Peter Stihl (President of IHKs, Chambers of Industry and Commerce) suggests workers should accept lower wages to help deal with the crisis (Sudwestpresse, 29-12-93).

The Future Commission in Economy 2000 recommended:

- **Competition Measures:** Better firm organisation; lower labour costs; time-to-market; tax-structure; infrastructure; vocational training; business services; firm culture and the climate for innovation – should all be improved;
- **Innovation Measures:** Baden-Württemberg should be more future-oriented and raise awareness of this. A *Land* Innovation Board should be established to initiate the future-oriented dialogue and achieve consensus. This now exists. The Board should engage in technology foresight, develop scenarios and make recommendation;
- **Production Costs:** Should be reduced by seeking productivity gains through moving into new technologies and industries, improving locational factors such as wage-costs and labour flexibility and becoming more globally competitive (e.g. only 6.4 per cent of German exports go to the USA, only 7.0 per cent to East and South-East Asia (as reported in *Zukunftskommission's* document, *Economy 2000*).

The response to this has been somewhat critical; the President of the *Land* Employment Office criticised it for offering little to prevent the unemployment level from reaching 300,000. Economics Minister Spöri called for a Japanese MITI for the *Land* and demanded: increased R&D investment; state venture-capital funds; assistance for firms to move from hardware to software; and tax-reliefs for modernisation by firms.

### (i) The Crisis in the Machine Tool Industry

Japan is the world's largest, Germany, the second-largest, producer of machine tools, as is shown in Table 3.2. However, both Japan and Germany's share of world production has fallen in the period after 1990 as the USA, for example, has revived its world share and China and newer producers, including Taiwan and others, have increased world-market share.

**TABLE 3.2**  
**World Shares of Machine Tool Production, 1990-93**

Country	1990	1991	1992	1993
Japan	23.3	32.9	25.1	25.3
Germany	18.9	25.0	22.7	18.2
USA	6.7	9.3	9.2	11.6
Italy	8.5	9.8	8.8	8.4
China	-	-	5.0	6.2
Switzerland	6.8	5.7	4.9	4.8
Taiwan	-	2.7	2.8	3.8
UK	3.7	3.6	3.0	3.4
South Korea	-	2.1	1.8	2.2
France	-	2.9	2.9	2.2
Others	-	6.0	13.8	13.9

Source: American Machinist & MTTA (Machine Tool Technologies Association).

**TABLE 3.3**  
**Export Share of World Machine Tools, 1992-93**

Country	1992	1993
Japan	21.0	26.5
Germany	27.8	22.9
Italy	8.1	9.6
Switzerland	8.6	8.2
USA	5.9	7.0
Taiwan	3.8	4.7
UK	3.5	3.4
France	3.1	2.1
Belgium	-	2.1
Others	18.1	13.7

Source: American Machinist.

In addition to German world market share by 1993, plus almost 30 per cent export share – unlike that of Japan during 1992-93. This is exemplified by the export share decline of some 17 per cent and a share increase of some 25 per cent in the machine tool industry, which was thought to be a decline of share by 20 per cent.

(ii) **The German Machine Tool Industry**

What are the problems of the German machine tool industry? The European machine tool umbrella organizations are too numerous and small to create a global presence in the market. Furthermore, builders of machine tools in Germany (salaries, benefits and other costs) are 20 per cent higher than in Japan and 30 per cent higher than in the USA. In Germany, the key competitor is Japan, which has 49.4 per cent of world output and 49.4 per cent of world market share. It is confronted with high labour costs from domestic customers. Productivity is low and the anticipated response to customer requirements is slow (Baxter, 1994).

One of Germany's machine tool producers, Berthold Leibinger, head of *Tru-Mittelstand* machine tool producer, has urged companies to the need for strategic technology led them into a trap of their own making without accounting for the need to introduce new machines with the same technology as the old ones but with a 20 to 25 per cent increase in price (Leibinger, 1994). But, interestingly, Leibinger has argued that machine tool firms should merge. Concentration is less, vulnerable to wipe-out in this recession. 'Small family-owned businesses add stability and especially in difficult times' (quoted in Baxter, 1994). Merger and acquisition option is seen as being a positive aspect of externalities coming from outside the firm (sub-contractors) and from the environment. *Mittelstand* firms enjoy internal 'social capital' built up over decades of operation. Increasing scale by merger is seen as a positive aspect of the machine-tool industry.

### Production, 1990-93

1992	1993
25.1	25.3
22.7	18.2
9.2	11.6
8.8	8.4
5.0	6.2
4.9	4.8
2.8	3.8
3.0	3.4
1.8	2.2
2.9	2.2
13.8	13.9

Machine Tool Technologies

### Machine Tools, 1992-93

	1993
	26.5
	22.9
	9.6
	8.2
	7.0
	4.7
	3.4
	2.1
	2.1
	13.7

In addition to German world market share declining below its 1990 level by 1993, plus almost 30 per cent decline from 1991 to 1993, German export share – unlike that of Japan, Italy, USA and Taiwan – also fell during 1992-93. This is exemplified in Table 3.3 which shows a German export share decline of some 17 per cent compared to a Japanese export share increase of some 25 per cent. Even the American machine tool industry, which was thought to be in serious decline, increased export share by 20 per cent.

### (ii) The German Machine Tool Industry

What are the problems of the German machine tool industry? Cecimo, the European machine tool umbrella association, says standard machinery producers are too numerous and small to compete effectively on the world market. Furthermore, builders of specialist machines lack the financial power to create a global presence and survive recessions. Social costs in Germany (salaries, benefits and other employee-related expenses) are 27 per cent higher than in Japan and 37 per cent higher than in the USA. For Germany, the key competitor is Japan. Together they account for 43.5 per cent of world output and 49.4 per cent of world exports. Germany is confronted with high labour costs and new demands for cost-reductions from domestic customers. Production outside Germany (W) is an anticipated response to customer demand for machine tools that are as good as they need to be rather than, in Germany, as good as possible (Baxter, 1994).

One of Germany's and Baden-Württemberg's leading industrialists, Berthold Leibinger, head of Trumpf, is quoted as recognising that *Mittelstand* machine tool producers' love of independence has blinded companies to the need for strategic mergers and that their obsession with technology led them into a trap of making sophisticated products for their own sake without accounting for customer's needs. 'We are trying to introduce new machines with the same or improved technical features as the old ones but with a 20 to 25 per cent cost reduction' (quoted in Waller, 1994). But, interestingly, Leibinger rejects the notion that *Mittelstand* firms should merge. Concentration would have left the industry more, not less, vulnerable to wipe-out in this recession. He concludes: 'Independent family-owned businesses add stability to the business community, especially in difficult times' (quoted in Waller, 1994). Clearly, the merger and acquisition option is seen as being detrimental to the advantages of externalities coming from outside the SME, both from other firms (sub-contractors) and from the enterprise support system. Moreover, *Mittelstand* firms enjoy internal 'economies of association' from the social capital built up over decades of good management-labour relations. Increasing scale by merger is seen as holding the threat of destroying these positive aspects of the machine-tool 'economy culture'.

One of the German machine tool industry's key weaknesses, apart from scale – which makes the pressure for productivity gains more difficult – is a somewhat incestuous outlook regarding innovation. A study of differences between innovation in the German and Japanese industries (Ruth, 1991) concluded that the German industry is very dependent on customers for innovation stimulus, and rather inward-looking, at the firm-level, for responding to innovative user-requirements. Japanese firms, by contrast, learned more about the market's requirements by engaging more wholeheartedly in marketing as a business activity. This, in turn, is a reflection of the relative size advantage of Japanese over German firms. This enables them to organise differently and to employ specialist marketing personnel.

Despite the view of Berthold Leibinger that scale was not a key problem, it is, nevertheless, worth indicating the differences between German and Japanese machine tool firms on this dimension, as is done in limited ways in the report of Brödner & Schultetus (1992). They took a representative sample of firms from both countries and examined them not so much from the viewpoint of scale as whether or not they could be said to be engaging in 'Lean Production'. The key findings, summarised in Table 3.4, showed that there was a massive productivity gap between German and Japanese firms.

**TABLE 3.4**  
**Key Economic Indicators of Japanese and German Machine Tool Firms**

Selected Firms	Japan 1990			German Average 1989	Germany 1990			
	A	B	C		A	B	C	D
Turnover per Employee (DM'000)	650	795	725	179	239	283	311	199
Value Added per Employee	336	517	249	95	119	132	149	113
In-House Production (%)	52	65	34	51	50	47	48	57
After-Tax Profits (%)	14	6	8	1.3	-2	2	5	2
Labour Costs/ Turnover (%)	10	12	10	34	31	23	24	38
Stocks/Turnover (%)	15	17	22	37	22	20	15	35

Source: Brödner and Schultetus, 1992.

Of particular interest is the s higher turnover per employee. Profits were much higher, labour lower and stockholding as an average than in the German outlook for German machine t

(iii) Selected Cases in Baden

For simplicity, machine tool fir into:

- Producers of Complete
- Part-Producers and Sub

Three examples of each are pres with Chief Executive Officers ( case examples give an indic Württemberg machine tool ind thereby presented.

(iv) Producers of Complete A

One important change for suc Traditionally, sales price was w plus a margin. Now, with 'simu being developed by teams of m engineers working in combinati based on detailed market resear and Germany plus other export ; from which costs of production This cost-target approach has be competition. In Trumpf, it is kno (TOP). Trumpf is a world-lea CEO-level and willing to adapt it producing, for example, partly-r Anglo-American markets.

World leader firms in the produ affected by the two key force Production. Japanese firms are o difference enables them to make years. Firms from a mechanical e to keep ahead in the electronics as

y's key weaknesses, apart from productivity gains more difficult – regarding innovation. A study of German and Japanese industries in an industry is very dependent on a rather inward-looking, at the size user-requirements. Japanese the market's requirements by treating as a business activity. This, the advantage of Japanese over analyse differently and to employ

at scale was not a key problem, differences between German and precision, as is done in limited ways (1992). They took a representative examined them not so much from they could be said to be engaging summarised in Table 3.4, showed between German and Japanese

4  
Japanese and German Firms

German Average 1989	Germany 1990			
	A	B	C	D
179	239	283	311	199
95	119	132	149	113
51	50	47	48	57
1.3	-2	2	5	2
34	31	23	24	38
37	22	20	15	35

Of particular interest is the size difference of typical firms, the much higher turnover per employee and value-added per employee in Japan. Profits were much higher, labour-costs as a percentage of turnover much lower and stockholding as a percentage of turnover slightly less on average than in the German case. All in all this represents a sombre outlook for German machine tool producers.

(iii) Selected Cases in Baden-Württemberg

For simplicity, machine tool firms in Baden-Württemberg can be divided into:

- Producers of Complete Machines;
- Part-Producers and Sub-Contractors.

Three examples of each are presented below, based on detailed interviews with Chief Executive Officers (CEOs) conducted in Autumn 1992. These case examples give an indication of the *dualisation* of the Baden-Württemberg machine tool industry and the challenges and opportunities thereby presented.

(iv) Producers of Complete Machines

One important change for such firms concerns thinking about cost. Traditionally, sales price was worked out by adding cost of production plus a margin. Now, with 'simultaneous engineering', (i.e. new products being developed by teams of marketing, production, R&D and control engineers working in combination), marketing arrives at a design price based on detailed market research in the main markets of Italy, France and Germany plus other export areas. This becomes the sale price target from which costs of production are deducted, leaving a profit margin. This cost-target approach has been adopted purely because of Japanese competition. In Trumpf, it is known as Trumpf-Optimierungs-Programm (TOP). Trumpf is a world-leader company, independent-minded at CEO-level and willing to adapt its products to meet market requirements, producing, for example, partly-manual machines for the price-sensitive Anglo-American markets.

World leader firms in the production of sawing machine tools are also affected by the two key forces of Japanese competition and Lean Production. Japanese firms are on average ten times bigger and this size difference enables them to make technology jumps every two or three years. Firms from a mechanical engineering tradition doubt their capacity to keep ahead in the electronics aspect of production in which the Japanese



excel. Lean Production pressures from customers are causing them to buy, rather than make, more of their product.

#### (v) Part-Producers and Sub-Contractors

There is a variation ranging from the highest quality flexibly-specialised firms, to high quality, flexible but, to varying degrees, dependent firms. The point to look for here is that the cost-squeeze on such firms, irrespective of their relative sophistication, is causing them to make significant changes in their business methods.

Specialist cutting machine tool firms have largely been shielded from the recession in the industry thus far. Total employment was relatively stable to July 1994. One company has recently set up a service base in the UK market to sub-contract to a number of UK machine tool firms, a decision stimulated by the VDMA's (Machinery Industry Association) recommendation that the *Mittelstand's* survival depended upon such global co-operation due to shrinking markets and the small scale of German machine tool firms. In the domestic market, competition is still seen as the key to promoting innovation.

For firms that have gone down the lean sub-contractor route, perhaps as a supplier to the Japanese, the experience of an Achern firm is instructive. Its machine building expertise developed in the early 1980s when, during recession, the company began to assemble machines, never to its own design, always sub-contracted. In the main, cloth-cutting machines were assembled, but in recent years a contract was made with Citizen, the Japanese watch-making firm. Citizen was responsible for sending shock-signals through the German machine-tool industry when they bought Boley, an established Esslingen precision (spindles) machine tool firm. Citizen, in 1989, needed the 'Made in Germany' label to overcome EC import restrictions. The link with Citizen was facilitated by the GWZ, the BW Agency for International Economic Co-Operation. Now that Boley has been restructured and demand is flat, the contract has finished.

Hence, the dependent supplier firms, ranging from the highly specialised to the most flexibly-advanced, face serious organisational and locational problems. At the highest value-added end of production, it is unlikely that such firms will leave the Black Forest. But long lead-times for parts mean competitors can penetrate a market already developed. Costs of parts-production are high enough that global sourcing from Eastern Europe is a virtual imperative for low value-added items. Moreover, the increasing uncertainty in the machine tool market means that firms engaging in flexible sub-contracting have, increasingly, to be willing to diversify beyond that industry to survive. It appears that a hierarchical

structure may be emerging in egalitarian industry.

#### (vi) Weaknesses of the Baden-Württemberg

There are many and deeply-founded weaknesses of the Baden-Württemberg machine tool industry. These are the following which were identified by Morgan & Morgan, 1990; Cooke, Morgan & Morgan, 1990.

- The high levels of institutional support system. Although government, intermediary and industry rather than quantitative processes operate efficiently, the Ministry of Industry's *Aktion Mittelstand* machine-tool programme in the first half-year is a case in point.
- The manufacturing base of the 'Post-industrial' economy under which make Baden-Württemberg's relative insignificance. Within the automotive engineering sector and one from which the future (e.g. the 'green' car) will draw much benefit;
- The *export orientation* is not as effective as in other regions which do not. Baden-Württemberg is focused on developed countries with simpler requirements of North America. In this they need to engage in co-operation with the state government. (Examples: Yokohama, Japan and Singapore have been established);
- The *skills* of the region are not as high quality diversified product range as machine tool companies. For machine tool industry does not, as others, it probably benefits from Baden-Württemberg (Brackenheim);
- Finally, *technology*, and advanced manufacturing have been a strength of the machine tool industry.



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structure may be emerging in what was, until recently, a relatively egalitarian industry.

(vi) Weaknesses of the Baden-Württemberg Machine Tool Industry

There are many and deeply-founded strengths in the industry. Amongst these are the following which we have stressed in the past (Cooke & Morgan, 1990; Cooke, Morgan & Price, 1993):

- The high levels of *institutional intelligence* in the industrial support system. Although much of the impact of relations among government, intermediary institutions and industry is qualitative rather than quantitative, information and policy guidance processes operate efficiently and effectively. The response to the Ministry of Industry's A.D. Little report on the problems of *Mittelstand* machine-tool and automotive firms in under a half-year is a case in point;
- The manufacturing base of the region is, in itself, a strength. 'Post-industrial' economies have major problems of productivity under which make Baden-Württemberg's problems pale into relative insignificance. While the very long-term future of the automotive engineering economy may be in doubt, it is a core-sector and one from which transportation development of the future (e.g. the 'green' car, public transport and aerospace) can draw much benefit;
- The *export orientation* is important. Firms which export their output are more effective and have a more secure future than those which do not. Baden-Württemberg's machine tool firms have focused on developed country markets and need to adjust to the simpler requirements of Newly Industrialising Economies. For this they need to engage in more export-co-operation in concert with the state government and banks (as, for example, at Yokohama, Japan and Singapore where German Industrial Parks have been established);
- The *skills* of the region are especially well-suited to the 'high quality diversified production' (Streeck, 1989) typical of many machine tool companies. Furthermore, it seems that, although the machine tool industry does not over-skill its workforce as much as others, it probably benefits from the high training densities in Baden-Württemberg (Braczyk *et al*, 1993);
- Finally, *technology*, and advances in its application, has clearly been a strength of the machine tool industry. Quality, reflected in

a high price has, until recently, proven to be a competitive advantage of massive proportions, and one which has appealed to customers in the most exacting markets, including, of course, Germany itself. This high quality, high value-added focus has enabled relatively high wages to be paid to highly skilled workers. Quality is in short-supply. The new trick is to keep quality high while reducing price significantly. This requires high productivity and low unit labour costs, not a reduction in quality *per se*.

Despite these strengths, there are significant weaknesses in Baden-Württemberg's machine tool industry. There are five of these:

- Machine tool firms in Baden-Württemberg have had a reputation for *slow delivery*. As a case in point, the Ford Motor Co. engine plant at Bridgend in Wales used to source machine tool supplies from Kieninger Tooling in Lahr, Schwarzwald. However, Kieninger were quoting 26 weeks delivery time, stressing it as a standard. This led to Ford looking for and finding local tooling suppliers;
- *Over-engineering* is a particularly pronounced problem (which, of course, used to be considered an advantage). The perfectionism of the Swabian 'proud engineer', with his '*pfiffige*' mentality and priority given to engineering excellence over price, has added costs to machine tool production. Having a similarly-minded set of customers such as Mercedes and Porsche has not helped overcome this 'tinkering' restlessness, a factor heightened by Japanese price-competition;
- Despite strengths in *occupational skills*, machine tool firms are more hierarchical, less transparent, with less frequent consultation and information flows than is the case typically in Japanese machine tool firms. There is a marked skill division of labour with *Meister* reinforcing hierarchies and sometimes hindering the development of multi-skilling (e.g. mechatronics) in machine tool firms (Brödner and Schultetus, 1992);
- It seems that *investment in innovation* has fallen away in the past decade or so. Braczyk *et al*, (1993) report that since 1989 Baden-Württemberg machine tool firms have cut R&D spending and that the quality and quantity of investment in capital generally has not been high since 1973. Naschold (1993) is referred to as criticising machine tool products for being too complex for the fast-growing markets of the Far East and Latin America.

As a consequence of these factors, all of which point to a problem of conservatism, rigidity and an unwillingness to experiment, there has,

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These points were further under conclusions to the effect that the . the meeting, he convened wi association), IHKs, IG Metall (a specific weaknesses were highlig

- Absence of Japanese-qu long-term dependence and
- Product complexity time-to-market, and set-up
- Insufficient use of lean m engineering to allow low-i
- Inadequate back-up sales ASEAN trade area;
- Insufficient collaboration and product development,

Lastly, though it is not mentioned i the machine tool industry has consequences for its region. Its Stuttgart, Esslingen, Ludwigsbu Enzkreis, Ortenaukreis, Heilbronn located in small semi-rural locatio the past, environmental effects cc environmental regulations may co to costs in the process. But the over-congested, especially in poten needs to be given to controlling encouraging more use of the exten threatened) rural rail system enjoy

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These points were further underlined in Economics Minister Spöri's conclusions to the effect that the *status quo* was no longer an option. At the meeting, he convened with VDMA, VDI (general industry association), IHKs, IG Metall (a trade union) and firms, the following specific weaknesses were highlighted:

- Absence of Japanese-quality control technology resulting in long-term dependence and know-how erosion;
- Product complexity causing product development, time-to-market, and set-up times to be uncompetitive;
- Insufficient use of lean management principles or simultaneous engineering to allow low-inventory production;
- Inadequate back-up sales and service networks, especially in the ASEAN trade area;
- Insufficient collaboration in purchasing, production, marketing and product development, hence no modularisation.

Lastly, though it is not mentioned in any of the industry critiques as such, the machine tool industry has some significant environmental consequences for its region. Its dispersed character, with centres in Stuttgart, Esslingen, Ludwigsburg, Rems-Murr-Kreis, Göppingen, Enzkreis, Ortenaukreis, Heilbronn, Reutlingen and Karlsruhe, much of it located in small semi-rural locations, means movement of goods and, in the past, environmental effects could be treated as a public cost. New environmental regulations may control the latter to some extent, but add to costs in the process. But the Baden-Württemberg road-system is over-congested, especially in potentially quiet, rural areas. Consideration needs to be given to controlling industrial use of rural roads and encouraging more use of the extensive (but with privatisation, no doubt threatened) rural rail system enjoyed in the *Land*.

### 3. OPTIONS FOR CHANGE

Is it possible to have world-class manufacturing without world-class machine tools? No! Is it possible to have world-class tools if one has to depend upon imports? No! Countries with superior machine tool industries exhibit superior industrial growth (Thurow, 1992).

Although Lester Thurow is here trying to exhort the USA to take manufacturing in general, and machine tools in particular, seriously as

any good economic nationalist would, he nevertheless has a point. It is unthinkable that the first option, letting the industry die in Baden-Württemberg, can be seriously advocated. Despite present problems, it is perhaps the world's finest and, in terms of embedded know-how, has a value that will persist even if cheaper production can be obtained elsewhere.

A second option, already mentioned, is that the scale of firms in the industry should be increased to match that of the Japanese. As Brödner & Schultetus (1992) put it:

The *Mittelstand* German machine tool firm appears to be something of a David versus Goliath ... The stark difference between the largest Japanese and German firms leads one to the conclusion that the capital power of the Japanese allows them a worldwide capacity to act, while the Germans are possibly losing access to markets (Brödner & Schultetus, 1992).

In addition to this, technological change means that stand-alone machining centres requiring integrated systems of software, electro-mechanical hardware and new organisational techniques leading to Computer Integrated Manufacturing (CIM) have become *de rigueur*. Here the Japanese have the necessary scale, organisationally and technologically (e.g. Fanuc's new 32-bit control system), while no German firm does.

Attempts to create the necessary scale amongst German machine tool firms appear to be foundering. Outside Baden-Württemberg, the Deckel-MAHO merger has resulted in the joint company filing for insolvency protection with debts of DM140 million in the year to June 1994. Pre-existing collaborations between Deckel and Gildemeister, MAHO and Traub, MAHO and Berthold Hermle do not seem to have helped (Eisenhammer, 1994). As Dieter Weidemann, CEO of Pittler, one of Europe's largest machine tool groups, argued:

Size offers no way out, for you cannot compete against the Japanese and Koreans with series machines made in Germany. The cost will always be 10-15 per cent higher (Cooke, Morgan, Price, 1993).

The option of vertical integration, seeking scale in the embrace of IBM or Nixdorf was rejected by Deckel because, as Assistant Chairman Peter Bachsleitner put it:

... we see the danger that one day we will no longer be able to enter into discussions since we will have become a mere iron and steel supplier (Cooke, Morgan, Price, 1993).

There seems to be no option of strengths of the existing system hold out possibilities as they h (Dempsey, 1994). Evidently, C on quality and innovativeness. game they know they will lose inexperience in mass markets. lose their know-how in the all part of the machine. Hence, th falling into the worst of all cate 'proud engineer', namely that c is the mentality which defines fully recognising the untenabil even middle way as an alternati

Instead of vertical collaborati groups may offer scale while r and lowering price. The virtuous may be on the horizon. Recent Emilia-Romagna, Tuscany an group-formation has enabled fi their sector generally (Franchi, Canullo, 1994). Similarly, wher components firms found pressu further innovation from large cu by the Ministry of Industry, r sponsor a number of technolog third parties with independent : IHKs. The 'honest-broker' hol proprietorial know-how was t independent competitors.

The aim here is to enhance cap sub-systems, components and interfaces, graphically interactive thus be produced by means of a di members. These generic system attendant price diminution but at compete in their particular mark these standardised parts. Ideally contain different types of machir the advantages of collaboration potential know-how appropriatic arrangements could obviously be even training amongst group-me

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There seems to be no option other than an innovative re-thinking of the strengths of the existing system, although Traub clearly believes mergers hold out possibilities as they have just united with Heckert of Chemnitz (Dempsey, 1994). Evidently, German firms seek to continue to compete on quality and innovativeness. If they take on the East Asians at their own game they know they will lose both from going downmarket and from inexperience in mass markets. If they merge with computer firms, they lose their know-how in the all-important value-adding control systems part of the machine. Hence, they see themselves as being in danger of falling into the worst of all categories from the viewpoint of the German 'proud engineer', namely that of becoming a mere 'metal-bender'. This is the mentality which defines attachment to a 'high road' future, while fully recognising the untenability in this context of taking on a low or even middle way as an alternative.

Instead of vertical collaboration or merger, lateral co-ordination into groups may offer scale while retaining quality, increasing productivity and lowering price. The virtuous circle that currently escapes the industry may be on the horizon. Recent evidence from the industrial districts of Emilia-Romagna, Tuscany and Marche in the Third Italy, suggests group-formation has enabled firms in industrial districts to out-perform their sector generally (Franchi, 1994; Dei Ottati, 1994; Alessandrini & Canullo, 1994). Similarly, when, in 1992, machine tool and automotive components firms found pressures for them to engage in further and further innovation from large customers, the Little report, commissioned by the Ministry of Industry, recommended the *Land* government to sponsor a number of technology-related model projects moderated by third parties with independent status, such as Fraunhofer Institutes or IHKs. The 'honest-broker' holding the ring was seen as essential if proprietorial know-how was to be protected amongst still-fiercely independent competitors.

The aim here is to enhance capability for *modularisation* of systems, sub-systems, components and parts. Control systems, mechanical interfaces, graphically interactive and programmable logic systems could thus be produced by means of a division of responsibilities amongst group members. These generic systems could thus be produced to scale with attendant price diminution but at high quality. Individual firms can then compete in their particular market on the basis of efficient acquisition of these standardised parts. Ideally, groups would be risk-spreading and contain different types of machine tool specialist, thus further enhancing the advantages of collaboration while minimising the disadvantages of potential know-how appropriation by competitor firms. Similar kinds of arrangements could obviously be extended to purchasing, marketing and even training amongst group-members.

Baden-Württemberg has always been thought to have a strong system of intermediary business support institutions. Examples like the Gosheim Lathe centre, now one of Germany's leading quality and innovation points for this technology, developed by Steinbeis, is a case in point (Semlinger, 1993). Also, the speed with which the model projects for collaborative R&D by *Mittelstand* firms to engage in innovation were set up by the Ministry of Economics, was impressive. But, perhaps implementation in these new and sensitive areas is more difficult than it was for training support or technology transfer in the past. There is a feeling that collaboration in innovation needs longer to develop because it is so close to the heart of the firm's existence, in its know-how. The sensitivity regarding co-operation in this new area, as compared with older ones such as training, concerns the question of proprietorial knowledge. Just as *Mittelstand* firms prefer not to merge because of the fear of losing their know-how, they are understandably unwilling to share their proprietary knowledge with a potential competitor. The *Land* Ministry of Economics has introduced the idea of 'model-projects' where a third-party such as a Fraunhofer Institute acts as the honest broker amongst such firms. Information exchange through the Institute protects individual firm know-how but enables diffusion of the gains from confidentially-pooled knowledge to take place to each member of the model-project.

Finally, what of the firms themselves? What – beyond the initiative taken by the government and intermediaries – have machine tool firms been doing to improve competitive performance?

- **Lean Production**, as a message and possible model, has been absorbed and, in some cases acted upon. Market-leaders have been as likely as sub-contractors to engage in this. Investment in in-house stock control and logistics systems, better customer-interaction and above-all, cost-control has begun, though implementation can take up to a year and a half, which is too long;
- **Value Engineering**: This cost-management system, involving clocking-in each time a different (and differently-skilled) worker conducts a task in the production process is being installed, again slowly. Waste in production time and organisation is thus being reduced;
- **Simultaneous Engineering**: Normally considered a large-firm response to the requirements of 'permanent innovation', this approach has been instituted by a group of Baden-Württemberg firms engaged in the measurement industry in the Albstadt area of Schwarzwald (Gassmann *et al*, 1993).

#### 4. CONCLUSIONS AND

It has been argued that the machine tool industry faces very serious problems of modernisation, summed up in six key dimensions: production; skills; the environment; awareness that these and related areas need action is being taken, but not enough; suggested, a tendency to under-utilise intermediary institutions in the past; individually they look similar; in Germany, in harness they act better; consensus for action. This may be a necessary condition for modernisation and assisting it because it creates a monitoring mechanism for an age of permanent innovation.

However, the first threat noted is international country competition. Not least, in high-end markets, especially those of Baden-Württemberg's machine tool industry, Japanese imports now account for 10% of CNC turning machine tools. Japanese machines are 10% cheaper, offer higher quality and reliability (Ministry of Economics, 1993). The Ministry's *Gemeinschaftsinitiative Wirtschaft* has identified the problem of Japanese competition as a major threat to Baden-Württemberg's high quality machine tool know-how. But, there is a need for more investment in the boom areas to overcome this weakness. The only way forward is to co-operate on the development of new components and parts. In this way the diseconomies of merger (as to

Costs of production are a second major threat to machine tool competitiveness. Five key points and action conditions in the case of Mettler-Toledo, are in the forefront of a systematic management tool for the industry: minimising waste and maximising quality. Ministry programmes of incentives (known as concurrent) engineering are aimed at increasing worker flexibility and productivity in this direction. The IG Metall study of 1993

#### 4. CONCLUSIONS AND ASSESSMENTS

It has been argued that the machine tool industry in Baden-Württemberg faces very serious problems of competitiveness. These problems can be summed up in six key dimensions: Japanese competition; costs; lean production; skills; the environment; and innovation capacity. There is awareness that these and related or subsidiary problems exist and in some cases action is being taken, but not in all dimensions. There is, it has been suggested, a tendency to under-estimate the importance of the intermediary institutions in the *Land*. While, on the surface and individually they look similar to intermediary institutions elsewhere in Germany, in harness they act efficiently and effectively to mobilise consensus for action. This may be the most vital asset for promoting modernisation and assisting *Mittelstand* firms to cope with change because it creates a monitoring and learning environment and culture. In an age of permanent innovation, this is of crucial importance.

However, the first threat noted was that of Japanese and other Asian country competition. Not least, the fact that price competition has reached high-end markets, especially the German domestic market, has given Baden-Württemberg's machine tool producers cause for concern. Japanese imports now account for 25 per cent of the German market for CNC turning machine tools. Japanese firms are both quicker and 30 per cent cheaper, offer higher quality and good service (Ministry of Economics, 1993). The Ministry view, expressed in its publication *Gemeinschaftsinitiative Wirtschaft und Politik* is that the structural problem of Japanese competition is survivable due to Baden-Württemberg's high quality production and technological know-how. But, there is a need to reduce costs and compensate for the lack of investment in the boom years. Control technology is a crucial weakness. The only way forward is for Baden-Württemberg firms to co-operate on the development of generic, modularised systems, components and parts. In this way, scale benefits can be achieved without the diseconomies of merger (as testified by the Deckel-MAHO case).

Costs of production are a second and crucial factor in the decline of machine tool competitiveness. Firms find themselves at different starting points and action conditions in relation to this. Some, like Getrag and Mettler-Toledo, are in the forefront now. Lean production is precisely a systematic management tool for taking cost out of production by minimising waste and maximising value-adding activity. The Economics Ministry programmes of incentives for projects on simultaneous (also known as concurrent) engineering and lean production (especially increasing worker flexibility and responsibility) are a move in the right direction. The IG Metall study of Mettler-Toledo, the Albstadt measuring



machinery firm shows how moving away from accountant-led purchasing (resulting in huge stocks – 50 per cent of turnover), unsatisfied customers and half-processed products being scrapped, resulted in increased productivity. This was because of cost-targeting, project-based management, worker participation and a market rather than a production focus. As a result, turnover is now DM100 million, stocks are DM4-5 million, or 4-5 per cent of turnover). Average product development time is now less than six months, while it was over two years. Some 30 per cent of turnover goes towards developing new products; 15-18 are in development. Manufacturing depth has been reduced to 40 per cent, below the industry average of 42 per cent. The firm is in credit, has been profit making since 1989 and productivity has increased greatly (Gassmann *et al*, 1993).

If lean production reduces production costs, what about the impact upon skills, work organisation and worker participation? Too many *Mittelstand* firms are, despite the mythology, more hierarchical, less open or transparent, have less frequent consultation and a weaker information flow than their Japanese competitors. The skill division of labour and power of the *Meister* reinforce the hierarchical tendency and undermine the requirement for meeting new demands of flexibility and multi-skilling. Once again, the Mettler-Toledo example points the way forward. The cornerstones of the new policy towards the production process are:

- Self-management;
- Individual responsibility – based on information;
- Integrated functions – no more Taylorism;
- Open communication;
- Organisation based on trust.

Each worker should be able to conduct many more work tasks. Teams of workers should work on simultaneous product development instead of being compartmentalised. Employees' desire to work well should be capitalised upon by recognition of the fact that people are the only source of creativity. In return, flexi-time and working elasticity can be achieved.

Next, innovation, the most crucial competitive weapon, needs a significant overhaul in the Baden-Württemberg machine tool industry. We have seen how the Japanese alone make sophisticated control systems, meaning that if firms do not co-operate to develop modular systems, more and more German machines will be fitted with Japanese control technology and a great deal of know-how will flow from Germany

to Japan. Other recommended pre-competitive R&D, concern:

- Mechanical synergies;
- High-speed manufacture;
- Design-for-manufacture a
- Graphic-interactive progr
- Use of micro-electronics a

A recent survey by Felder and Ne about Baden-Württemberg mach Expenditure on R&D is less than i to small firm size. Informal inn Radically improved products acco of turnover from improved prod became smaller. Turnover from ov engineering businesses and labour of simultaneous engineering mean of new knowledge rather than technology transfer sources. Purch gaining know-how and more form Clearly, there is much room for im

Finally, what does the Baden-V opportunities and limits of netw well-endowed region, especially in Max Planck Institutes, 14 Fraunhöi universities. Moreover, it has 39 F whole 'economy culture' of the regi circumstances, it is possible to have technology-transfer for SMEs, Foundation. This organisation was only 7 per cent of its funding comes either comes from market transacti public sector (e.g. evaluating pr funding) or for firms using publ consultancy. The network consists o usually in the Polytechnics. Indi accredited by Steinbeis to act as tec directed by Steinbeis to the appro takes a fee. This policy is difficult t many countries lack the rich inn Baden-Württemberg.

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to Japan. Other recommended areas of co-operation, especially in pre-competitive R&D, concern:

- Mechanical synergies;
- High-speed manufacture;
- Design-for-manufacture and value for money;
- Graphic-interactive programming systems;
- Use of micro-electronics and micro-mechanics.

A recent survey by Felder and Nerlinger (1994) concludes the following about Baden-Württemberg machine tool firms' innovation capacity. Expenditure on R&D is less than in other engineering sectors, partly due to small firm size. Informal innovation activity tends to be higher. Radically improved products accounted for a relatively small proportion of turnover from improved products since 1990, especially as firms became smaller. Turnover from overseas was very low compared to other engineering businesses and labour productivity was also lower. The lack of simultaneous engineering meant that customers were the main source of new knowledge rather than production, logistics, research or technology transfer sources. Purchase of equipment is the main way of gaining know-how and more formal methods are not very pronounced. Clearly, there is much room for improvement.

Finally, what does the Baden-Württemberg case tell us about the opportunities and limits of networking? First, it is an exceptionally well-endowed region, especially in terms of research institutions with 14 Max Planck Institutes, 14 Fraunhofer Institutes and 9 international-class universities. Moreover, it has 39 Fachhochschulen (Polytechnics). The whole 'economy culture' of the region is 'high road' in mentality. In such circumstances, it is possible to have a diffused, network-based system of technology-transfer for SMEs, as happens through the Steinbeis Foundation. This organisation was set up by the *Land* government but only 7 per cent of its funding comes from direct public funding. The rest either comes from market transactions or through contract work for the public sector (e.g. evaluating proposals from firms for innovation funding) or for firms using public technology grants for technical consultancy. The network consists of over 100 Technology Centres based usually in the Polytechnics. Individual scientists or engineers are accredited by Steinbeis to act as technical consultants to firms who are directed by Steinbeis to the appropriate consultant. For this, Steinbeis takes a fee. This policy is difficult to transfer because most regions and many countries lack the rich innovation infrastructure enjoyed by Baden-Württemberg.

## DENMARK: BUILDING CLUSTERS IN ISOLATION

A further point concerning collaboration is that, as was noted in connection with the 'model-project' idea – whereby SMEs seeking or being required by larger customer-firms to become *innovative* suppliers are encouraged by Ministry of Economics policy to collaborate – it is not a simple matter to do so. Innovation, in particular, is a sensitive process in which even firms disposed to collaborate must guard their proprietary knowledge. Where there is a rich and trusted intermediary organisation with appropriate expertise, such as a Fraunhofer Institute, that problem may be overcome. But such an institution needs to have earned the respect of the business community and governance system for it to be a feasible option.

Because of the relatively recent implementation of the model projects, it is too early yet to judge their success. By 1994, it was reported that progress was quite slow but efforts to meet the exacting innovation requirements of out-sourcing customer-firms like Mercedes and Bosch were continuing and there remained a desire amongst all parties to succeed. The example of the Gosheim lathe centre is now evaluated as a complete success in that the centre exists and serves the innovation needs of firms in the lathe industry in Germany as well as those in Baden-Württemberg. The involvement of Steinbeis in its establishment is a little unusual in that the Foundation normally deals with requests for technology-transfer from single firms. In this case, it was a request for assistance to establish a systemic innovation facility by a group of firms for an industry.

### 1. INTRODUCTION

With a population of 5.1 million in Baden-Württemberg, it is not surprising that both large, research-based firms and small firms engaged in Research by the European Commission to introduce micro-electronics equipment to catch up in the 1980s, there were shortages. However, Denmark is a country in terms of GDP per head that it can generate communication and its system of SMEs.

TA

D  
Economic

Population (1991)	
Labour Force Participation Rate (1991)	
Labour Force (1991)	
Employment in Agriculture	
Industry	
Services	
GDP Per Capita (1991)	
GDP Per Employee	
Unemployment Rate (1993)	

Source: Eurostat.

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## CHAPTER 4

### DENMARK: BUILDING NETWORKS AND CLUSTERS IN ISOLATED RURAL SETTINGS

#### 1. INTRODUCTION

With a population of 5.1 million (Table 4.1), approximately half that of Baden-Württemberg, it is not surprising that Denmark has a relative lack of both large, research-based firms and a government technology policy. Research by the European Commission shows that Denmark was slow to introduce micro-electronics equipment and that when efforts were made to catch up in the 1980s, there were organisational inadequacies and skills shortages. However, Denmark is the EC's second most prosperous country in terms of GDP per head. Because of Denmark's small stature, it can generate communication and interaction economies, especially in its system of SMEs.

TABLE 4.1  
 Denmark  
 Economic Indicators

	Denmark	EU (EUR 12)
Population (1991)	5.1 million	344.8 million
Labour Force Participation Rate (1991)	56.3%	55.1%
Labour Force (1991)	2.9 million	142.0 million
Employment in Agriculture	5.8%	6.4%
Industry	27.1%	33.3%
Services	67.1%	60.3%
GDP Per Capita (1991)	109%	100%
GDP Per Employee	84%	100%
Unemployment Rate (1993)	8.0%	10.4%

Source: Eurostat.

Of key importance to this system are the support infrastructures for small business. The most important of these are: the Chambers of Commerce and Industry; local and regional technical schools; local and regional banks providing long-term loans for local SMEs; and the Danish Technological Institute with its 15 Technology Centres. The Danish Technological Institute (DTI) is a privatised branch of the Ministry of Industry. It employs 1,200 technologists and others in developing, identifying and transferring generic technologies, largely to SMEs. Some 55 per cent of DTI's contract income is from firms employing less than 50 people.

Recognising that isolation from information and know-how was a handicap to SMEs, DTI in 1989 established a 'Network Programme' which channelled government support to firms willing to co-operate in certain business activities. In one small town in Jutland, the following case-history is instructive. Seven small furniture makers found local markets shrinking. With the aid of a DTI broker they took advantage of the Network Programme. Their discussions led to them agreeing to create a trading company. Through the trading company, they divided up key tasks, so that, for example, design for all firms is done by two designers. Each firm specialises in a particular production phase and the company now exports high-quality furniture to the EC and beyond.

By 1992, 175 networks had been created, in which 42 per cent of firms had increased turnover by 4 per cent or more, and one in five showed increases of 10 per cent or more. Of key importance to the success of this programme was the appointment by DTI of 'Network Brokers'. These are local professionals, lawyers, consultants or engineers whose job it is to create networks of firms, occasionally supported, as appropriate, by colleges, local authorities, enterprise agencies and so on for consultancy advice, training or business information. These networks then bid for grants from technology programmes aimed at product and process innovation, quality improvement, product differentiation, and very importantly, design, which is seen as a key selling point. These networks maintain the philosophy that 'The Competitive Advantage of Regions is Achieved through the Competitive Advantage of Firms'.

## 2. DENMARK AS A LEARNING ECONOMY

Denmark spends a relatively low proportion of its GDP on R&D. In 1991, it was 1.7 per cent compared to a 1987 figure of 1.4 per cent. The 1991 figure is not massively larger than, for example, Ireland's, which was then 1.1 per cent, later to rise to 1.2 per cent by 1993. This feature was noted in the 'Archipelago Europe' study of Denmark by the European

Commission DG-12 FAST project is further explored, from a systems perspective (Hansen *et al* (1991)). Hansen's study shows that expenditure is a result of particular circumstances. This is associated with the Danish economy, usually dominated by small firms. One company alone accounted for 9 per cent of sector R&D expenditure in 1989. Firms with less than six employees were engaged in

R&D expenditure should not be underestimated. It is much more concerned with the generation of new knowledge and progress, though in the early 1980s it showed Danish firms lagging behind in micro-electronics, in industry. The micro-electronics sector was held to be responsible for the following observation, that it must compensate for its structural disadvantages

There are also some strengths in innovation, however. In social communication and interaction between firms making international connections seems as if cultural distance is participating in innovation. Results indicate that there may be a system of innovation to coordinate large, research based firms and through communication and interaction of small and medium-sized firms (Johnson *et al*, 1991).

This view underpins a considerable body of policies to support small firms over a decade or so. In other words, what it makes up for by searching and learning elsewhere into innovations, rather than

The notion of a 'learning economy' (Johnson (1994)), and its relevance in the context of small economies. The authors note that the transition of micro-electronics to Denmark involves interactive learning and new processes of economic change. The

support infrastructures for small are: the Chambers of Commerce; local and regional schools; local SMEs; and the Danish Technology Centres. The Danish specialised branch of the Ministry of Science and Technology, together with other experts and others in developing, technologies, largely to SMEs. Some firms from firms employing less than

information and know-how was established a 'Network Programme' for firms willing to co-operate in all town in Jutland, the following all furniture makers found local DTI broker they took advantage of relations led to them agreeing to create a joint company, they divided up key tasks and all firms is done by two designers. The production phase and the company is done by the EC and beyond.

led, in which 42 per cent of firms or more, and one in five showed the importance to the success of this DTI of 'Network Brokers'. These consultants or engineers whose job it is to be fully supported, as appropriate, by agencies and so on for consultancy services. These networks then bid for contracts aimed at product and process development, product differentiation, and very much a key selling point. These networks provide a competitive Advantage of Regions is a competitive Advantage of Firms'.

## THE ECONOMY

proportion of its GDP on R&D. In 1991, the 1991 figure of 1.4 per cent. The 1991 example, Ireland's, which was then noted by 1993. This feature was noted by of Denmark by the European

Commission DG-12 FAST programme in Hansen (1991). The question is further explored, from a systematic learning perspective by Johnson *et al* (1991). Hansen's study shows that Denmark's relatively low research expenditure is a result of particularly low expenditure in the private sector. This is associated with the Danish firm-size structure, which is more than usually dominated by small and medium enterprises. Indeed, one company alone accounted for 9 per cent of total and 18 per cent of private sector R&D expenditure in 1989. Only some 8 per cent of firms with more than six employees were engaged in R&D in the same year.

R&D expenditure should not be confused with innovation. The latter is much more concerned with the commercialisation rather than the generation of new knowledge. Here, the Danes have made steady progress, though in the early 1980s this was less the case. Research showed Danish firms lagging in their absorption of, for example, micro-electronics, in industry. Again, the dominance of the small-firm sector was held to be responsible (Hansen, 1991; Johnson *et al*, 1991). The following observation, though, indicates how Denmark may compensate for its structural disabilities:

There are also some strengths in the Danish national system of innovation, however. In some respects it is characterised by communication and interaction economies both within and between firms making interactive learning rather effective. It seems as if cultural distances between different kinds of people participating in innovation activities are often quite short. The results indicate that there may be some possibilities in a national system of innovation to compensate for a relative lack of both large, research based firms and government technology policy, through communication and interaction economies in a system of small and medium-sized firms. At least for a period of time (Johnson *et al*, 1991).

This view underpins a considerable amount of the thinking that has gone into policies to support small firm development in Denmark in the past decade or so. In other words, what Denmark lacks in capacity to invent, it makes up for by searching and learning to transform inventions from elsewhere into innovations, rather as Japan has done.

The notion of a 'learning economy' has been elaborated upon by Lundvall and Johnson (1994), and it repays close analysis because of its general relevance in the context of smaller, SME-dominated, peripheral economies. The authors note at the outset how the belated introduction of micro-electronics to Denmark convinced them of the central role of interactive learning and new combinations of knowledge play in the process of economic change. The recent development of Information &

Communication Technologies (ICT), the rise (especially from Italy) of flexible specialisation and changes in the process of innovation have promoted knowledge-intensity and learning to the front rank of assets or resources for contemporary competitive advantage. Incremental innovation has become necessary for the survival of firms, requiring many learning interfaces inside and outside firms. Users are crucial sources of innovative knowledge and learning. Meanwhile research costs continue to escalate and product life-cycles shorten, so payback time is reduced.

As a consequence, innovation processes must be capable of rapid-response, multi-skilling and networking skills increase in importance and application of learning becomes a crucial part of overall firm performance. Management increasingly becomes a matter of creating the institutional setting (rules, routines, habits) for stimulating interactive learning. Thus, advanced economies are learning economies. In a learning economy, networking amongst firms, horizontal communication and frequent mobility of persons between departmental posts are typical features of associated 'learning organisations'. There is a tendency for economies to specialise according to their excellence along specific sectoral learning curves. A case in point would be the Italian industrial districts. But although learning occurs by monitoring internal organisational performance in relation to goals, a large part of economic learning comes from overseas. The relationship between 'tutor' and 'learner' economies is a complex one.

In learning economies, learning and tutoring are going on at mundane levels as well as within science and technology. An example from Denmark is quoted by Lundvall and Johnson (1994) to show what they mean by this. A thirty-employee firm from Jutland producing furniture introduced a new work-bench for electronics repairs. It was successful, not least because it was made from dust-repellent material which also prevented static build-up. It originated from a discussion at a trade-fair. Representatives of the service department of a large Danish consumer electronics firm were there seeking such a work-bench. The small firm contacted a design firm and set up a project-group. They discovered they needed experts in materials, so they contacted the Danish Technological Institute (DTI) and a prototype was constructed, tested and marketed. The whole process took one year and is representative of a user-driven interactive learning and incremental innovation system in a rather mundane product area.

Policy, conclude Lundvall and Johnson (1994) can assist such processes. First, the existence of the technology transfer institute DTI is itself a product of government, even though it is now privatised. But policy can also fit the kind of trajectories that knowledge frequently evolves along,

by stimulating progress further along. These trajectories are referred to as 'path-dependence'. In the context of the Network Programme, to be discussed later, it is clear that some firms have developed a prototype, state-of-the-art technology such as an innovation grows from the fishing and trawler-building and has enabled this network of firms to gain a competitive advantage in a traditional industry. In respect to radiotelephony in Denmark, government policies have traditionally operated in a way that such policies have been less successful in encouraging firms to shift from one technology to another.

Policy can be useful in helping to overcome 'lock-in' to diversity too. 'Lock-in' is the dominant technology in an innovation system is still producing work in an industry or branch. This is an anachronistic (hot metal versus cold metal) situation. Environmental regulation is particularly discouraging innovation, notably the Danish alternative energy policy which stimulated Denmark's work in wind energy. Importantly, policy and government can create the institutional infrastructure in which firms can learn about itself, understanding and acting upon its own needs and society (including its own). For example, government is discouraging firms from pursuing objectives. If an industry or active firms are not encouraged to graduate to a better technology, it is an innovation which Johnson (1992) identifies as a 'lock-in'.

### 3. DANISH ENTERPRISE INITIATIVES

Because of its relative backwardness in many technologies, the Danish government has been active in the 1980s. Much of this was in the form of the National Agency of Technology, which has created the infrastructure. Grants for product development have been given to over 1,000 firms and a further 1,000 firms. £20 million was invested in research equipment alone and a technology transfer programme graduates to study abroad. The Innovation Centres (TICs) and a funding scheme have been scattered throughout the country.



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by stimulating progress further along such trajectories, or what elsewhere  
are referred to as 'path-dependencies' (Arthur, 1994). For example, under  
the Network Programme, to be described, a group of SMEs in Aalborg  
have developed a prototype, state-of-the-art, 'intelligent trawler'. Clearly,  
such an innovation grows from the region's traditional involvement in the  
fishing and trawler-building and equipping industries. However, policy  
has enabled this network of firms to gain competitive innovation  
advantage in a traditional industry. A comparable example occurs with  
respect to radiotelephony in Denmark in Section 5(iii) below. Industrial  
policies have traditionally operated in such a way. Where industrial  
policies have been less successful, though still important, is in  
encouraging firms to shift from one trajectory to another.

Policy can be useful in helping to stimulate and safeguard institutional  
diversity too. 'Lock-in' is the downside of path-dependency, where an  
innovation system is still producing, for example, trained technicians to  
work in an industry or branch which is becoming technologically  
anachronistic (hot metal versus desktop publishing, for instance).  
Environmental regulation is policy which creates opportunities for  
innovating, notably the Danish alternative energy regulations in the 1970s  
which stimulated Denmark's world-lead in wind power technology. Most  
importantly, policy and government administration can become the  
institutional infrastructure in which a learning economy is embedded by,  
itself, understanding and acting upon system linkages within economy  
and society (including its own). Finally, government can have a role in  
discouraging firms from pursuing obsolete or unrealistic economic  
objectives. If an industry or activity is uncompetitive, it can encourage  
businesses to graduate to a better one. This is the 'forgetting' aspect of  
innovation which Johnson (1992) in particular is associated with.

### 3. DANISH ENTERPRISE AND INNOVATION SUPPORT INITIATIVES

Because of its relative backwardness in picking-up on micro-electronics  
technologies, the Danish government had a big push on technology policy  
in the 1980s. Much of this was inevitably directed at small firms. In 1987,  
the National Agency of Technology spent some £30 million on  
infrastructure. Grants for product and process innovation were awarded  
to over 1,000 firms and a further 700 went to joint solution teams and  
firms. £20 million was invested in Advanced Technology Centres for  
equipment alone and a technology scholarship programme enabled  
graduates to study abroad. The DTI had established 15 Technical  
Innovation Centres (TICs) and a further 82 local technology centres had  
been scattered throughout the country. Added to this, a large number of

private consultants also supported Denmark's approximately 7,000 SME manufacturers. This 'shotgun' approach was criticised for being strong on the inputs and grants side but less concerned about the outputs and performance side. With a change of minister in 1990 many of these support programmes were abolished and the DTI itself privatised.

In 1989, the Ministry of Industry and Trade established a plan of action to introduce network co-operation amongst firms in Denmark. It was to be a three-year programme with a budget of some £20 million, project-managed by the soon-to-be-privatised Danish Technological Institute. The programme was modelled on a stylised picture of the Emilia-Romagna network model of production based on sub-contracting and partnership in industrial districts. Of course, the latter 'model' grew organically without any specific initial design, though later, elements of enterprise support were added, as we have seen. The stylised picture had been presented by the American consultant Richard Hatch (Hatch, 1988), and the Danish Ministry adopted it. The basic idea was to seek to help Danish SMEs overcome the isolation often inherent in small firms and, through networking, to encourage innovation and competitiveness.

The key elements in support of the programme were grants (to pay brokers and consultants to advise on business action plans), network brokers, and centres from which the programme could be run in the field. The role of the specially trained brokers was to create networks of firms willing, with grant-incentive, to co-operate on any aspect of improving their businesses jointly – from technology to marketing. Forty brokers were recruited to work in the programme and they were given a nine-month training programme to gain accreditation. Each broker was required to commit 25 per cent of working time to the programme and also to pay for a series of seven two-day training sessions at a cost of some £3,000. Most brokers were consultants, some were employees of Advanced Technology Centres.

Rather, as in Emilia-Romagna, where businesses expressed criticism of public enterprise support policies which appeared to encroach upon private-sector consultancy or Chamber of Commerce territory, so in Denmark there was hostility to the Network Programme. Business associations were unhappy about competition, but also about co-operation, which they thought undermined entrepreneurship. Some objectives were antagonistic to the giving of grants for such purposes. Nevertheless, the programme went ahead buoyed by the publicity, both positive and negative, that it had engendered. The phasing of the grant arrangements was as follows: first phase (£2 million) for networks of at least three firms and two kinds of co-operation to be designed; second phase (£3.5 million) for development of fruitful ideas; and third phase

(£10 million) to implement a small (e.g. a new kind of fishing boat in

Some 3,000 firms became involved (Rosenfeld, 1990). Much of the cost of many firms in the programme goes to the initiative. Their role is as important as that of the Steinbeis Foundation in Baden-Württemberg. The functions of DTI repay the effort of successful, modern, enterprise su

#### 4. THE DANISH TECHNOLOGICAL INSTITUTE

It dates from 1906 and employs 1,250 staff in two centres at Copenhagen (Tast) and a private foundation, run on a for-profit basis, consultancy and other service provision lines:

- Applied research;
- Technological problem-solving;
- Quality, materials and environmental issues;
- Management and organisational issues;
- Provision of training and consultancy;
- Management and engineering services;
- Information provision.

DTI is the leading technology transfer agency in Denmark. More than 10 per cent of its activity is in technology transfer for DTI activity at lower cost.

DTI is structured operationally into three main areas:

- Sectorally Specialised Departments (e.g. construction, textiles and clothing);
- Technologically Specialised Departments (e.g. grouped technologies, especially computing, bio-technology, new materials);
- Human Resource Department (e.g. organisational matters).

mark's approximately 7,000 SME which was criticised for being strong and concerned about the outputs and in 1990 many of these and the DTI itself privatised.

Trade established a plan of action amongst firms in Denmark. It was to a budget of some £20 million, privatised Danish Technological based on a stylised picture of the production based on sub-contracting. Of course, the latter 'model' grew in design, though later, elements of have seen. The stylised picture had Richard Hatch (Hatch, 1988), the basic idea was to seek to help often inherent in small firms and, innovation and competitiveness.

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businesses expressed criticism of which appeared to encroach upon the territory of Commerce, so in the Network Programme. Business competition, but also about undermined entrepreneurship. Some giving of grants for such purposes. had buoyed by the publicity, both considered. The phasing of the grant scheme (£2 million) for networks of at operation to be designed; second of fruitful ideas; and third phase

(£10 million) to implement a small number of the most advanced ideas (e.g. a new kind of fishing boat in Aalborg).

Some 3,000 firms became involved in the programme during its first year (Rosenfeld, 1990). Much of the credit for the success of involving so many firms in the programme goes to the DTI, the managers of the initiative. Their role is as important to SME support in Denmark as that of the Steinbeis Foundation in Baden-Württemberg, or the Real Services centres in Emilia-Romagna (Pyke, 1993). Examination of the structure and functions of DTI repays the effort in terms of defining key activities of successful, modern, enterprise support systems.

#### 4. THE DANISH TECHNOLOGICAL INSTITUTE

It dates from 1906 and employs 1,250 people in many locations but mainly in two centres at Copenhagen (Tastrup) and Aarhus (in Jutland). It is a private foundation, run on a for-profit basis in competition with consultancies and other service providers. DTI has the following main action lines:

- Applied research;
- Technological problem-solving;
- Quality, materials and environmental testing;
- Management and organisational consultancy;
- Provision of training and courses;
- Management and engineering training;
- Information provision.

DTI is the leading technology transfer agency in Denmark. Its founding function as a technical training agency has declined such that, today, less than 10 per cent of its activity is in this sphere. Colleges have substituted for DTI activity at lower cost.

DTI is structured operationally into three divisions:

- Sectorally Specialised Departments: e.g. emphasising construction, textiles and clothing, wood and furniture etc.;
- Technologically Specialised Departments: emphasising single or grouped technologies, especially those of a generic nature, e.g. computing, bio-technology, new materials etc.;
- Human Resource Departments: emphasising managerial or organisational matters.

Apart from the textiles and clothing department, centred at Herning-Ikast in rural Jutland, the rest are concentrated at Copenhagen or Aarhus. Some small, generalist branches (e.g. business management) are distributed regionally as are the government-subsidised TICs (Technological Information Centres). These are forerunners of the UK Business Link and Business Connect network centres acting as access points for SME enterprise support.

DTI is dependent on SMEs for its income, so it has an interest in continually improving services to that sector. In 1990, 36 per cent of income came from firms with less than 10 employees, 30 per cent from those with between 10 and 50, the remainder from those employing over 50. The average invoice is for £3,000. With privatisation and a decline in government support for grant-giving and subsidy more generally, DTI's target market has not been growing. This is one reason why DTI placed so much effort in promoting, as successfully as possible, the Network Co-Operation Programme.

To return to the Network Programme, it will be recalled that some 3,000 firms became involved, although by 1992 the numbers had settled down to around 1,000 firms in about 200 networks. Meanwhile, some 500 firms have established around 100 networks *without* government-funding. Each network has, as the numbers suggest, an average of five firms in it. Small-firm co-operation was seen by government and DTI as necessary if they were to be able to afford DTI's relatively advanced and sophisticated technological services. The development of a programme supporting Experience Exchange Groups was an element of this strategy of network-building, too. The Experience Exchange Groups are a bottom-up mechanism whereby SME entrepreneurs express needs and experiences assisted by a consultant facilitator who animates discussion amongst firms in the groups. Co-operation may be a solution to problems raised.

The Ministry of Industry deployed a staff of three to work on the programme, liaising with DTI as programme-managers. In turn, they were advised by a twelve-member consultancy group, drawn from the social partners, whose job was to establish consensus in conducting the programme. As we have seen, there was not complete consensus as to the desirability or viability of the programme.

Amongst the key features of the programme were, as noted earlier:

- The network brokers – facilitators of networks, advising on aspects of co-operation, identifying opportunities, bringing firms together and catalysing discussions

- Financial Subsidies – necessary, naturally receptive to collaboration to see the benefits of co-operation took place, it was between competing areas;
- Centres from which to organise and regional technology centre system of meeting and co-operation programme.

Admission to the scheme was on the form new, legal Network Co-Operation participants (must be at least three), preferred, but not obligatory, as a selection of applicants included: expected a good size-distribution amongst firms viability; and good representation. Broker-training was, as noted earlier, cent only actually became brokers generated over 100 networks. Networks identify possible networks, provide appropriate networks. Legal and tax set up standard co-operation contracts. Firms involved: (1) Feasibility Study per cent of costs up to a maximum of Phase (50 per cent of costs for first year, 50 per cent of costs for first year, 3 payment was some £12,000).

Despite the tendency for co-operation rather than competing markets, some amongst competitors. This occurred could agree in which markets they competitors might co-operate to des collection (e.g. furniture or clothing Firms might compete on the home markets. Finally, competitors could purchasing, especially for special equ

Nevertheless, some competitors who One group of eight small engineering large orders from large firms such as their failure to do so was that one firm share a significant established customer Equally, that customer objected to

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- Financial Subsidies – necessary to induce Danish firms, no more naturally receptive to collaboration than firms in most countries, to see the benefits of co-operation. Notably where co-operation took place, it was between firms in complementary rather than competing areas;
- Centres from which to organise networks – the network of local and regional technology centres was valuable as a decentralised system of meeting and contact points for the running of the programme.

Admission to the scheme was on the basis that firms were prepared to form new, legal Network Co-Operation Companies, legally binding participants (must be at least three) to work the agreement. This was preferred, but not obligatory, as a *modus operandi*. Criteria used for selection of applicants included: export-potential; employment potential; a good size-distribution amongst firms in networks or potential networks; viability; and good representation from a wide range of industries. Broker-training was, as noted earlier, at a cost to brokers; around 50 per cent only actually became brokers but these trained brokers actually generated over 100 networks. Network scouts were also trained, to identify possible networks, provide information and even link firms to appropriate networks. Legal and taxation expertise was on hand to draw up standard co-operation contracts. The three phases of the scheme for firms involved: (1) Feasibility Study and Production of Action Plan (100 per cent of costs up to a maximum of £6,500); (2) Planning and Set-Up Phase (50 per cent of costs for first year up to £8,000); (3) Running Stage (50 per cent of costs for first year, 30 per cent in the second – average payment was some £12,000).

Despite the tendency for co-operation to be based on complementary rather than competing markets, some co-operative networks developed amongst competitors. This occurred especially where network firms could agree in which markets they would compete and co-operate. So competitors might co-operate to design a particular product or product collection (e.g. furniture or clothing), but compete on other products. Firms might compete on the home market but co-operate on export markets. Finally, competitors could and did co-operate on joint purchasing, especially for special equipment useful to all.

Nevertheless, some competitors who sought to co-operate failed to do so. One group of eight small engineering firms sought co-operation to win large orders from large firms such as Volvo and Bosch. One reason for their failure to do so was that one firm in the 'network' was reluctant to share a significant established customer with the rest of the group. Equally, that customer objected to the whole group supplying his

competitor abroad but not him. The firms in question also failed to achieve the objective of establishing a common, computerised information system. Thus, despite incentives, co-operation in networks was by no means always secured by means of the Network Programme. A sector which proved relatively cool on co-operation was textiles and clothing, based in the industrial district of Herning-Ikast.

## 5. EVALUATION OF THE NETWORK PROGRAMME

The Network Programme attracted applications for funding according to the sectors listed in Table 4.2 and by size distribution of firms as revealed in Table 4.3.

This table shows that the network programme was mainly of interest to traditional industry sectors, including primary industry.

**TABLE 4.2**  
**Distribution of Network Funding Applications by Sector**

Sector	%
Farming, Forestry, Fishing	10
Food, Beverages, Tobacco	6
Textiles, Clothing	3
Wood and Furniture	11
Graphics Industry	7
Iron and Metals	25
Plant and Equipment	10
Trade, Hotels	6
Transport	4
Others	18

Source: Danish Ministry of Industry.

Table 4.3 shows that the Network Programme appealed overwhelmingly to firms in the less than 50 employee category. Overall, this category accounted for 77 per cent of applications for network funding.

**Distribution of Network Funding Applications by Employee Size**

Employees
1-5
6-9
10-19
20-49
50-99
100-199
200+

Source: Danish Ministry of Industry.

In 1991, an evaluation of the programme was conducted by the National Agency for Business Development (Knap) on behalf of the Danish Ministry of Industry. The evaluation was that 40 per cent of firms participating in the programme ascribed at least 4 per cent of their sales increase to the fact that they had been a member of the Network Programme. Furthermore, 60 per cent of firms reported an increase in sales of more than 10 per cent. Of course we must remember the 60 per cent of firms whose performance to being in network was not better than 4 per cent increase in sales. No respondents thought that the network programme had increased their international competitive power (Gelskov). 93 per cent of the networks reported sales increase to the programme.

The most frequently mentioned objective was product development mentioned by 71 per cent of Phase 2 and Phase 3 networks, but exploitation of new products was mentioned by only 7 per cent. Some 29 per cent of networks reported failure to reach a fourth phase because of failure to reach a fourth phase for reasons other than grant-related questions. The failure to achieve Phase 3 grants caused 29 per cent to reply in the negative. In response to the question 'What was the main reason for failure?' 29 per cent said marketing had been st

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## WORK PROGRAMME

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### 4.2

#### ing Applications by Sector

%
10
6
3
11
7
25
10
6
4
18

amme appealed overwhelmingly category. Overall, this category s for network funding.

TABLE 4.3

#### Distribution of Network Funding Applications by Firm Size

Employees	%
1-5	21
6-9	11
10-19	20
20-49	25
50-99	12
100-199	5
200+	6

Source: Danish Ministry of Industry.

In 1991, an evaluation of the programme was carried out by Gelsing & Knop (1991) on behalf of the National Agency for Industry and Trade, an agency of the Ministry of Industry. The key empirical finding of this evaluation was that 40 per cent of firms that had reached Phase 3 of the programme ascribed at least 4 percentage points of their increase in sales to the fact that they had been a member of a network established by the Network Programme. Furthermore, more than 20 per cent ascribed an increase in sales of more than 10 per cent to involvement in their network. Of course we must remember the 60 per cent of firms who did not ascribe their performance to being in networks, or if they did, it resulted in a less than 4 per cent increase in sales. Nevertheless, 75 per cent of survey respondents thought that the network co-operation had strengthened their international competitive power (Gelsing & Knop, 1991, p.11). Moreover 93 per cent of the networks reported some increase in turnover ascribable to the programme.

The most frequently mentioned objective of the network was marketing, mentioned by 71 per cent of Phase 2 networks and 58 per cent of Phase 3. Product development was noted as an objective of 40 per cent of networks, but exploitation of new production equipment was mentioned by only 7 per cent. Some 29 per cent of networks had dissolved, 24 per cent because of failure to reach a formal co-operation stage, mostly for reasons other than grant-related questions. In other words, when asked if the failure to achieve Phase 3 grants caused the failure of the network, 18 per cent replied in the negative. In respect of network achievements, 64 per cent said marketing had been strengthened as a consequence of



networks, while 70 per cent indicated that product development had been strengthened. Organisational improvement was mentioned by 33 per cent and improved image by 22 per cent.

Some 29 per cent of network partnerships had changed during the development process (71 per cent had remained stable). Gelsing and Knop (1991) note that this illustrates that company co-operation in networks is a development process in which mutual trust must be established and individual as well as common objectives must be clarified. The main reason for change is that one or several participants cannot achieve their objectives in the co-operation; sometimes it is because of normal trading difficulties of firms (e.g. bankruptcy). Bearing in mind that 93 per cent of networks reported increased turnover from involvement in the programme, the question arises of how many reported actual reductions in costs as a consequence of network participation. Only 15 per cent of networks stated this as an objective, but 19 per cent reported cost reduction as an effect of involvement in the Network Programme.

Finally, as many as 75 per cent of the networks confirmed that network co-operation has strengthened the international competitive power of the participating firms. Of the remainder, 20 per cent could not say whether or not this was the case. This high figure for those reporting higher international profile is considered to be a major achievement of the programme even though it need not mean such a widespread increase in turnover. Many Danish SMEs appear to operate in declining markets though increasing their competitive strength nevertheless. This is a problem of having such a large part of the economy operating in traditional product markets, some of which (e.g. dairy produce) are under threat from changing fashions in food consumption.

#### (i) Recent Network and Cluster Experiences in Denmark

The Danish Network Programme can be considered a success. One indicator that the idea was good is that at least 100 networks formed in parallel with the official programme but without official subsidies and incentives. Any programme that results in 93 per cent of participants ascribing some degree of increased sales or turnover to it has to be considered a success, especially as 20 per cent ascribed at least a 10 per cent increase in a two-year period. Moreover, the strengthening of presence in foreign markets, actual reductions in costs of doing business for some 20 per cent of networks and the widespread improvement in marketing and image all testify to the accomplishments of the programme in exceeding expectations.

Network thinking informs at least two policy support for indigenous enterprisers in the city of Aarhus which, with neighbours Silkeborg and Randers, comprise a population of some 600,000. The Aalborg, also in North Jutland with telephone companies, all of which are

#### (ii) The Aarhus Growth Groups

The region is dominated by the food cluster-like fashion, include environmental energy technology, electronics and for more than 33 per cent of the private per cent of private sector establishments. In 1991, Aarhus municipality launched a development initiative with a view to a consensus approach, typical of Danish strategy through public-private dialogue. Key features of the plan are:

- Growth Groups;
- Innovation Contracts;
- Business Advisory Agency;
- Venture Capital Investment (CVC);
- Agri-food Forum;
- International investment localisation;
- Establishment of Knowledge Centres.

Organic networks of firms, banks, buyers, purchasers and trade unions were stimulated through information exchange.

The 'Growth Group' concept is that business success comes from improved learning supported by professional consultants in networks which become growth groups. Each group consists of 10 to 15 firms with an innovation process (e.g. product or process development, management, modern marketing, etc.) on occasions over an eighteen-month period with individual consultant support; payments

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Network thinking informs at least two further advances made by Danish policy support for indigenous enterprise. The first of these is centred on the city of Aarhus which, with neighbouring towns such as Skanderborg, Silkeborg and Randers, comprises an area in north Jutland with a population of some 600,000. The second is centred upon the city of Aalborg, also in North Jutland where a world-class cluster of mobile telephone companies, all of which are local SMEs, has developed.

#### (ii) The Aarhus Growth Groups Concept

The region is dominated by the food industry but others, related in a *cluster-like* fashion, include environmental science, bio-technology, energy technology, electronics and software. Food processing accounts for more than 33 per cent of the private sector labour force and over 80 per cent of private sector establishments employ less than 50 persons. In 1991, Aarhus municipality launched *Plan 2001* as an economic development initiative with a view to creating 20,000 new jobs. The consensus approach, typical of Danish policy-making, sought to build the strategy through public-private dialogue and public-private interaction. Key features of the plan are:

- Growth Groups;
- Innovation Contracts;
- Business Advisory Agency;
- Venture Capital Investment Company;
- Agri-food Forum;
- International investment location initiative;
- Establishment of Knowledge Centres.

Organic networks of firms, banks, business associations, public sector purchasers and trade unions were stimulated to engage in discussion and information exchange.

The 'Growth Group' concept is the most innovative. This stresses that business success comes from improved performance based on continuous learning supported by professional resources. Firms come together in networks which become growth groups by implementing this philosophy. Each group consists of 10 to 15 firms working on an aspect of the business innovation process (e.g. product or process development, total quality management, modern marketing, etc.). Seminars are held on ten occasions over an eighteen-month period. Between seminars, firms have individual consultant support; payment is shared (50:50) between firm

and municipality. The average cost per group is some £100,000. So far, 14 groups have been launched and preliminary assessments suggest average turnover has increased by more than 10 per cent with 200 new jobs having been created. Firms pay £4,000 each to the group and growth group themes range from developing food processing equipment to innovative environmental technology (Huggins, 1995).

Groups enable firms to access each other's resources and reinforce firm commitment to achieving common realisable innovation objectives. Meeting deadlines reinforces group commitment, there being an informal cultural 'sanction' if other priorities are placed higher. One example is CD-Line, a growth group focused on eleven clothing firms. They produce complementary products, one firm specialising in shirts, another in suits, another ladies knitwear and so on. They are joint-marketing their unified product ranges in Germany and Sweden, they share marketing personnel, quality assurance, and paperless trading (EDI) business communications. The group gains contracts the individual firms could not.

### (iii) The Radiocommunications Cluster in Aalborg

Denmark's trade figures display international specialisation in telecommunications, medical electronics and instrumentation. The Danish electronics industry, of which these sectors are the leading segments, employs 24,000 and more than 90 per cent of sales are exports. In mobile phone equipment, Denmark is the sixth most specialised country after Finland, Sweden, Japan, USA and UK. Aalborg has the second most important mobile phone production cluster after Copenhagen, (Dalum, 1995).

The cluster originated in a single firm, SP Radio, from which, after 1946, a further twenty-four either spun-off or were new start-ups linked to the new Aalborg University (established in 1974) and its Science Park. One factor explaining Aalborg's path-dependency in mobile communications is the existence of a large, commercial fishing fleet representing buyers of radio communications equipment. The strength of Aalborg University in electronic engineering boosted the cluster from the 1980s onwards, during a period when the market for mobile telephony was growing quickly.

The mobile phone equipment companies are both co-operative and competitive, the former locally, the latter globally. However, the success of the cluster has brought change in the form of outside acquisition of firms that were too small to become global players. Thus, Amstrad bought Dancall, a cluster-leader and the Korean firm Maxon bought T-Com while Motorola, Ericsson and Nokia closed down DE Development, a local joint

venture they had funded. Policy, e  
Aalborg a world-class SME-t  
Whether it can be sustained as su

## 6. CONCLUSIONS

The Danish case is of considerable interest in developing competitive advantage. The accomplished small firm sector of the Programme was successful in the establishment of a large number of firms to improve their sales. Of key importance following. First, the institutional framework was well-founded and respected body combining business expertise. Its equivalent in Ireland care was also taken to include of the programme. Second, the programme a sense of momentum to firms and practice of co-operating, in the first action plan, to final implementation. Third, the initiative involved having the network-formation process as an intent. These were available to necessary technical consultancy to or in terms of product or process scepticism of firms towards business management consultancy on the o

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### Cluster in Aalborg

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panies are both co-operative and international globally. However, the success of the form of outside acquisition of local players. Thus, Amstrad bought the firm Maxon bought T-Com while owned DE Development, a local joint

venture they had funded. Policy, education and research combined to give Aalborg a world-class SME-based radio-communications cluster. Whether it can be sustained as such remains to be seen.

## 6. CONCLUSIONS

The Danish case is of considerable relevance to Irish thinking on how to develop competitive advantage by co-operative means in a less accomplished small firm sector. The Danish Network Co-Operation Programme was successful in its own terms, both in assisting the establishment of a large number of small firm networks, and in assisting firms to improve their sales. Of key importance to this success were the following. First, the institutional context within which the programme was managed was well-founded. The programme was run by DTI, a respected body combining business management and innovation expertise. Its equivalent in Ireland could be Forbairt, though in Denmark care was also taken to include other organisations in discussions about the programme. Second, the programme had definite stages which gave a sense of momentum to firms and networks moving from the unfamiliar practice of co-operating, in the first place, through development of a joint action plan, to final implementation for those seeking to reach that stage. Third, the initiative involved having trained intermediaries to facilitate the network-formation process and resources sufficient to support that intent. These were available to assist firms in networks to purchase necessary technical consultancy to enable them to innovate managerially or in terms of product or process innovation. This overcame the scepticism of firms towards bureaucracy, on the one hand, and management consultancy on the other.

## WALES: FROM COAL PERFORMANCE ENC

### 1. BACKGROUND

#### (i) Firms and Institutional Cha

Until the mid-1980s, the main ec system was as a supplier of agri especially coal and steel. Havi Revolution, beginning with icro experienced a lengthy period of 1 years until the effective ending of defeat of the miners in the 1984-5

During the post-war years, ge engineering and other manufactur belts of South and North Wales. T Ferodo, GEC, Ferranti, Hotpoi established, many demonstrating th in a UK economy dependent for a recover traditional markets throug 1975), there was no obvious patter other than that they were classical goods industries, seeking and fir shopfloor workers, both male and sourced much of their supplies loc items such as packaging and transp

The establishment of the Welsh D meant that, for the first time, Wal strategic economic development. economic plan for Wales, not even nevertheless there developed a taci of investment, both domestic and c engineering. This strategy took of because this was the period of mos first-round of manufacturing indust years from 1983 to 1993 Wales, w and GDP, consistently attracted be inward investment in the UK.