INFORMATION FOR INNOVATION IN SMES: THE IMPACT OF THE EDUCATION AND TRAINING PROVIDED BY THE YORKSHIRE AND HUMBERSIDE UNIVERSITIES' ASSOCIATION

Introduction

The objective of this research was to relate the innovation of SMEs, and the increased competitiveness presumed to result from their innovation, to their use of higher level education and training. The research focussed particularly on the provision of education and training for SMEs by the Yorkshire and Humberside Universities' Association (YHUA), a grouping funded by the European Social Fund under provisions to aid depressed regions with Objective 2 status. The assumption of the YHUA scheme was that higher level education and training for the employees of SMEs would provide these SMEs with the information they require for innovation. With more innovation, they would become more competitive, creating more jobs and more wealth in the region.

It is curious that anyone ever considered the YHUA scheme would work as it was apparently intended to work. The explanation is perhaps best sought in the penumbra of writings that surrounds SME policy. The plight of SMEs attracts the interest of government everywhere, and governments everywhere intervene on market failure grounds. The very nature of the sector - huge, scattered, volatile, diverse - together with the range of problems it faces, make any single, uniform intervention unlikely to be successful. It may be that governments are attracted to intervene in the affairs of SMEs by the prospect of being seen to be doing good rather than with much prospect of actually being effective. Indeed, so diverse is the sector that gauging any impact of government intervention is always likely to be problematic.

It was always optimistic to assume that the objective of the YHUA scheme could be achieved; if there is a relationship at all between higher level education and training in SMEs and their innovation, it is not going to be a calculable one. This expectation that there should be a calculable relationship is grounded firmly in the argument that the more education received by the employees of SMEs, the more innovative, and hence

competitive, these SMEs will be. There is a further policy supposition and this is that the unaided market will not propel SMEs into providing this education for their employees, nor the employees to seek provision for themselves, and that government must consequently intervene to ensure its provision.

This research project sought to broaden the enquiry. Are SMEs – aided or unaided – capable of being innovative? Are they all equally capable? What does the innovative SME require for its innovation? Information obviously, but there are many potential sources of information, some no doubt much more significant than others to the innovation of SMEs. Among all these, just how important are the higher level education and training of SME employees? Indeed, though it strains the imagination, perhaps SMEs are already active members of vibrant information networks that supply all the information they could possible require for innovation. In short, rather than attempt any sort of evaluation of the YHUA programme, this research sought to place the programme in context, the context being the innovation of SMEs. As the purpose of the YHUA programme is to exploit higher level education for the information SMEs require for their innovation, the specific context is how SMEs find, acquire and use the external information they require for innovation.

To this end, we have paid particular attention to the theory behind government-subsidised education for SMEs, and have looked at the success such schemes have met. As Peter Senker makes all too clear in his section of this report, the history of such government involvement is not one in which policymakers can find much reassurance. Education for the employees of SMEs seems to have been provided for many years at great public expense and to little effect. The benefits claimed have been assumed rather than proven, the assumption being unquestioned because helping SMEs is seen to be a good thing to do, and the provision of education is seen to be helping. Senker argues that there is no point providing SMEs with higher level skills unless SMEs are able to use these skills. Basically, graduates are required to use graduates. Thus, such schemes as that under consideration here might be expected to contribute to the infrastructure required for innovation, but not to provide the innovation itself.

The section by Peter Liesch considers what, if not education, might provide the information for innovation in SMEs. He identifies, as have many others, customers, suppliers and competitors as the chief sources of this information. He also paints a depressing picture, again recognisable in many other papers on the subject, of SMEs isolated from the outside world, their very existence, never mind their innovation, dependent on the tolerance of a handful of major customers. He depicts SME managers paddling furiously just to keep their noses above water, with neither time nor energy to consider where they might find and acquire new information to use for innovation. This stark reality is hardly addressed by government policy for SMEs, and certainly not by the YHUA scheme. Indeed, while such schemes are often justified in terms of the difficult circumstances in which SMEs typically find themselves, it tends to be this same reality that condemns the schemes to such modest success (Mulhern, 1995).

This, then, is the context in which the report looks at the impact of the YHUA scheme on the innovation and competitiveness of SMEs in northern England. It examines SMEs which have participated in the scheme, and SMEs which have not. But it also looks at the other actors in the scheme, those who provide higher education services for SMEs, and concludes that the benefits for the providers of higher education and training are easier to discern than the benefits for the recipients.

Innovation in SMEs - Policy and Practice

Rothwell identifies innovation policy as the link between the abstraction of science and technology policy and the cold reality of industry policy (Rothwell, 1986). Yet, the development of innovation theory, which has certainly been policy-driven, seems to have outpaced developments in innovation and industry policy. For instance, it is still common among policymakers to see SMEs simply as nascent large firms which should be exploiting innovation to realise their growth potential. SMEs, it would seem, have no business being small.

> "Companies that introduced new technologies at least once a year were three times as likely to forecast an increase or rapid increase in turnover than those that never introduced new technology." (Marsh, 1996)

Of course, many managers of SMEs have no ambitions at all to manage large companies (Reid, Dunn, Cromie and Adams, 1999), and the economy is dependent upon the part that SMEs play in it - as SMEs (Rothwell, 1989).

There is a plethora of schemes by which the UK government affords assistance to SMEs. Many of these schemes are intended to help by boosting the innovation of SMEs. For instance, the Teaching Company Scheme (TCS) encourages graduates to work in industry so that they may transfer technology from university to firm. About 90% of the firms participating in TCS are SMEs.

> "The mission of TCS is to strengthen the competitiveness and wealth creation of the UK by the stimulation of innovation in industry through collaborative partnerships between the science, engineering and technology base and industry." (Department of Trade and Industry, TCS leaflet, June 2000)

This linear assumption that innovation results from transferring the information from what is often termed 'the knowledge base' to the firm seems to be fundamental to most of these schemes. Behind the management speak of the Regional Economic Strategy for Yorkshire and Humberside lies the same assumption. The strategy is to:

> "…. create Centres of Excellence clustered round universities to increase the commercial exploitation of higher education's research base." (Yorkshire and Humber Regional Development Agency, nd, p.4)

Unilink, another one of the plethora of programmes funded by the European Union to assist the region's SMEs, is justified in the same way.

> "UNILINK is a university lead [sic] project developed to help companies solve their technical and design problems using the expertise of the regions [sic] universities and research base." (*RIS Newsletter*, 12 May 2000, p.2)

There is actually very little evidence to substantiate this model of innovation. Indeed, there is considerable evidence that innovation is unlikely to be produced in this way. Information for innovation comes from a variety of sources rather than from a single knowledge base, it is transferred in a variety of ways, and transfer is a complicated, interactive process involving the exchange of information rather than just its one-way flow. Consequently, networking – an activity in which SMEs are weak – is

fundamental to innovation, and there is evidence that SMEs that network are more innovative than SMEs that do not (Rothwell, 1991; Hart and Tzokas, 1999).

Innovation, and perhaps particularly innovation in SMEs, is complex. It is also the product of serendipity and happenstance as much as managed and controlled process. Yet policy retains a simple linear view of innovation. Why this should be is not hard to deduce: it is convenient to be able to justify input in terms of output, resources in with innovation out. So, policy makers and politicians have an interest in maintaining the fiction of a linear innovation process, no matter how high the chances that programmes based on the notion will fail (Culkin and Smith, 2000). The many European Union programmes to assist SMEs seem especially prone to failure (Dannreuther, 1999). Also keeping faith with the linear model of innovation are those who imagine themselves playing a seminal role in such a process. This obviously includes scientists and engineers, but also the institutions that employ them. Thus, universities also have much to gain from acceptance that the innovation of SMEs is the product of a managed, linear process. This belief is never tested: the success of the YHUA scheme is judged not in terms of innovation, but of direct output – beneficiaries recruited, NVQs achieved, SMEs assisted, and so on.

> "The information you provide will not be used to reassess grant, it will be used merely as an indicator for us as administrators to assess how we stand as a regional project in terms of achieving targets." (YHUA memorandum, 18 July 2000)

Success in terms of broader objectives is simply assumed.

> "….. we are in the process of organising a large event to celebrate and disseminate the huge progress made by the regions [sic] universities in addressing SME skill shortages and access to higher level skills by employees of SMEs in the O2 areas." (YHUA memorandum, 4 August 2000)

The reality of innovation in SMEs is at variance with the theory behind policy. The evidence is that SMEs are already surprisingly innovative. They have to be innovative to survive. Their problems lie elsewhere and solutions are frequently confounded by

the demands already made on SME managers. Basically, SME managers are too busy coping with a wide range of immediate demands to give much attention to less pressing matters. Thus, their horizons are limited, their view of the world restricted.

According to a recent Department of Trade and Industry (DTI) survey of innovation in SMEs, nearly a third earn more than half their turnover from their three largest customers (Marsh, 1996). Such dependency on dominant partners is a long way from the relationships observed among firms in vibrant information networks. The typical SME is isolated, which is presumably why SMEs perform so much of their own R&D, and look to their own resources for development. Inevitably, these resources are limited and often inadequate. The result is often frustration, not just with failure in innovation, but also with government exhortations to succeed which are based on a linear interpretation of the means by which SMEs innovate.

The YHUA Scheme

The Yorkshire and Humberside Universities' Association (YHUA) was formed in 1993 by the vice-chancellors of the region's universities to provide a forum to promote the contribution that the universities make, individually and collectively, to regional GDP and employment and to extend the universities' contribution to regional development. The YHUA Office and secretariat are based at the University of Leeds. Since its creation, the Association has expanded to involve almost 100 of the policy and professional staff of the universities, who meet to develop policy, promote partnership and work together on projects. The YHUA is also has partnerships with other regional bodies – colleges of further and higher education, Training and Enterprise Councils (TECs), Business Links and the Regional Innovation Strategy Sector Boards.

In 1998, the 10 YHUA universities also set up a joint venture company to assist them in working together on projects responding to regional needs. Current projects include the YHUA Objective 2 Action Plan and the Higher Level Skills Training Fund. The latter was a component of the YHUA Objective 2 Action Plan. The Fund supported higher level training (NVQ levels 4 + 5 or equivalent) and other services (skills

analyses, customised training plans and in-company mentoring) for Objective 2 SMEs and their employees. The Fund made available around £4.7 million from the European Social Fund in 1999/2000. It focused particularly on meeting the training needs of the Regional Innovation Strategy (RIS) Boards. The Fund supported technological training and management training for technological businesses (management of entrepreneurship, technological change, intellectual property and technology transfer), as well as human resource management. Universities and colleges in Yorkshire and Humberside supplied training and other services for the Fund, and SMEs in all EU Objective 2 areas of Yorkshire and Humberside were eligible for support from the Fund. In all, some £6 million was provided by the European Social Fund for the region's ten universities to provide courses and programmes for business. Over 1000 companies were assisted and more than 2500 employees trained (*Unilink News*, 2000, p.4).

The HLS Fund offered a broad range of support to a variety of stakeholders at the regional level:

- For Objective 2 SMEs and their employees: training or other skills-related supporting needs.
- For RIS Sector Boards: customised training to solve sectoral skills needs; also, developmental work – skills needs and sectoral analyses - that can help define skills needs of the future.
- For training and business support intermediaries: a source of training funding for clients.
- For universities and colleges: access funding and contacts to develop training portfolios (see http://www.yhua.ac.uk/projects/HLSProjects.html).

The Survey

Part of this research project involved surveying SMEs participating in the YHUA scheme. The intention of the survey was to determine whether the higher level education and training provided did contribute to the innovation and hence competitiveness of SMEs in the Objective 2 areas of the north of England. Many

managers of small firms in the region do not believe that the workforce needs new skills and identify financial problems as by far the biggest obstacle to their prosperity (Baldwin *et al*., 2001, pp.28.53). In fact, it was always clear that the link with competitiveness would be too tenuous to test in practice, and links likely to be more sturdy were tested instead. Did higher education and training contribute to the innovation of SMEs in the region? Did anything? Would anything? Other links simply had to be assumed, particularly that between innovation and competitiveness. Managers of SMEs are forced to make a similar assumption:

> *My experience is that the link – education and innovation - is tentative. Innovation thrives in business cultures which allow room for this.*

After appropriate preparation and piloting, and interviews with a sample of SME managers, questionnaires were sent to SMEs that, according to providers of education and training services in the YHUA scheme, had participated, or were still participating, in the scheme. Participants were actually employees of SMEs, but the subsidy that was the essence of the scheme went to the providers of these education and training services. The SMEs that employed participants in the scheme had to satisfy the scheme's conditions, but were not otherwise involved. Consequently, the direct beneficiaries of the YHUA scheme are not SMEs at all, and not even the employees of SMEs being educated or trained under the scheme. Both may benefit indirectly and eventually, but the direct and immediate beneficiaries are the providers of education and training. The situation did nor escape the notice of some SME managers:

> *Too many 'providers' as you call them [with] no commercial awareness and commercial cost pressures.*

Providers of educational and training services had little interest in who was receiving their services as long as the provision qualified for public subsidy. Only where the list of customers was deemed to have commercial value (and was therefore to be kept secret from other providers of educational and training services) did providers demonstrate much interest in who received their services. Consequently, compiling an appropriate survey list presented this research project with serious and unanticipated difficulties.

Eventually some 794 questionnaires were posted in October 2000 to SMEs with employees who were, or had been, participating in the scheme. A similar number of questionnaires (800) was posted to SMEs whose addresses were procured from a commercial database. These were not known to have been involved in the YHUA scheme, though the complexity of the scheme's administration, and the fact that neither SMEs nor their employees were directly involved in the scheme's funding arrangements meant that SMEs could not be sure whether they actually were involved in the scheme. The industry sectors of the comparator group were chosen to match those of the SMEs assumed to be involved. Sectors were intended, as much as circumstances allowed, to provide samples of SMEs from both high and low technology areas. Although the survey adopted the official definition of a SME as a firm with fewer than 250 employees, the vast majority of SMEs in this sample had fewer than 50 employees.

Despite considerable effort to encourage SMEs to complete and return the questionnaire, the response was poor, little more than 16% overall. Time did not permit the sending of reminders, but this procedure would probably not have yielded many more returns. The SME sector is notoriously hard to survey and responses are often low, even when there is real interest in the subject under investigation. There was little discernible enthusiasm for higher level education and training. But whatever the explanation, these survey results must be regarded as no more than illustrative and indicative; they are not statistically significant. The quotation in italics introduced throughout the report comes from respondents to the survey, and is also illustrative.

Overall, some 210 usable responses to the survey were received, 134 from SMEs probably involved in the YHUA scheme, and 76 from SMEs probably not involved. As there was no discernible difference between the two groups in attitude towards education and training, the returns were simply bundled into one overall group of 210. Questionnaires were posted to the chief executive of each SME, addressed by name, and these were nearly always the individuals who completed the survey form. Most (____ %) of these chief executives are educated to degree level, and engineering is the subject in which most (37%) have their qualifications, although – a sign of the times, perhaps – almost as many (29%) are qualified in management and business studies.

On average, they have been with their current firms for just about 11 years, substantially longer than chief executives of most large firms these days.

> *I have nearly completed an MBA at Leeds University ….. This has provided valuable learning and knowledge to enable innovation in a wide variety of disciplines.*

The YHUA programme was justified on the grounds that education and training would help SMEs be more innovative. However, by their own estimation - or rather that of their chief executives - these SMEs are already highly innovative. Some 87% of respondents claim that their company has innovated in the last five years. This may not seem like much of an achievement, particularly in view of the very comprehensive definition of innovation the survey provided, and in view of the possible tendency of chief executives to portray their firms as rather more innovative than they really are. Even so, such a result does seem to challenge the underlying assumptions of the YHUA scheme that SMEs resist innovation and that government intervention is required to make them embrace it. It is strange that these assumptions persist in the face of just about all the available evidence. For instance, a recent survey of manufacturing SMEs in South Yorkshire reports that three-quarters of them are innovative (Innovation Advisory Service, 2000, p.1), and an earlier study of the patenting practices of SMEs in the UK discovered that 83% of their chief executives consider them to be innovative (Macdonald and Lefang, 1998). Similarly, a new report to the Yorkshire Training and Enterprise councils (TECs) finds two-thirds of Yorkshire firms, large and small, to be innovative in the sense of having introduced a new product or service within the previous year (Baldwin *et al.*, 2001, p.27). SMEs – as their managers often try to explain – have to innovate in order to survive. Innovation is not an option, but simply a way of life for most SMEs.

> *Innovation is mainly common sense and dedication.*

> *Innovation, I believe, is an evolution of ideas that sometimes takes years to surface. And only rarely is a spark of inspiration (but it is nice when it is).*

> *Innovation is seeing a need/niche and filling it – I do not believe you can be educated to innovate.*

> *I do not believe that innovation can be 'taught' as such.*

While there are obviously many factors that bear on the innovation of SMEs, the survey concentrated on the contribution of employees, and especially the education of employees, to this innovation. As Table 1 reveals, natural ability and experience in the job seem to be valued most highly. Formal educational qualifications are just not considered important to the innovation of these SMEs. It is understandable that the YHUA scheme should concentrate on the provision of formal educational qualifications to SMEs for that is the business of its members. It is less understandable why the scheme should seek to justify its activities in terms of the innovation it encourages in SMEs whose managers categorically deny any such impact.

Table 1. Importance of Employee Attributes for Innovation in SMEs (% of Respondents)

	Not at all important	2	3	4	Very important
natural ability	0	3	15	26	45
experience in the job	1	5	24	30	30
experience in other jobs	3	14	35	30	7
experience in other firms	4	25	37	18	5
formal education qualifications	7	20	37	22	4

I think that it is important to have some knowledge of the industry you are involved in to know what will work and how the market and your customers will respond. Knowing how your industry operates is the most important factor in innovation.

My experience is that of a huge void between education/training and innovation.

In our experience it is not crucial to have high levels of academic qualifications – rather enthusiasm and a willingness to learn, adapt and change is important.

Whilst education may assist in researching or implementing innovation, it is not necessarily required for innovation.

Commercial innovation can only come as a result of experience .... It does not necessarily follow that if you give someone extra knowledge they will be innovative.

> *I believe the ability to innovate is first, born in people; second, can be improved if people have received education prior to long practical experience. I don't know whether education **after** experience is as good.*

The survey also revealed that, in as much as these respondents consider education and training at all relevant to their innovation, it is training rather than education that they really value. Their favoured providers are colleges of education rather than universities or consultants and, as Table 2 reveals, day courses are overwhelmingly preferred to any other intensity of provision.

Table 2. Preferred Intensity of Provision of Training and Education (% of Respondents)

day courses	55
part-day courses	23
distance learning	12
weekend courses	6
week courses	4

This preference for day release is compatible with what is known about small firms being unable to cope with prolonged absence of staff, and compatible also with the value chief executives attach to training rather than education. Indeed, many yearn for a return to old-style apprenticeships. Table 3 makes quite clear that the practical and applied are considered more appropriate to the firm's innovation than the theoretical and abstract.

Table 3. Level of Education and Training Considered Most Appropriate to SME Innovation (% of Respondents)

apprenticeship	22
GNVQ/BTECH	22
first degree	16
GCSE	15
foundation year	7
masters degree	6

Ph.D. 3

When an apprentice is taken from Humberside Council run organisation, they spend too many days away on courses not of use to the lad. Apprentices should go back to 5 years and not 4.

The three dimensional degree courses at colleges of art seems to have isolated silversmithing trade students. Though there are few trade students nowadays, they use to go to the college of arts and crafts part-time and night classes to complement their apprenticeships.

Found our latest student on placement to have greatest number of 'new' ideas in IT/internet but the lad with GCSEs has more understanding of practical side of the business.

We rely heavily on recruiting graduates to most of our 'permanent ' positions (currently 27 jobs). We also run apprenticeship schemes (currently 21 participants) and have started to recruit from them. Education, training and innovation are the lifeblood of the organisation.

Table 3 is revealing, not so much in the prominence of training over education, for this is predictable, but in the relative value attached to a university degree, not that the YHUA scheme subsidises university degrees. These respondents are not at all hostile to university education, valuing it as much as GCSE qualifications. University degrees are now very much more common than they were even a few years ago and employers have more experience of them than ever before. However, they perceive an important distinction between training and education and are convinced that universities should be providing the latter. They are absolutely scathing towards universities that provide training when they should be providing education.

There can be a tendency for 'lower level' education to provide a barrier to innovation by providing answers rather than frameworks for questioning. There seems to be little positive development on innovative 'right brain' thinking.

I become more and more depressed at the reduction in standards of first degree level in universities – especially ex-polytechnics.

The quality of graduates we are now interviewing is disappointing, their ability to solve problems in an innovative manner is decreasing.

The main problem in training is getting people to think! This is obvious but a very difficult thing to do in practice.

Level of qualification not as good as previous years and still void between qualification and what industry requires.

Just over half of respondents reported participating in government-subsidised initiatives to encourage education and training of employees. As two-thirds are participants on the YHUA scheme, it would seem that a good few chief executives of SMEs are unaware that they are participating in government-subsidised initiatives. Even so, those that are aware consider both the education and training received, and the subject matter taught to be appropriate to the firm's innovation. Now this is curious for these very same managers are generally doubtful about the relevance of education and training to innovation in SMEs. The explanation may be that they are critical of the principle of subsidising education and training for innovation in SMEs, but more sympathetic towards receiving the subsidy themselves.

The individuals who participate in this subsidised education and training come from across the whole spectrum of SME employees, with senior managers as likely to participate as manual workers and clerks. Interestingly, though, respondents – senior managers themselves – would prefer fewer junior employees to attend and many more middle and senior managers (Table 4). This may reflect the dominant role of universities in the supply of education, such education being considered more appropriate for managers than for other workers.

Table 4. Status of Participants in Education and Training Schemes (% of Respondents)

	Likely to Attend	Should Attend
senior management	19	22
middle management	21	28
junior management	17	18
clerical/administrative	18	7
manual worker	20	12
other	5	13

The SMEs in this survey are surprisingly outward-looking, most of them estimating that external information makes a major – though not an immense - contribution to their innovation. The literature supports their opinion (e.g., Macpherson, 1992). As

Table 5 reveals, most of this information comes from predictable sources. It is firmly established in studies of SMEs that the major external sources of information for their innovation are customers, suppliers and competitors. Table 5 makes clear that these SMEs are no different. Customers, especially a few chief customers, are far and away the most important sources, followed by suppliers and then by competitors. Not surprisingly, the survey of Yorkshire firms for the TECs also discovered customers, suppliers and other businesses to be the most important collaborators for Yorkshire firms in research and development (Baldwin *et al.*, p.47). The least useful external sources of this information are revealed to be government departments and agencies, universities and consultants - the very providers of information in the form of education and training under the YHUA scheme.

Table 5. Importance of External Sources of Information for Innovation in SMEs (% of Respondents)

	1	2	3	4	5
universities	**24**	**22**	**18**	**11**	**10**
trade associations	**11**	**20**	**23**	**24**	**9**
professional associations	**18**	**16**	**22**	**20**	**10**
research associations	**22**	**20**	**22**	**15**	**4**
government departments or agencies	**26**	**21**	**19**	**8**	**3**
your own group headquarters	**15**	**10**	**17**	**14**	**12**
consultants	**17**	**27**	**18**	**18**	**5**
your suppliers	**7**	**10**	**22**	**25**	**23**
your main customers	**1**	**8**	**14**	**32**	**32**
your customers as a whole	**1**	**8**	**22**	**28**	**26**
your competitors	**4**	**27**	**26**	**26**	**15**

Some 36% of respondents report that the external information they acquire for innovation comes to them for free. Half as many say they pay cash for external information, and may be referring to consultancy fees. Very few respondents report any sort of networking or exchange of information for other information. Indeed, these respondents are more likely to look to a common pool of knowledge from which they may all draw. Information for innovation is seen as either available for nothing, or it is bought. There is little evidence here of searching for information and, indeed, managers of SMEs are unlikely to have time to spare even for searching, much less

for building up the contacts and networks necessary to secure a regular and reliable supply of external information for innovation.

> ….… *we pay for advice from independent source who collates articles each month into a news sheet – approximately 16 sides A4.*
>
> *Getting information can seem like walking round a maze, and not at all simple, as it should be.*

As Peter Liesch makes clear in his section, information networking entails relationships which allow information to be exchanged, normally for information of equal value. This is vastly more sophisticated than the concept of a pool of knowledge to which SMEs contribute and from which they can all draw. Yet, even this rudimentary pooling system is unfamiliar to most of these SME managers. This discovery is significant: without the communality of the information pool, or the inter-dependence permitted by networks, each SME is very much alone. For the information required for innovation, each is forced to depend on its own resources. And while network action encourages further inter-dependency, isolation is equally self-perpetuating.

> *All our innovation to date has been inspired and executed within our company.*

By far the most important means by which these SMEs acquire external information for innovation are by reading specialist technical and trade journals, by keeping track of the competition, and by talking with friends and colleagues in the industry (Table 6). It is tempting to construe at least the last of these as evidence of networking, but this would be fanciful. It simply confirms what is already known about the world of SMEs, that this is an environment in which information for innovation comes from senior managers keeping their eyes and ears open whenever they can for snippets that just might be useful for change within the firm. But also revealed is that formal agreements to acquire information for innovation from other firms are of little importance, perhaps confirming the isolation of these respondents in their efforts to innovate. That they are not networking is further suggested by their striking reluctance to hire employees from innovating firms. But just about as useless in providing the external information vital for innovation are watching the television and – perhaps predictably - participating in government training programmes.

Table 6. Means by which SMEs Acquire Information for Innovation (% of Respondents)

technical and trade journals	63
friends and colleagues in the industry	58
keeping track of the competition	57
market research	39
professional research papers	38
conferences and seminars	37
talking to employees of innovative firms	36
copying the innovation of other firms	33
visiting innovative firms	28
informal transfer agreements with other organisations	22
informal transfer agreements with other organisations	22
formal transfer agreements with other organisations	20
government training programmes	16
hiring employees of innovative firms	15
watching TV or radio	10

APPROPRIATE EDUCATION AND TRAINING FOR INNOVATION IN SMES[1]

Small firms are immensely diverse. They range from such small retail outlets as fish and chip shops, newsagents, hairdressers and hi-fi shops, to car repair workshops and a multiplicity of manufacturing firms, to high technology firms developing applications of new materials or biotechnology, designing complex instrumentation or writing complex software.

> "The SME population is highly differentiated….from …the simple craftsman and small service business …to the sophisticated manufacturing business operating in complex and uncertain markets, to a wide range of 'professional' small firms offering services directly to the consumer and to industry and commerce." (Gibb,1996)

[1] This section of the report was written by Peter Senker.

This section of the report considers the various ways in which firms can learn. It identifies some of the principal sources from which they can draw the new information needed to innovate. It then considers why SMEs need to innovate. The vast majority of SMEs operate in traditional sectors and find it extremely difficult to access the information they need for innovation. The nature of these difficulties is outlined. One government-supported scheme, the Teaching Company Scheme, represents a powerful mechanism for enabling SMEs to acquire and use the information they need for innovation. Its mode of operation is outlined, and the reasons for its success analysed briefly. Some prominent features of current and proposed government training arrangements are then presented, and their contribution to SME innovation is considered.

Innovation in SMEs

International competition is intensifying, and is based increasingly on firms' ability to develop new products of high quality consistently, and to manufacture them efficiently and cheaply. The complexities of the new product development processes, shortening product life-cycles, the transformation of production processes, the growing use of computer and telecommunications-based innovations (such as the Internet and e-commerce), together with such organisational innovations as total quality management, all demand that firms learn to do things in new ways if they are to sustain and enhance their ability to compete (Dodgson, 1993).

Firms in traditional sectors

Several studies have found that UK manufacturing firms face serious problems at a certain stage in their development: as firms grow, the problems they face become too diverse to be controlled successfully by one or two people. In order to continue to be successful, growing firms need to change from 'entrepreneurial' - based mainly on the knowledge and experience of one or two founder/proprietors - to 'managerial'. Serious threats to a company's long-term viability may also be presented to firms that fail to employ graduate level staff with scientific and management training who are capable of using new technology as well as modern management and marketing methods (Senker, 1981). University-trained staff also have 'knowledge of knowledge' - when they are confronted with technical problems beyond their capability, they

know how to seek out external information to solve such problems (Gibbons and Johnston, 1974).

Where firms in traditional sectors use new technology, they often use technology that is produced by their materials and equipment suppliers, and sub-contractors rely on their customers for precise specifications (Rothwell, 1991). Studies have shown that small food manufacturing firms are also assisted by the activities of some large food retailers acting as brokers between the science base and their small firm suppliers when necessary (Senker, 1986). There may be a similar relationship between large garment retailers and their suppliers (Braham, 1985). But there is extensive evidence that firms which do not employ qualified scientists or engineers (QSEs) have great difficulty in absorbing knowledge from such external sources. Studies of firms in the plastics processing industry suggest that lack of QSEs and technicians limits their ability to use the technical information available from their suppliers and adversely affects the quality of the products produced (Walsh, Townsend, Senker and Huggett, 1980; Rigg, Christie and White, 1989).

Most firms in traditional sectors such as construction, food, plastics, clothing and mechanical engineering, were founded by practical people, few of whom yet recognise or understand the need for graduates or technicians in scientific, technological or management disciplines. If there is nobody in a firm who can understand the information generated in universities and research institutes, then the firm cannot use such information. Firms cannot innovate effectively unless they employ staff who understand science, technology and modern management methods, and are able to apply them. For example, in the absence of the necessary knowledge to use new machinery, the provision of financial support for modernisation of machinery by itself cannot provide firms with the capability for effective innovation: if the firm does not employ appropriately educated and trained workers, financial support cannot ensure it uses new machinery effectively, or to modernise products, services or production processes.

The principal factor constraining firms' demand for scientific and technological information is their own lack of scientific and technological capability. Universities play important roles in producing new information and in educating students. But

firms can gain access to such information only if they employ people capable of reading the textbooks, journals and manuals in which it is published, and communicating directly with those who produce it. There is a considerable amount of empirical research data which demonstrates that this capability is related to the educational level of a firm's staff, in particular to the employment of qualified scientists and engineers able to comprehend the published output of universities and research institutes (see, for example, Entorf and Kramarz, 1997; IRDAC, 1991). Qualified staff can also participate in personal discussions with people who generate new information. In principle, the higher the level of information and understanding within the company (the more elevated its skills profile), the more its staff are aware that new information could help their business; and the more they can use new information to improve the company's competitiveness.

Cooperative research associations were originally established to assist smaller firms in industrial sectors that were unable to support in-house R&D. However, it has been found that large firms have more contacts with research and technical associations than SMEs. To some extent this is related to the fact that large firms have the time and personnel to make such contacts (Rothwell, 1975). A survey of Sussex companies' links with higher educational institutes found that interaction increases with QSE employment and with firm size (Lowe and Rothwell, 1987). Another study found that the in-house laboratory and contract research organisations are complementary to each other, and cooperative research associations cannot therefore compensate for the lack of in-house research by firms (Mowery, 1983). A study of government support for industrial R&D in Norway throws further light on the problems encountered by small firms without qualified scientists and engineers that attempt to access expertise within research institutes. SMEs have difficulty specifying their needs in the technical manner required by the research institutes, and those that manage to surmount this hurdle seldom implement the results of projects undertaken for them by the institutes. This is often because firms just do not have staff able to comprehend and apply the results to their products and processes (Senker, 1997).

However, the learning process may also be constrained by firm culture that is conservative and sustains existing structures of belief (March, Sproull and Tamuz, 1991). There is a tendency for organisations to socialise new recruits to adopt their

pivotal or central assumptions, and firm culture is taught to new members as the correct way to perceive, think and feel. This has implications for firms trying to transform themselves by adopting a more scientific approach to management, or indeed, introducing technology which is new to them. The new approach may demand cultural change in the company. To be integrated successfully into the organisation, all new recruits have to assimilate company culture to a very considerable extent. But there is also a need for company culture to accommodate itself to the new knowledge being introduced. This holds true whether the knowledge relates to management techniques, the introduction of new technology, or the application of science. It is likely to involve recruiting and/or developing people able to integrate a firm's accumulated knowledge about its products and processes with the new information being introduced. During the process of integration, problems beyond the capability of the new recruits may emerge, demanding interaction with external experts. Senior management also needs to be involved in the process of integration, learning about the wider implications of adopting a new approach (see, for example, Senker, 1984; Bessant and Haywood, 1988; Senker and Simmonds, 1991).

Small high tech firms

While the vast majority of SMEs operate in traditional sectors, small high technology companies have great significance in contributing to innovation, productivity and growth of the economy as a whole (Oakey and Mukhtar, 1999). There is no convincing evidence that lack of training is a major problem for these firms. High technology firms that employ QSEs find that the few people they employ have insufficient time and insufficiently wide knowledge and experience to cope with the numerous problems these firms face. Such firms also tend to be short of financial resources. Some government programmes appear to help these SMEs to overcome these obstacles, but the design of other programme does not seem to have taken the specific needs of SMEs or specific technologies into account. Programmes for technology transfer in scientific instruments and advanced engineering ceramics appear appropriate for SMEs, but are less relevant in relation to biotechnology. In ceramics, lack of investment in public research can be a major barrier to technology transfer from academe. This has been overcome to some extent by the transfer of technical information from supplier and buyer firms (Senker, 1997). Similarly, many biotechnology SMEs are intimately connected with larger firms as suppliers of

intermediate products, research materials and equipment, and they report that they have benefited from such links in a number of ways. The main method by which high technology SMEs overcome barriers to technology transfer is by building good informal relationships with academics. This includes bartering goods and services in exchange for access to university expertise. Companies offer lectures to students, or give valuable materials in return for university information, advice and help. The expertise needed by SMEs takes many forms, including market information (in parallel computing), use of university instrumentation (in advanced engineering ceramics and biotechnology) and scientific information.

> *It is very hard for any general courses to be of much use since it is specialised information that is needed. Free research facilities would be more useful and subsidies to enable the purchase of market reports.*

How firms learn

Firms can learn by a variety of means; for example, by conducting research and development (R&D), by training their own staff, by hiring individuals from outside, by reverse engineering, by installing capital goods and by imitating competitors. In addition to R&D, learning can also take place in many other firm activities, including design engineering, manufacturing, marketing and management. It is important for firms to learn continuously and to base their learning on multiple sources of information (Tiler and Gibbons, 1991). The acquisition of information by firms is a complex process, however, and it is necessary to draw a sharp distinction between individual learning and organisational learning. It is not sufficient for a firm to access useful information. It also has to organise methods for the internal diffusion of new information, and to ensure that information received from external sources is communicated and utilised effectively throughout the organisation. For example, it is not enough for only certain individuals to learn about information technology (IT). Indeed, it is dangerous for an organisation to rely on individual IT experts (Dale, 1986). The organisation as a whole must learn to use IT so that it can draw upon the complex blend of skills and talents over which it has control, locating and drawing upon the strengths in its knowledge base. A key part of the learning process is concerned with the identification of information which can add value to the business, and integrating new information with the knowledge the company already has (Tiler and Gibbons, 1991).

Sources of new information

A study of over 2,000 UK SMEs enquired into their use of external technical information and support (Small Business Research Centre, 1992). About 60% of the firms in the sample made use of such external information. Trade and professional journals, together with suppliers and customers, were by far the most important sources. Universities and government research establishments were the least important, a finding which mirrors that in the YHUA study.

But universities play a significant role in producing new information, and in providing access to the stored knowledge developed over time. For SMEs to innovate, they need to be able to access this information effectively. A great deal of this information is published in textbooks and journals, but it can often be applied only by graduates who have absorbed the associated tacit knowledge and skills. Polanyi (1966) encapsulates the essence of tacit knowledge in the phrase "We know more than we can tell", and provides clarification by giving such commonplace examples as the ability to recognise faces, ride a bicycle or swim without even the slightest idea of how these things are done. Tacit knowledge is heuristic, subjective and internalised and is not easy to communicate. Winter's (1987) taxonomy of information recognises that information may, or may not, be observable, teachable and articulable. This is helpful in understanding that it may be possible to acquire tacit information that is observable but non-articulable by working closely with experts and learning through example and experience. Well-established practices of recruiting qualified scientists and engineers enable firms to apply scientific information - both formal and tacit - to solve their technical problems.

There are significant difference between university-educated and industry-trained problem solvers in their use of external sources of information. Those who lack a university education, but who have had industrial experience, education and training, tend to rely more on their existing education and experience to solve technical problems. In contrast, those with a university education are more inclined to use this to extend their information resources. University-educated problem solvers make frequent use of information in the scientific literature and also utilise direct personal contacts with scientists in the public research sector (Gibbons and Johnston, 1974).

Industrially-trained problem solvers tend to ignore these resources. These findings have two explanations: first, that university-educated problem solvers have acquired 'knowledge of knowledge' - the ability to recognise when available internal resources are inadequate to solve particular problems *and* where and how to find the necessary information. It also seems that industry-trained problem solvers experience a barrier to the use of scientific sources, and this can inhibit them from transferring scientific information to industrial applications (Senker, 1997).

There has been rapid growth in the number of graduates produced by universities in Britain in the last two decades. This growth has resulted in graduates in numerous disciplines being recruited to fill posts in industry previously held by less highly-qualified people. The increased employment of graduates raises relevant questions. To what extent are the additional skills and information acquired by these graduates wasted? To what extent are jobs being changed to use the additional skills and information acquired by graduates to improve productivity, and the quality of product and service?

In manufacturing, while QSEs in the shape of graduate engineers are being employed as supervisors and upgrading supervisory skills, foreign language graduates are being used to help to increase export sales. Many non QSE graduates have entered the service industries and there are many cases of them playing significant roles in expanding the range and quality of services offered by their companies (Mason, 1997). For example, in the steel and financial services industries, product ranges have been widening considerably and job roles have been broadened to take advantage of graduates' skills, knowledge and analytical capacity, and their ability to undertaken non-routine work. Graduates are not necessarily being under-utilised if they are employed in jobs for which university degrees have not traditionally been required. In financial services, there is a mixed picture. There has been an increasing tendency to stream graduates into several layers of employment. As in manufacturing, some jobs in which graduates were not normally employed in the past now employ them and utilise the extra skills and knowledge they possess. However, while it is difficult to draw hard and fast distinctions, it seems likely that some graduates lacking technical expertise and inter-personal skills are regarded as well-suited to routine, clerical-grade

jobs. In such cases, it may be that university education has been wasted (Mason, 1995).

Present UK government policies and their limitations

For some decades now, the UK government has been anxious both to promote innovation in small firms and to stimulate training in them. The two departments currently most involved in these efforts are the Department for Education and Employment (DfEE) (training) and the Department of Trade and Industry (DTI) (innovation). The DfEE has introduced Modern Apprenticeships and National Traineeships (now re-named Advanced and Foundation Modern Apprenticeships) and is very keen that SMEs should adopt them. However, recent research has found that the barriers which restrained take-up and use of Modern Apprenticeships and National Traineeships by SMEs were related to the business culture of SMEs. Driven by short-term business imperatives, and operating within slim profit margins, SMEs tended to provide in-house training for immediate requirements, which often made them unresponsive to adopting external training initiatives. In addition, many SMEs did not have the infrastructure and staff to introduce and manage training initiatives (Sims, Golden, Blenkinsop and Lewis, 2000). The DTI has numerous schemes to promote innovation by firms, with a range of special schemes for SMEs. Schemes such as the Teaching Company Scheme (TCS) have helped SMEs to learn the value of R&D and innovation, and of collaboration with academia (Senker, 1994).

The Teaching Company Scheme

Several studies have demonstrated the success of the Teaching Company Scheme in terms of encouraging technology transfer and training relevant to innovation in both large and small firms (see, for example, Senker and Senker, 1994). Established in 1975, the TCS sets up partnerships between academic institutions and companies to bring benefits to industry and academic institutions, and to develop a group of high quality, young, technical managers. Its objectives include facilitating the transfer of technology and the diffusion of technical and management skills, encouraging industrial investment in training, and the provision of industry-based training (supervised jointly by academic and industrial staff) for young graduates intending to pursue careers in industry. The TCS also seeks to enhance levels of academic research and training relevant to business by stimulating collaborative research and

development projects, and by forging lasting partnerships between academia and business.

The TCS operates through programmes in which academics in universities join with companies to contribute to the implementation of their strategies for technical or managerial change. Each partnership, called a TCS programme, involves academic participation with company managers in the joint supervision and direction of the work of a group of young graduates. The graduates, known as TCS associates, are recruited by the academic department concerned and are normally based full-time at the company. The TCS makes a grant towards the basic salaries of the TCS associates and provides the academic department with the costs of a senior assistant, who takes over a proportion of the normal workload of the academics so they can spend time at the company. Industrial and academic partners interested in setting up a programme are advised by a TCS regional consultant.

A TCS programme can put in place an organisational mechanism which initiates information transfer from academia in firms that have not previously recruited graduate scientists or engineers. It can also play a significant role in creating more favourable attitudes to the recruitment of such graduates. In a company that already recruits scientists and engineers, a TCS programme can facilitate transfer of specific scientific, technological or management information that may be critical to the company's future.

The TCS associate acts as a conduit to bringing new information to the company. He or she is also able to adapt the new information to the needs of the firm by absorbing certain aspects of company culture. TCS programmes are most successful when the company need no longer rely on external experts because organisational learning has taken place, enriching the company's existing knowledge. Organisational learning resulting from TCS programmes has sometimes been so extensive that it amounts to cultural change. This can entail transformation of a company's attitudes and procedures from a craft mode of operation to a scientific mode, or radical changes involving the use of more scientific methods for ensuring quality in processes and products. This is important because company culture needs to change in order to accommodate new technology or managerial methods.

It is interesting to reflect on the success of some TCS programmes in inducing 'cultural change' in companies. The TCS associate enters the company not as a new employee, but as an employee of the university department with which the company is co-operating in the programme. Thus, the TCS associate absorbs the company culture to a considerable extent by virtue of working in the company and being jointly supervised by a member of the company staff. However, his or her absorption of the company culture is limited to the extent that his or her work is controlled by a Local Management Committee (LMC) on which university academics sit, and by virtue of the fact that the TCS associate is jointly supervised by academics in addition to company managers. Thus, in comparison with a graduate recruited by the company, the TCS associate is encouraged and supported in the acquisition of information and cultural norms deriving from academics (Senker and Senker, 1994). TCS associates acquire information held by academics, and derived from the network of information production in which the academics are involved, and are in a privileged position to inject this information into the companies (Tiler and Gibbons, 1991). This injection is likely to be accepted by the company as it does not come directly from an external source (as it would if the academics themselves were acting as temporary consultants to the company). Thus, the potential of TCS associates to change company culture is greater than that of new graduate recruits with comparable knowledge, skills and experience. TCS associates are in the interesting - no doubt sometimes difficult - position of being both part of the company and absorbing its culture, and at the same time being partially independent.

As Tiler and Gibbons (1991) point out, there are difficulties in integrating graduates into small firms not accustomed to employing them. Small firms, especially traditionally run companies in industries using mature technology, may be wary of graduates (Belfield, 1998). Indeed, one of the significant cultural changes which TCS programmes have the potential to induce in small firms is transforming reluctance to employ graduates into enthusiasm about their recruitment. Acceptance, if not enthusiasm, is evident among managers in the YHUA study.

Lifelong learning policies

Government policies currently focus on encouraging individuals to learn throughout their working lives. This is necessary for economic development, but it is not sufficient in itself. Increasing the capacity of SMEs to find appropriate new information and technology and to apply them appropriately has been relatively neglected. Particularly in less prosperous regions, one of the principal problems detracting from the UK 's competitiveness is the failure of SMEs in traditional industries to modernise their products and processes by using new technology. The vast majority of training programmes operate by increasing the supply of suitably educated and trained people, but the failure of SMEs to demand highly qualified workers is not addressed. The YHUA scheme is typical.

Modern Apprenticeships

The minimum requirements for Modern Apprenticeship are:

- a formal training programme compatible with the framework developed by the sectoral National Training Organisation (NTO);
- training aimed at the acquisition of a National Vocational Qualification (NVQ) at Level 3 or above, including acquisition of relevant key skills (numeracy, communication, etc.); and
- a formal training contract between the apprentice and the sponsoring employer.

Unless the relevant NTO framework stipulates off-the-job instruction, none is required. Most Modern Apprentices work under frameworks without such a requirement and, although most do receive at least some off-the-job instruction, much appears to have little educational content.

There are serious problems associated with the revival of apprenticeship via the Modern Apprenticeship in the unregulated environment of the UK. In summary, these are the low educational attainments of many potential apprentices, widespread youth preference for full-time schooling, and low employer demand for apprenticeships regulated by market forces alone. There are also the dangers of employers free-riding on the training efforts of others, low quality in work-based training, and under-training in the face of high payroll costs for apprentices (Ryan, 2000).

The National Vocational Qualifications (NVQ) system

The NVQ system was originally intended to simplify the structure of qualifications. The Qualifications and Curriculum Authority (QCA) admits that it has manifestly failed to do this. What the introduction of NCVQ (the National Council for Vocational Qualifications, the predecessor of QCA in terms of responsibility for vocational qualifications) did was add another set of qualifications to an already confused system. Few small firms have adopted NVQs, largely because of the complexity of the system and the work involved in implementing assessment processes. In effect, instead of having a choice of learning pathways leading to nationally recognised qualifications, employees (especially those in SMEs) are generally denied access to qualifications. Lack of employer and employee interest in NVQs derives from the poor design of the qualifications and of the standards which underlie them (Senker, 2000).

To the extent that the training system does respond to the training needs of employers, it responds mainly to the needs of large employers. Perhaps partly because the systems which administer training have been designed by bureaucrats and representatives of large firms, they do not take account sufficiently of the extreme difficulties small firms have in dealing with paperwork. Few small employers have the time to serve on the committees which design NVQs (Matlay and Hyland, 1997). Such constraints on small firms need to be recognised; unaided they cannot deal with bureaucratic demands from funding and other bodies. The practical training and work experience that small firms can provide represents a potentially valuable but neglected national asset: there are far fewer training opportunities available for trainees in small firms than there should be. But small firm training needs to be supplemented by broader skill training and general education which can be provided in partnership with other organisations, such as further education colleges (Evans *et al*., 1997).

National Training Organisations

Far from designing training programmes to help SMEs cope with innovation, Industrial Training Organisations (ITOs), which became National Training Organisations (NTOs), have been forced by funding constraints to devote a high proportion of their efforts to the design of standards, qualifications and assessment

methods to comply with inappropriate guidelines imposed centrally, first by NCVQ, and then by QCA. Government proposals do not seem to be based on any coherent understanding of why small firms do what they do: for example; why they train less than they should. Storey (1999) suggests three possible reasons why small firms may not train very much, and the evidence for each is plausible:

1. **SMEs do not train more because the owners and managers of small firms are stupid and ignorant and do not appreciate the benefits of training.** There is some evidence for this insofar as the government's Teaching Company Scheme has subsidised the employment of graduates (mainly scientists and engineers) in some small firms that have never employed them before. In many cases, owners and managers think graduates to be just over-paid *prima donnas* with nothing to offer. Indeed, recent research has indicated that a significant consideration for SMEs is recruiting staff who can get on with the existing workforce. The ability to work together in a small company is often regarded as more important than new recruits having previous experience or qualifications (Sims, *et al*., 2000).

2. **SMEs do not train more because the benefits of training accrue to other firms to a large extent, and not to the firms which train.** In contrast to large firms, there is a very restricted internal labour market in small firms, so a high proportion of those who are trained in particular small firms may leave. Managers in the YHUA study certainly think the risk of trained staff leaving is high.

   > *We have been active in training both apprentices and mature staff. Unfortunately, we have suffered from over-training where after training, staff have moved to other companies*
   >
   > *Manufacturing will not invest in training because those who don't invest, steal from those who do. There is not enough skilled labour to go around.*

3. **SMEs do not train more because learning derived from experience may be more important than formal training.** This is probably true in large firms, and it may be even more true in small firms (Eraut, Alderton, Cole and Senker, 1998). The YHUA study would seem to confirm that it is.

> *Education/training is essential in order to understand new technology. Formal qualifications will assist initially, but development in a specific field is necessary to the introduction of innovative products.*

The reorganisation of training

Individual Learning Accounts and the University for Industry are designed to reinforce individual responsibility for learning on the one hand, and to offer solutions in the form of training on the other. But these initiatives will not be adequate to overcome the substantial barriers to small firm training. It is necessary to reform the institutional structure as well. There are proposals in *The Learning Age* Green Paper which are likely to *increase* the barriers to training provision in small firms. In discussing mechanisms for sharing investment in skills with employers, the Green Paper states:

> "From next September, for employee training which directly benefits individual employers, further education colleges will share these costs equally with employers by increasing fees" (Evans *et al*., 1997).

Increased fees will hardly encourage small employers to invest in training. The organisation and delivery of work-based training (WBT) is currently under review. However, Unwin (2000) argues that:

> "Whilst a process of whole-scale re-branding … will take place, young people and adults are unlikely to see much improvement in the WBT programmes available to them. "

The Labour government initiated a major overhaul of post-16 funding mechanisms, institutional architecture and contractual arrangements. The language changed extensively, the terms 'education' and 'training' being replaced by 'learning' and 'skills'. But changes in substance are far more difficult to discern. One of the key reasons for change is the government's dissatisfaction with the disparate funding streams for post-16 education and training. TECs are being abolished, but higher education and school sixth forms have not been affected substantially by the reforms. The faith in the business community and in the merits of consumerism that has characterised education and training policy since the late 1970s prevails undiminished (Unwin, 2000).

The Small Business Service

The objectives of the Small Business Service are to:

- act as a strong voice for small business at the heart of government;
- simplify and improve the quality and coherence of government support for small businesses; and
- help small firms deal with regulation and ensure their interests are properly considered in future regulation (see DTI, 1999, 2000).

A Small Business Council will report to the Secretary of State for Trade and Industry on the needs of existing and potential small businesses and the effects of government and the SBS on such businesses.

The Small Business Service will promote the benefits of being recognised as an Investor in People to SMEs as a basis for improving learning at work. Learning and Skills Councils will work closely with the Small Business Service to encourage businesses to invest in their workforce through learning. The SBS will also encourage small businesses to provide Modern Apprenticeships and National Traineeships (*Consultation*, 1999). In *Learning to Succeed*, the government recognises that the actions of individuals, especially the millions of small businesses, will have a major impact on the skills that individuals develop and on productivity in the economy (p.64), and that "in the digital age, learning must take place 'on-site' in small and medium sized companies as well as in large businesses" (p.13). But *Learning to Succeed* seems to offer SMEs little more than change in structure; government policy seems very much the mixture as before.

The Small Business Service is to provide "a seamless service to small and medium sized businesses and to integrate skills development with enterprise and business competitiveness." (p.10). If DfEE and DTI have problems in co-operating at national level, it seems unlikely that DTI will be able to set up 'a seamless service' at local level. While the DTI is committed to reducing the burden of regulation on small firms, the DfEE is committed to increasing regulation. Government policy is based on the assumption that no special incentives are needed to encourage small firms to train. Government is considered to have no responsibility for lowering the barriers to

training caused by the complex system of training provision created by previous governments and continued by the present one (rendered even more complicated by the addition of Individual Learning Accounts and the University for Industry). There is no evidence of any government thinking about what is needed to encourage SMEs to train more, nor about why SMEs should be encouraged to train (Hyland and Matlay, 1998).

> *As a small company and hands on its difficult to take time to obtain higher qualifications or study at home, like, IT, e-business, computer studies. We operate 24/7/365.*
>
> *The link [of education and training with innovation] for small firms like ours also has a financial aspect – if we are doing well why change, if we are doing poorly how do we pay!! Catch 22.*

INFORMATION FOR INNOVATION IN SMEs

Innovation in SMEs, or anywhere else, can be seen as simply a change in the way things are done. How things are done depends on the information used to do them, which, in turn, is dependent on the information available to do them. So, innovation is very much dependent on the supply and exploitation of information (Lybaert, 1998), which is why education and training, being concerned with just such matters, are generally conceded to be critical to innovation. But there are other sources of the information firms need for their innovation. Among the most important of these are customers, suppliers and competitors. Survey after survey reveals these to be by far the most important sources of information for innovation, whatever the size of firm.

The real difference between SMEs and large firms is the greater propensity of SMEs to rely on their own internal resources for the information required for innovation: large firms are much more likely to look beyond their own boundaries. The irony is that large firms are much better endowed with internal resources than SMEs; they are the ones who conduct R&D (at least as conventionally defined). They should be much less dependent than SMEs on external information for their innovation. The explanation is probably that information is needed to use information. The previous section of this report expressed this in terms of graduates: SMEs need graduates in order to use graduates. It is precisely because SMEs contain relatively little

information that they can find, assess, understand and utilise so little external information. SMEs are forced to look inwards. Underlying this explanation, though, are the circumstances which constantly beset the managers of SMEs; searching for external information demands time and energy and in most SMEs there is little to spare of either of these.

> *We would like to develop and expand our staff knowledge and qualifications but as a small company it is very difficult to spare personnel through normal working hours and the expense can be prohibitive.*
>
> *Education/training and innovation are important but they are expensive to provide for employees, both in course fees also in lost time (output) which small firms in a competitive market find very hard to justify.*

INFORMATION AND NETWORKING IN SMEs [2]

Part of the YHUA study focused on determining the part played by networking in the innovation of SMEs in the region. It would have been surprising had networking been found to be important as resource constraints make such activity onerous for SMEs. Managers of SMEs have contacts, but contacts are a feeble means of acquiring the information required for innovation compared with networks. Contacts offer bilateral exchange of information: networks multilateral. The research found little evidence of networking among SMEs in the region, but this does not mean that networking cannot play a role in the innovation of these SMEs. Networking, as this section of the report seeks to explain, is an essential accompaniment to the formal collaboration advocated by so much modern management method (Marceau, 1999). It is also an antidote to the self-imposed isolation of most SMEs. Networking, though, depends upon co-operation and trust, and is antipathetic to stark notions of competition. Indeed, policy to provide education and training to produce innovation to increase competitiveness may actually discourage the network formation that can contribute to the prosperity of SMEs.

The key factors in the adoption of innovation are access to information and receptiveness to new ideas. It has long been accepted that informal channels of information flow are as important as formal channels (e.g., Rogers, 1983). In

addition, technological gatekeepers have been shown to be pivotal in the dissemination and adoption process (Macdonald and Williams, 1994). However, while much is known about diffusion, diffusion enquiry in the various research traditions has been 'independently invented'; that is, diffusion researchers in the various traditions seem scarcely to know of each other (Katz *et al*., 1963). One consequence is that knowledge about diffusion seems not to have diffused to those in need of it. SMEs are one such group. These enterprises often lack knowledge of modern business systems and of developments needed to achieve some degree of competitiveness in an increasingly global environment.

Information is accepted as a key element in effective business management, just as collaboration is increasingly favoured by organisations that seek to improve their efficiency and competitiveness through extending their knowledge base (Badaracco, 1991; Hedlund, 1994). These generalisations are particularly applicable to science and technology-driven enterprises; that is, those that specifically seek to apply scientific information to the management of complex issues (von Hippel, 1988). There is, however, a gap between the acquisition of information and its effective application.

This is a complex and significant matter in itself, made more so because it relates to the use of information gained through collaboration between multiple stakeholders. The management literature generally, and the literature of science and technology policy specifically, favour collaboration as a means of developing and increasing knowledge stocks (Dodgson, 1993a). Collaboration is fundamental to any management process involving multiple users and a variety of sources of information. Inter- and intra-organisational linkages now characterise commercial reality in an increasingly complex and integrated global environment (Gupta and Cawthon, 1996; Doz and Hamel, 1998). The management literature in this area has been concerned with the advantages of both loose ties among players in networks, and also formal alliances, mergers and acquisitions (Friedman, Berg and Duncan, 1979; Porac, Thomas and Baden-Fuller, 1989; Hakansson, 1990; Hagedoorn, 1995; Inkpen and Beamish, 1997, Holmlund and Kock, 1997-9).

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[2] Most of this section was written by Peter Liesch.

It may be that no real conflict is involved here, that as far as an organisation's knowledge base is concerned, a formal agreement is no more than a more controlled collaboration, and a loose network simply a less controlled collaboration. It may be that all that has happened is that the spectrum of collaboration has broadened. However, it is also possible that traditional formal collaboration has proved to be less than satisfactory in the long run. If this is so, a possible explanation may be that the information acquired through formal collaboration is insufficient for knowledge building and that additional information from other sources is required (Macdonald, 1996). Formal collaboration may even inhibit the acquisition of information from these other sources, particularly from external information networks. These effects might not be immediate, but they could become evident over time.

Stakeholder information

No organisation that seeks to generate, package and transfer information can do so in isolation from its stakeholders. Often, the collaborating stakeholders will have different viewpoints and intentions, for it is these differences that offer the advantages of collaboration (Huxham, 1996). However, these same differences can undo a collaboration. Somehow, they must be managed effectively so that the variety of knowledge bases, and potential flows of information from these knowledge bases, become an asset rather than a source of conflict (Boisot, 1995). While it seems probable that the most productive collaborations are those involving a large number of diverse participants, such a network is extremely costly to maintain and requires investment by the collaborators to open and maintain communication channels (Arrow, 1974; Perry, 1993, Lamberton, 1998).

The participating stakeholder groups within collaborations may not be formally articulated and need not necessarily correspond with the boundaries of organisation, Such sub-networks have been called 'invisible colleges' (de Solla Price, 1963). Communities of common interest abound and are observed across diverse contexts, but are generally drawn together through commitment to common goals, and knowledge and information exchange (Rappa and Debackere, 1992; Liesch, 1997). The range and complexity of relationships among the stakeholders in these communities is little understood. Confounding this internalisation of information

within membership associations is the use by organisations of internally legitimated knowledge. Miller (1990), Pascale (1990) and Hanson, Steen and Liesch (1997) demonstrate the problems inherent in organisations concentrating on doing better the things they already do well. A gap between the possession of knowledge and its application to effective business practice and management may occur because mental models based on existing knowledge do not fit well the complex challenges of the management problem (Bohn, 1994; Marshan, Welch and Welch, 1996).

> *We make knives for use in industry and the meat trade, the only alteration in methods over the last 100 years is a change from carbon to stainless steel, from wood handles to polypropylene.*

Also little understood are the processes through which information acquired from external sources is internalised within the knowledge base of an enterprise. Liesch and Knight (1999) introduce information internalisation as an alternative explanation to market internalisation in seeking an understanding of the internationalisation of the smaller firm. As the information from the external environment is virtually infinite in nature and quantity, the manager must select those observables and non-observables most relevant to the contemplated decision and action. This is a process of deconstruction of data out of the environment. These data are then translated and disseminated to other individuals or coalitions within the enterprise through a process of knowledge reconstruction. Knowledge within the enterprise is thus created by the interaction of individuals and coalitions (Nonaka, Byosiere, Borucki and Konno, 1994).

Ultimately, the enterprise amplifies the information introduced and created by individuals, crystallising and legitimising it as part of the firm's information network and knowledge stock (Dodgson, 1993b; Nonaka and Takeuchi, 1995). This process of knowledge creation also occurs at the inter-organisational level through both formal and informal communities of interaction (von Hippel, 1987; Porac, Thomas and Baden-Fuller 1989; Schrader, 1991; Welch and Welch, 1996). In this process of knowledge creation through information translation, it is essential to separate information along two dimensions, one referring to the volume of information and the other to the meaning of information (Dretske, 1981). It is meaning, not volume, that furthers understanding through knowledge accumulation, with information acquisition

clearly being antecedent to knowledge creation. The adage that we are drowning in information but starving for knowledge bears testimony to this interpretation and to the value of talented individuals in the information-to-knowledge creation process. This is a management problem, particularly acute for the smaller firm because it lacks resources, and especially human resources.

> *My son, who is a 2/1 university graduate, has helped me with thoughts of innovation. Being a small firm we react and try to innovate but generally our education level is GCSE/B.Tech which satisfies the electrical installation work we do. This level is the norm for TV and video servicing that we carry out.*

Collaboration, knowledge and network management

It is widely accepted that information is formally exchanged for some other consideration, often access to a resource (Mowery, 1989). Information exchange through informal networks is on-going, with exchange taking place as information becomes available. Useable information may come from outside the network and any obligation to supply information is a personal rather than an organisational responsibility (Macdonald, 1993). Formal collaboration (or formal education and training), despite the endeavours of policy makers, may not yield the types and mix of information required to close the gap between the acquisition and mere possession of information and its application to effective management. Indeed, it may lead to a collaborative inertia in which productivity falls far short of expectations (Huxham and Vangen, 1994). Typically, technical information is of little value without further information (Harkola and Greve, 1995). A blend of technical and other information may be required for effective application. Subtle and different blends may be required at different times (Utterback, 1974). Informal networks may have the capacity to accommodate this while formal collaborative agreements may not.

Before information from external sources can be used within an enterprise, it must be directed into the internal communication channels of that enterprise. These channels, even in a small firm, can be as complex and subtle as those operating externally. Pre-existing channels may not permit the monitoring and control of information flow necessary in collaboration. Consequently, collaborating enterprises tend to superimpose new hierarchical systems to assess information received and to distribute it to appropriate internal activities (Perry, 1993). A series of committees, for

example, may perform this function. It could be that such committees open new information highways in enterprises where there were previously only roundabouts, but it is in the nature of committees to require procedure and justification. Justification for continuing with the old is usually stronger than justification for launching into the new, and committees are not known for their eagerness to take leaps of faith (Daniels, 1983). The coimmittees of the YHUA scheme seem to leave no scope for informaal networking in the rigid structure they impose on the networking of SMEs.

> "Proposals for the establishment of the Yorkshire Forward Cluster Network incorporating the 15 existing RIS Sector networks were agreed by the RIS Innovation Board at its meeting on 6th September and adopted by the Yorkshire Forward Board on 22nd September 2000. The YF Cluster Network will comprise the existing 15 RIS Sector networks, rebranded as Yorkshire Forward Sector Groups clustered into three groups of five with common characteristics…. Each cluster network will operate through a management group comprising the Chairs of the five business sector groups together with a Yorkshire Forward Board Member and/or a Yorkshire Forward Executive."(Yorkshire Forward, nd, p.21)

An alarming supposition, one that policy makers have rarely considered, is that existing information networks may be damaged by formal collaborative agreements (Macdonald, 1992). While day-to-day relationships might continue within the firm with or without collaboration, the enterprise's information links to the outside are likely to be less numerous and robust. A collaborative agreement to reveal information to a fellow member implies that information is to be withheld from non-partners, with mechanisms established to ensure secrecy. The inability of key employees to supply information to their informal networks may well generate a reticence among other information sources, and particularly among members of information networks, to supply information in return. Over time, the employees and hence the enterprise, may well be ostracised from personal information networks, having sacrificed informal information flow for formal. In these circumstances, increasing pressure might be placed upon the collaboration to compensate by supplying further information, pressure the collaboration was not designed to bear, and which may be sufficient to alter the balance of power among the partners. These imbalances are common in collaborations and are generally attributed to the superior ability of one partner to exploit resources. It might be that the imbalance begins in the networks beyond the collaboration.

It is axiomatic that collaboration may starve non-collaborators of the information central to the collaboration. Information networks are complex and fragile constructions. When a part is excised by collaboration, it seems unlikely that the remainder can continue functioning as before. For example, a reduction in one type of information previously available in the network could make less valuable information of another but complementary type (Stiglitz, 1980). Because networks are interlocking and overlapping, this effect may well be contagious, spreading its debilitating virus from one network to another, formal and informal. As collaboration deepens, it becomes obvious to members of informal networks that information is being withheld. Not obvious, because of the nature of information, is precisely what information is no longer available. Even when collaboration does not restrict information supply to the network, its very existence may be enough to cause suspicion that it does. In the absence of trust, information exchange begins to break down (O'Reilly, 1978; Dodgson, 1993c). In these circumstances, if information is to flow among enterprises at all, it is likely to do so only through collaborative agreements.

Network Opportunities for SMEs

The networks approach to industrial marketing has its origins in the 1980s in a research tradition established conjointly at the Department of Business, Uppsala University and the Stockholm School of Economics. Identified with this tradition are, for example, Johanson and Mattsson (1988), Hakansson (1987, 1989), Axelsson and Easton (1992), Gadde and Hakansson (1993) and Forsgren and Johanson (1992). Much like social network analysis, the industrial network approach "focuses on the 'space' between organizations… the existence of relationships among firms engaged in economic exchange provides a compelling reason for using inter-organisational relationships as a research perspective" (Easton, 1992, p.3). This perspective has been applied to various issues, but particularly the internationalisation of the firm (e.g., Forsgren and Johanson, 1992), and technological development (e.g., Hakansson, 1987, 1989).

Inter-organisational relationships have a three-fold importance in commerce and industry in that they influence the productivity of an enterprise, its control over its environment, and its development (Hakansson, 1989). Networks have been conceived as being exchange mechanisms, that operate not by the invisible hand of the market, nor by the bureaucratic governance of the hierarchy, but by the intercoupled mutually-determined connectedness among participants who invest in, and exploit, relationships. Hakansson and Johanson (1993) have conceptualised networks as a generic governance structure, with the nature of relationships being all-important to this exchange paradigm.

This 'connectedness' construct has been imported by the industrial network analysts from the social network theorists. The social networks approach concentrates on the network actors and their relationships; the resources they use in their interactions are somewhat peripheral to the main play. For industrial network researchers, while the actor exchange relationship is fundamental, so too are the resources exchanged and the means by which these exchanges are effected.

The industrial network researchers resort to four basic metaphors: networks as relationships, structures, processes and positions (Axelsson and Easton, 1992). The network is neither in equilibrium, nor is it in balance; rather it is in a sort of stable but dynamic disequilibrium. Various forces have been identified that appear to bind networks, including a functional interdependence whereby the network components combine demands and supply under the authority of the actors and within a system of exchange. A power structure is imposed to control activities and resource allocation, and a knowledge structure develops to fashion the activities and to make best use of resources. This whole process is effected within a time-dependent organisational arrangement in which the historical investment by the actors in experience, resources and activities largely determines the network structure (Hakansson, 1987).

There has been a noticeable shift over the past decade in the way firms enter foreign markets. This shift has seen an emerging interest in the role of SMEs. The entry of SMEs to the international marketplace heralds a new era of international trade that was previously the domain of the large multinational enterprise (MNE). Within this environment, the twin forces of globalisation and advancing technologies have altered

the nature of competition and co-operation. Today, SMEs are successfully entering foreign markets, becoming highly internationalised while nonetheless remaining small.

Globalisation and advancing technologies are spawning new external, market-based approaches to the conduct of international business, and business that is conducted locally. Buyers, able to compare goods and services from around the world, are now more conscious of quality, price and other attributes. This calls for much greater managerial flexibility in the selling firm's international activities. Generally, the boundaries between domestic and international markets are becoming less relevant as enterprises expand their profiles abroad. Alongside these trends, advances in information, communications and transport systems have greatly reduced business transaction costs. Technology has facilitated the entry into world markets of resource–constrained SMEs interacting directly with customers through telecommunications, the Internet and e-mail. While these information technologies provide similar benefits for large firms - the traditional multinationals of the 'old economy' - their widespread diffusion has made going international a viable and cost-effective management option for SMEs.

A thread running through the dominant explanations for the internationalisation of the firm is the importance of acquiring information to support foreign expansion. This is as crucial for the enterprise outwardly internationalising (entering foreign markets) as it is for the enterprise inwardly internationalising (receiving foreign goods and services for local markets). Information internalisation can be defined as a process of searching for, acquiring and absorbing both tacit and explicit information into the enterprise and translating it into knowledge that is then applied to some purpose (Liesch and Knight, 1999). Of all resources, information is perhaps the most critical to the expansion of SMEs into foreign markets, and to the survival of SMEs in their home markets.

International business today is becoming increasingly networked, facilitated through partnerships with foreign distributors, trading companies, complementary manufacturers and other specialist suppliers, as well as traditional buyers and sellers (Johanson and Mattsson, 1988). Networks, alliances and other strategic partnerships

are replacing hierarchical forms, bringing the possibility of competitive advantages to small enterprises (Alchian, 1984; Achrol, 1991). By participating in international networks, SMEs create further conduits for information flows and knowledge formation. Networks, then, are a mechanism enabling the entry of new players to new, and international, markets. They are also a means by which these new players can develop and strengthen their activities in these new markets (Craig and Douglas, 1996).

NETWORKS, SMEs AND THE YHUA SCHEME

It should come as no surprise that SMEs are highly innovative; their innovation is a necessary response to competition and the fluidity of their markets. This should not tempt the conclusion that the innovation of SMEs is a function of their networking. It is no such thing. Our own YHUA survey provides results very similar to those of a survey carried out by Rothwell in that the vast majority of SMEs report customers to be the dominant source of external information for their innovation (Rothwell, 1991). Rothwell finds, as we do, that suppliers and competitors are also significant sources, but his interpretation of their importance is rather different from our own. Rothwell sees networks in which SMEs are linked to all these players: we see only a few dominant linkages dwarfing all others. This difference in interpretation may be explained in small part by Rothwell's SMEs, with up to 500 employees, being rather larger than our SMEs and therefore capable of flexing considerably more economic muscle; and in large part by his sample having been selected objectively for its innovation. Our sample is of SMEs in depressed parts of the north of England and its innovativeness is self-reported. In consequence, Rothwell is able to depict SMEs as policy makers would like them to be - as interacting with a host of external information sources, participating in government programmes to provide yet more information for yet more innovation, utilising this information through the employment of qualified scientists and engineers, and generally exploiting their behavioural advantages in innovation to complement the material advantages of larger firms. Our picture is much more dismal, but perhaps much more typical of the average SME. We find little evidence of any network behaviour, and considerable evidence of firms shackled to a very few obvious information sources. There is little benefit from

government programmes, and innovation is regarded as essential to survival rather than as the means to prosper and grow.

Our findings - basically that customers, suppliers and competitors are the most important sources of external information for innovation - are reminiscent of those of von Hippel (1988), and might raise suspicions of the information trading that he and others have found elsewhere (von Hippel, 1987; Carter, 1989, Schrader, 1991). But the networks of these SMEs are not the networks of equals typical of high technology firms. They are networks of dependence in which the powerful help the weak only as long as they are of use, and equals compete to be used.

Networking is very much in vogue at the moment, both as a device to contain some of the notions of management academics and consultants, and also as a mechanism for programmes designed to encourage innovation in SMEs. Many governments have implemented innovation programmes based on constructing networks of SMEs (Chaston, 1995; AusIndustry, 1995; Oztel and Martin, 1998). But, as Liesch has established, the networks established by authority tend to be quite different from those which have developed informally, a point perhaps insufficiently appreciated by policy makers (Lawton Smith, Dickson and Smith, 1991). Even where there is appreciation, this is rarely of the relationship between the formal and the informal. There is some evidence that formal information systems may damage the informal (Macdonald, 1992). If this is happening, it could be that government programmes to encourage innovation in SMEs through the formation of networks are undermining the very networks that are so important for their innovation. Actually, this is unlikely to be happening in the UK: SMEs have very little use for the various network schemes concocted by the DTI to provide SMEs with information for innovation. There are many possible explanations. Among the most likely is that many years are required to establish the trust and contractual understanding required for information transactions in networks - our own research elsewhere found that networking individuals had known each other for an average of 16 years (Macdonald and Williams, 1992). Then again, if the experience of SMEs mirrors our own in seeking information from government agencies, problems of access may be the explanation (see O'Reilly, 1982).

If government cannot impose instant networks on small firms, what can it do? It can facilitate the formation and the consolidation of networks by bringing together firms, and particularly individuals. Other research has suggested that individual public servants can play a useful role in business networks as what might be called 'blind nodes' (Giusti and Georghiou, 1988): they are not expected to know themselves, but they are expected to know who might, to make contacts for individual managers of SMEs that they would be unlikely to be able to make for themselves. This means moving back from the current level of intervention (which is basically brokerage or the 'one stop shop') to allow those who are brought together to form their own relationships and perhaps eventually their own networks. While current programmes seem determined to create networks composed exclusively of SMEs, Rothwell (1983a) finds no evidence to suggests that SMEs are at their most innovative when isolated from all but their peers. Isolation is one of the main obstacles to innovation in SMEs and it is intensified by policies and programmes that segregate SMEs from the rest of the economy. The YHUA scheme does this. Moreover, it treats education and training as one-off quick fixes for the problems faced by SMEs. This not only makes unrealistic expectations of the contribution of education and training to innovation, but also undermines any contribution they might make to network formation.

Weighing the benefits of the YHUA scheme

Linear models struggle to explain the innovation of SMEs. They reveal only that much of this innovation is different from the innovation of linearity, a revelation from which it is all too easy to conclude that the innovation of SMEs is somehow inadequate. Rothwell has traced development from the crude linearity of the innovation models of the sixties to the sophistication of modern, interactive models of organisational networking (Rothwell, 1992). While government programmes based on the supposition that innovation is a linear process - of which the YHUA scheme is one - are unlikely to encourage innovation, they may well yield other benefits. Belief that innovation is ultimately dependent on the knowledge base maintained by universities and exploited for the benefit of SMEs by research and education is belief that directs resources to the universities. Thus, universities would seem to benefit from the YHUA scheme even if SMEs do not.

Universities are now organisations in which the bottom line is as important as it is in any SME. They have to be competitive and have had to change greatly in order to compete. Their own innovation as they struggle to create a market for their services is really much more remarkable than that of their customer SMEs.

> "Firstly funding agencies such as the RDAs, Regional Government Offices, the new Skills Councils and the Small Business Service can be persuaded to give priority to exploiting the philosophy of using sector specific, learning partnership between HEIs, NTOs and small firms as a strategy [to] deliver regional economic development based upon embedding Lifelong Learning into SME sector firms. Secondly it is necessary to persuade relevant UK and European funding agencies that priority should be given to funding the development of new sector specific, self study learning systems covering those issues where owner/managers feel competence enhancement is a route through which to deliver improved organisational performance." (Chaston, 2000, pp.7-8)

The YHUA scheme gives service providers in higher education and training the opportunity to sell their services and, indeed, themselves. This can be unfortunate when the provision of these services is allowed to compromise the objectivity of research. For example, one academic survey of the innovation of one hundred SMEs in South Yorkshire also found that:

> "85% said they would be interested in hearing more about the services available through the Institute of Work Psychology, University of Sheffield." (Institute of Work Psychology, *Change Management in SMEs*, Sheffield, nd, p.7.)

Managers might feel that case studies provided by a university have some academic content, and are not presented simply to sell the university's services. Yet, the following testimonial decorates the front page of what purport to be academic case studies from the University of Leeds:

> "PrintNET has streamlined our computer system, saving us time and money. We would highly recommend PrintNET's services to other companies" (*PrintNET Case Studies*, University of Leeds, October 2000)

The case studies disclose no problem in SMEs that the University of Leeds was not able to rectify instantly.

If SMEs are quite pleased to accept the educational and training services being offered by these providers – and the survey evidence here suggests they are - it may

be because these providers go out of their way to emphasis that there will be no cost to the SME. Consider the marketing of the University of Leeds:

> "Can Your Company Afford to Ignore over £3,000 worth of **FREE, DEGREE LEVEL MANAGEMENT TRAINING? TWO** degree-level course being run at the University of Leeds are **FREE** to selected print and packaging SMEs….. All this is *available* absolutely **FREE OF CHARGE** to people working in independent companies employing less than 250 staff in and around the following ESF Objective areas: South Yorkshire, Wakefield, Pontefract, Castleford, Bradford, Bately, Dewsbury, Cleckheaton, Hull, Grimsby, Scunthorpe and Beverley." [original emphasis] (*PrintNET Newsletter*, 2, October 2000)

> "£4,600 (per employee) of training to support your staff development – **FREE TO YOU**." [original emphasis] (Intofood Programme leaflet, University of Leeds, 2000)

It is not always immediately evident in this promotional material just whence the funds to pay for the education and training have come. One leaflet from the University of Leeds makes the conditions of funding clear in small print on the back page, but larger print on the front page declares:

> "The University of Leeds is offering **20 FREE PLACES** on **Open and Distance Learning (ODL)** courses to help you acquire these new skills. It doesn't matter if you have no formal qualifications or haven't studied for some time." [original emphasis] ('Learning works' leaflet, University of Leeds, 2000)

> "Leeds Metropolitan University, with the backing of the European Social Fund, are offering you as an employer an opportunity not to be missed…..Free training and staff development. **YES, ABSOLUTELY FREE!** [original emphasis] (leaflet, Leeds Metropolitan University, 2000)

The promotional publications of these institutions are redolent with the testimonials of grateful small businessmen, but the distinction between information produced to sell the university's services and information produced as part of the university's service is not always clear.

> "We had lots of negative comments [about YHUA education and training], but we wouldn't want to show these, would we?" (Manager, Leeds Metropolitan University, December 2000)

Promotional material emphasises that funds have already been allocated and are simply waiting to be spent:

> "PrintNET has up to £400,000 to spend on helping Yorkshire businesses to innovate and to make the most of new technology." (*PrintNET Newsletter*, 1, April 2000)

When there is conflict between the interests of these service providers and the interests of SME, it is the interests of the providers which seem to win out. For example, the SMEs in our own survey are quite clear that they want more specialist training at the NVQ level, but more general training at the degree level. Yet, the experts who man the Packaging Materials Task Force of the Foresight Panel roundly declare that:

> "… more specialised education is required at degree level, together with wider exposure to packaging related topics in the broad spectrum of undergraduate scientific training" (Packaging Materials Task Force, Consultation Document, Summer 2000, p.26)

SOME APPROACHES TO SOLUTIONS[i]

International competition is intensifying, and is based increasingly on firms' ability to develop new high quality products and services consistently and to manufacture them efficiently and cheaply. SMEs that fail to employ graduate level staff with scientific and management training who are capable of using new technology and modern management and marketing methods, SMEs that are unable to network, will find difficulty being competitive in this environment.

Universities play a significant role in producing new information, and in providing access to the stored knowledge developed over time. SMEs need access to this and other information if they are to innovate effectively. There is extensive evidence that firms which do not employ qualified scientists or engineers have great difficulty in absorbing knowledge from such external sources. SMEs cannot innovate effectively unless they employ staff who understand science, technology and modern management methods, who are able to apply them, and who can relate to the company culture of SMEs. The few people each SME employs have insufficient time and too narrow a range of knowledge and experience to cope with the numerous problems these firms face. The main method by which these SMEs overcome barriers to information acquisition from universities is by building good informal relationships with academics, which is the essence of networking and may be nascent networking.

The present system of education and training in England and Wales is not delivering the high quality learning we need as a society and economy. Factors which contribute to our poor national performance include:

- low expectations of what people can achieve
- an education system which produces young people who are disillusioned with formal learning
- a widespread belief that many are destined for unemployment or low skilled work
- well-founded cynicism about the poor quality of government-financed training schemes for the unemployed.

Provision remains fragmented and incoherent. 'A' levels are too narrow, specialised and old-fashioned. Vocational training is too job-specific, low level and poorly co-ordinated. Inadequate education and training have deprived young people of opportunities for earning an honest living. The costs to them and the rest of society have been very high. Foundation training standards are way below those needed to enable the workforce to become competitive. Youth Training Schemes have been revamped frequently, but overall must be judged to have failed. There is no solid reason to suppose that the latest version – Foundation Modern Apprenticeships –the re-branded National Traineeships – will be any more successful.

Market approaches to education and training are cumbersome and expensive to administer. As is all too evident in the YHUA scheme, educational institutions are forced to give too much priority to short term financial considerations, and too little to provision of courses which meet current and anticipated local labour market needs. Changes in the ways in which education and training are organised and funded have resulted in the continuation of an absurdly complex, expensive and incomprehensible system. Despite – perhaps because of – the efforts of YHUA providers to promote their wares and sell their services, SMEs in the north of England are still uncertain about what education and training are available to them.

> *When I have looked for training in Leeds I have found nothing available nor any financial assistance or incentives to train.*

> *In my industry (removals) very little, in fact, no financial help is available for training, or expansion, and with training of any new employee or employed already … I've tried almost every source, TEC, DTI and all drawn a blank.*
>
> *I would very much like to expand my business but as no funds are available to train new and existing employees, change in business is very unlikely.*
>
> *There is very little help from local or central government. You are on your own.*
>
> *It is extremely difficult for small companies to get help with ideas from organisations like universities! Can you help please?*

Recent experience and extensive research demonstrate that market forces cannot form the basis for effective national education and training strategies. An industrial strategy based on achieving a high skill, high productivity economy is needed. The broad-based skills required by the economy cannot be produced through full-time schooling and mass higher education alone. Effective work-based education and training embracing academic, vocational and practical elements are also needed. The market-based model of provision has failed and it is necessary to turn to one based on *partnership and entitlement.* Partners should include central government, employers and their representative organisations, employees and the trade unions, local authorities and local delivery partnerships, the careers service, educational institutions and voluntary bodies. At the moment, the principal influences on training provision are the government and large employers. If SMEs are to participate more and to benefit more from education and training, they must be more involved in its design and governance.

The most effective government scheme at present for increasing the innovation of SMEs, their demand for more highly skilled workers, the supply of relevant training, and probably even their networking, is the Teaching Company Scheme. Several studies have demonstrated its worth in terms both of encouraging technology transfer and training relevant to innovation in SMEs. Organisational learning resulting from the Teaching Company Scheme has sometimes been so extensive that it is justifiable to refer to it as 'cultural change'. This can involve transformation of a company's attitudes and procedures from a basically 'craft' mode of operation to a 'scientific' mode of operation; or radical changes involving the use of more scientific methods for ensuring quality in processes and products. The Teaching Company Scheme has

been extended to include technicians, and the resources devoted to it have increased steadily, but expenditure on the Teaching Company Scheme is extremely small in relation to its proven potential. An obvious solution to increasing small firms' demands for skill and their investment in training relevant to innovation would be to develop more Teaching Company Scheme-style programmes, to expand the resources devoted to them substantially, and to extend their scope considerably.

CONCLUDING THOUGHTS

It is hard to be positive and constructive about the YHUA scheme, and particularly about the contribution of the education and training it provides to the innovation, and hence competitiveness, of SMEs. True, participant SMEs are pleased to receive free education and training, and are happy to proclaim that what they receive is appropriate. But this is a classic special pleader situation: those who are given something for nothing generally think it is a good idea that they are given something for nothing.

The main problem with the YHUA scheme is that it is driven by neither market nor by government. SMEs have almost no influence on the supply of education and training because they have no funds with which to express demand. Nor has government planned what education and training SMEs should have; this is determined by what the providers care to supply, and by what both they and the scheme’s administrators can justify in terms acceptable to the European Union. The YHUA scheme has all the deficiencies of the education and training schemes identified by Senker, and none of the strengths of the networks explored by Liesch. The prospects of improving such a scheme so that it comes nearer to meeting their requirements are remote, not because the YHUA scheme has been incapable of providing what is required of it, but because it has been all too capable. The YHUA scheme has brought benefits to the providers of education and training for SMEs, which is presumably precisely what it was intended to do. It has also been enmeshed in a web of other schemes that SMEs have found confusing and frustrating, but that have maintained organisations and administrators working to increase the innovation of SMEs (see Oztel and Martin, 1998; Dannreuther, 1999).

> *Most important to have education/training to be grant aided. Less payment for non productive civil servants poorly promoting the systems and more money on grant funding.*

Of course, the YHUA scheme is justified in other terms altogether, in terms of the benefits to SMEs through their increased propensity to be innovative and consequent increased ability to be competitive made possible by the education and training they receive. The evidence to substantiate this causality, to support even an association, is thin. SMEs are already innovative and even were they not, the contribution of information supplied through the YHUA scheme, or most other government-subsidised schemes, would have no discernible influence on their innovation. SMEs get the information they require for innovation from other sources and in other ways.

There is a tendency for policies and programmes to assist SMEs to be just a shade patronising. SMEs are treated as children, needing parental guidance until they grow up. Yet, SMEs know very well the world in which they operate and have little to learn about it from outsiders. For example, chief executives in the YHUA survey are well aware of the importance of innovation to their businesses, and of graduates, and they are apparently more aware than the providers of education and training of the essential difference between the two. Evidence elsewhere suggests that these providers have some trouble keeping up with the pace of change in some of the high technology SMEs they serve (Cooper, 2000), not a problem covered in any depth by the promotional literature of the universities. SME managers are also more aware of the real obstacles to their innovation, which are poverty and the absence of time and energy to do any more than just survive. Providers could become more aware of the basic constraints and place their education and training in this context.

Managers of SMEs are much less aware of the world beyond theirdaily existence, of developments elsewhere, of how competition actually takes place in co-operation, of networking. Providers of education and training have much greater awareness of these issues, and consequently have the ability to introduce SMEs to them. The benefits of such provision would be neither immediate nor easily measurable, but they would be significant and they would eventually be reaped by SMEs themselves. In some contrast, the benefits of the YHUA scheme are certainly immediate and measurable, but seem to go only to the organisers and providers of education and training.

Not an automatic link [of innovation with education and training], but employees encouraged to develop and train tend to be better motivated and open minded, more responsive to new challenges and more aware generally.

Mentoring of staff and support groups of employees make an excellent forum for exchange of ideas and the growth of both staff and the firm.

The management of interpersonal relationships between all of these different fields is essential, to ensure that the very best lateral thinking approach is followed, bringing a continuous improving environment.

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