The rise and fall of 'Supernet': a case study of technology transfer policy for smaller firms

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Abstract

A dominant theme in innovation policy throughout the world has been the support of small- and medium-sized enterprises (SMEs). Although policy-making has been evolving away from simplistic and 'universal' measures addressing all SMEs towards more targeted approaches, there is still a lack of knowledge about the nature and extent of SME support needs and the mechanisms for delivering it effectively. The result is that the policy environment is characterised by a wide range of experimentation; this paper reports on one such experiment—Supernet—aimed at improving the access of SMEs to major centres of technological excellence in the UK. During its two and a half years of operation Supernet largely succeeded in establishing a mechanism through which SMEs could access the extensive technology base of the UK. Its limitations were less in execution (indeed, overall management of the operation was generally well-regarded) than in positioning. As a stand-alone venture it was probably too specialised a service for the needs of many SMEs (although valuable for a few) but as part of a broad spectrum of innovation support it filled an important niche, complementing other, more locally oriented types of provision, particularly those being developed by the 'Business Links' network. The paper reviews the history of Supernet and explores some of the issues that its implementation raises for innovation policy. In particular, it argues that there is a need for some form of managed network enabling access for SMEs to the technology infrastructure within a national system of innovation. It concludes with some thoughts on the design and operation of such a network based on lessons offered by the Supernet experience. © 1999 Elsevier Science B.V. All rights reserved.

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1. Introduction

A dominant theme in innovation policy throughout the world has been the support of small- and medium-sized enterprises (SMEs). The argument is that SMEs constitute the majority of firms in the economy, and are the primary engine of growth, particularly in terms of employment (OECD, 1993; Storey, 1994; Hoffman et al., 1997). Such growth depends on their being innovative, and whilst a small number of SMEs in the high technology sector have achieved a reputation for innovation, the majority are less involved. Thus the case is made for providing various kinds of direct and indirect support to enable higher levels of innovativeness amongst SMEs (Oakey, 1991; Rothwell and Dodgson, 1993).

This is, of course, an oversimplification. SMEs are not a homogeneous group but range from micro-

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enterprises (such as hairdressers and grocery shops) which create employment but which have little if any demand for help in effecting technological change, right through to specialist high technology companies (in the biotechnology sector, for example) which have highly specific needs for financial, technological and managerial assistance. This problem has been recognised by many commentators, who argue for a much more differentiated approach to technology policy, building on improved understanding of specific characteristics of different sectors and firm types (Pavitt, 1984; Nelson, 1991).

Although policy-making has been evolving away from simplistic and 'universal' measures addressing all SMEs towards more targeted approaches, there is still a lack of knowledge about the nature and extent of SME support needs and the mechanisms for delivering it effectively (Hoffman et al., 1997). The result is that the policy environment is characterised by a wide range of experimentation, in both design and delivery mechanisms (Dodgson and Bessant, 1996). This paper reports on one such experiment, aimed at improving the access of SMEs to major centres of technological excellence in the UK.

2. The SME problem in innovation and technology transfer

It will be useful to review the nature of the SME 'problem' as far as innovation policy is concerned. Most SMEs are not creators but users of technology and so a prime concern is that of effective technology transfer. (There are exceptions, especially in the high technology field, but even here SMEs are likely to carry out limited and highly focused R & D; there will still be a need for technology transfer for complementary knowledge and equipment.) Too often arrangements for technology transfer assume some version of the linear model of innovation, whereby demand is clearly communicated or where new technology has enough momentum to find its way to SME users (Rothwell, 1992). The reality is that many SMEs lack the capability to understand and articulate their needs, and rarely scan for sources of new technological opportunity (Dodgson and Bessant, 1996). Even those that have an awareness

of their needs may lack the information or capability to find and access sources of technology.

The market failure which this implies has been recognised by many policy-makers and various attempts have been made to bridge the gap through the use of intermediary structures or roles (Carlsson and Jacobsson, 1993). Examples include the use of 'innovation consultants' of various kinds, whose role is to act as a counsellor, helping firms identify and articulate their needs, and also as a broker, enabling them to access the most relevant sources of support and assistance (often ranging from financial through to technological [Skaug, 1992]).

Other options include the use of structural mechanisms to close the gap—for example, by providing specialist information centres, or specific financial support to encourage R & D or technology transfer activity within SMEs (Vickery and Blau, 1989; Dodgson and Bessant, 1996). In other cases, policy efforts are directed towards a particular technology and make use of several approaches to close the SME gap—often linking financial support with inputs to enhance the likelihood of successful implementation rather than simply adoption of new technology (Bessant, 1997).

It is also worth noting that in some cases SMEs, recognising these limitations, have organised themselves into networks and clusters which demonstrate elements of 'collective efficiency'; examples include the *consorzia* of Italy and the industrial districts in Spain, Germany, Pakistan and Brazil (Piore and Sabel, 1982; Semlinger, 1995; Schmitz, 1997). Several public sector policies have been designed to promote networking of this kind (Danish-Technological-Institute, 1991). Carney discusses the role of 'structural service agencies' working within industrial clusters to help facilitate development and innovation amongst SMEs (Carney, 1997).

In different ways, these mechanisms all recognise the underlying difficulty confronting SMEs. It is not so much that they are small as that they are isolated —and thus mechanisms need to be found to enable better connection. One set of connections involves linking SMEs to sources of specialist technological expertise within the national innovation system. Most countries have some form of Research and Technology Organisations (RTOs—specialist laboratories, universities, government laboratories, sectoral facili-

ties, etc.)—and these often represent a major investment of public money as well as an accumulation of specialist technological competence over many years.

Potentially these could be of value to SMEs in their technological change activities—but only if there are mechanisms for raising their awareness of the RTOs and for accessing their knowledge and support. Unfortunately for many SMEs there is both an information gap—a lack of knowledge about which RTOs exist and what they might be able to offer—and a 'perception gap' where SMEs see the activities of RTOs as being too advanced and specialised and not applicable to their problems. There is also a perception of high cost which deters SMEs from approaching RTOs.

The problem is not confined solely to the demand side, however; there is also a gap on the supply side. Many RTOs have a tradition of working with larger firms or on major publicly funded contracts, and have not seen SMEs as an important market. There is an understandable pressure inside these organisations to work on intellectually challenging research-based projects rather than on delivering relatively straightforward problem-solving services associated with application and transfer of technology. As a result there is often a gap between the supply of technology transfer service from RTOs and the demand articulated by SMEs.

This pattern is changing, particularly as a response to a more competitive environment for RTOs (Rush et al., 1996b). Across the world there is a move away from public subsidy and towards greater emphasis on market-related activities; in many cases this has included the privatisation of RTOs. Making the transition to being more market-oriented is not always easy and in a number of cases public policy support has been engaged in trying to help RTOs identify and implement new strategies, many of which stress a more SME-focused role. In the UK, for example, the Focus Technical Reviews programme involved management consultants helping a selected group of RTOs redefine their roles and operating practices to make them more market-focused, with particular emphasis on their potential work with SMEs.

These trends have increased pressure to close the gap between supply and demand, and have led to numerous experiments along the lines mentioned above. In the remainder of this paper we look at one such experiment—Supernet—which was part of the UK government's attempt to link SMEs more effectively with sources of technological excellence.

3. Evolution of the UK innovation infrastructure

Before we look at Supernet in detail it will be useful to place it in the wider context of UK technology transfer policy and infrastructure. In common with most industrialised nations there is a tradition of support for innovation in the UK which can be traced back over several decades (Rothwell and Zegveld, 1981). In early years much of this support took the form of financial assistance via subsidies, loans and grants for R&D and for applying new technologies in products and processes. In the late 1970s a more focused approach was adopted as a response to the emergence of the challenges posed by microelectronics and information technologies, and a number of policy innovations were introduced. Of particular relevance was the shift to more emphasis on information based activities—particularly awareness-raising and consultancy advice (Northcott et al., 1986; Vickery and Blau, 1989; Bessant, 1997).

Throughout much of the 1980s emphasis was placed on trying to accelerate the rate of diffusion of key new technologies through a combination of advice, consultancy and financial support delivered through an increasingly large and complex set of programmes. But in 1988 a major shift in emphasis reduced the element of financial incentive dramatically, replacing it with a thrust towards creating the climate for innovation and providing the information and advice to enable this to happen. This approach was exemplified in the 'Enterprise Initiative' which was the name given to a bundle of subsidised consultancy services through which firms (largely SMEs) could obtain advice on business development issues such as product design and development, quality management, business planning, manufacturing strategy, production technology, information systems and marketing. This programme was widely publicised and proved popular with firms; it had the additional effect of mobilising the latent consultancy base in the UK, since the fee level and project size tended to exclude the larger consultancy firms and encourage the growth of small, local and specialised players.

During the early-1990s, Enterprise gave way to a new concept—the Business Link. This was in part a response to comments from business that the range of government support and advice had become too diffuse and lacking in focus; there was a lack of awareness of what was available or how to access it. Thus the idea of a 'one-stop-shop' emerged, under whose roof all support activities (for general business development, not just innovation) would be concentrated. Such Business Links would be set up in a regional network and would exist primarily for the benefit of local SMEs. Whilst SMEs would be encouraged to approach the Business Link in their area, the process would be augmented by appointing a series of specialist advisors within each Link whose role would be to find and assist SMEs in business development.

The roll-out of the Business Links programme took several years but by its completion in 1997 there were over 240 Links in England (Scotland and Wales had their own similar arrangements). Within their staff of specialist advisors were two groups of particular relevance to technology transfer—the Innovation and Technology Counsellors (ITC) and the Design Counsellors (DeC). Their role was essentially to provide innovation consultancy support to help bridge the gap between SME demand and sources of support and advice (Bessant and Rush, 1995, 1998).

On the supply side, a number of new actors have also emerged. The changing climate has meant that traditional RTOs have been joined by many other suppliers of advice or technical service. For example, many publicly-funded agencies have been privatised and now need to seek new market opportunities whilst those which remain in the public sector—for example, in the defence industry—are now being pushed towards a more commercial orientation. Higher education institutions (HEIs) are also coming under severe financial pressures and are beginning to market their research and technical service capabilities to compensate for gaps in other sources of funding.

For many of these SMEs are seen as an attractive potential market—but the commercial experience of these agencies in managing technology transfer to this market on a commercial basis is often limited. Attempts have been made to help develop these skills—for example, through individual strategic re-

views (Rush et al., 1996a) or by the government—but there remains some degree of difficulty with connecting up rich sources of technology supply and a large potential user base amongst SMEs.

Recognition of market failure in transmission/coupling between needs and means in the technology transfer infrastructure relative to SMEs has been a strong feature of recent government policy and has led to a number of experiments aimed at closing the gap. One such example was Supernet.

4. The Supernet initiative

The original ideas behind Supernet were for some form of advanced manufacturing technology (AMT) network. This was envisaged as drawing together national capability in applying AMT and making this available through a number of nodes to potential users—possibly through some form of IT-network. With the advent of Business Links the location of those nodes became better defined, and Supernet was seen as a support mechanism particularly for the work of the Innovation and Technology Counsellors and Design Counsellors in their work helping firms articulate needs and identify sources of technical assistance. The concept was also extended to cover technology across a broad front, not just in manufacturing processes. A number of organisations tendered for the detailed design and management of the scheme, and the contract was awarded to Pera Group, the consulting arm of a long-established RTO with broadly-based links across manufacturing industry and with prior experience of managing a part of the 'Enterprise Initiative'.

In operation SME needs were communicated to the Supernet Manager (PERA) who passed on the enquiry to appropriate Supernet Member organisations, RTOs, HEIs and other technology providers. From the outset Supernet was designed to offer more than simply a 'Yellow Pages' approach to technology problem-solving since value would be added by the ITCs and other Business Links staff in articulating and framing the problem and by the Supernet team in further clarifying the nature of the enquiry and 'sign-posting' it to the most appropriate technology resource.

The potential contribution of Supernet to the innovation infrastructure was thus threefold:

- it offered a mechanism for establishing a world class technology network on the supply side, linking centres of excellence primarily based in the UK but including some overseas RTOs
- it offered a rapid response channel through which agencies such as Business Links could quickly access this network, and in doing so develop their own awareness and familiarity with the technology base
- it provided analysis of technical problems to identify the underlying needs and thus offered rapid and accurate matching between needs and technological means in support of SME innovation

Supernet was launched in November 1994 and was originally designed to run for three years with funding from the UK Department of Trade and Industry (DTI), after which its future operational basis would be reviewed. (The original tender asked those organisations responding to outline their plans for how the service might continue after the initial government pump-priming funding expired.) In the event its operations in the above form stopped in May 1997, although a slimmed-down Internet-based service now operates under the auspices of the Business Link Network (the company established to undertake central services for the national network of Business Links).

5. Evaluating Supernet

Supernet represented the latest in a series of attempts to provide a technical information and advice infrastructure for SMEs; earlier examples included the Technical Action Point (TAP), the British Technical Advisory Scheme (BTAS) and the Technical Action Line (TAL). During its short life it underwent a process of continuous development to improve the quality and effectiveness of its service. As part of this learning process an independent evaluator was commissioned to monitor various aspects of Supernet operation.

Three key questions formed the basic framework for the monitoring and evaluation work:
- is Supernet the right thing to do?

- is it being done well?
- could it be done better?

Success criteria included the extent of use and the effectiveness of use; in other words, did people use it and did it help them solve their problems when they did? Achieving these depended upon:
- developing a wide range of coverage (in geographical and technological terms),
- establishing a high level of local involvement (especially through the emerging Business Links/Specialist Counsellor (ITC/DeC) framework) and
- effective management of the Supernet system (measured by indicators such as speed and quality of response, ease of access, etc.)

A number of activities characterised the evaluation:
- interviews with Supernet users, predominantly ITCs and DeCs but also including some user firms. A total of 19 were visited with reasonably broad geographical coverage.
- interviews with Supernet members (suppliers of technology advice and services); a total of 23 were visited, again with reasonably broad geographical coverage and with an attempt to meet different types of member.
- interviews with PERA staff involved with Supernet management

In addition a number of Supernet briefings, workshops and similar events were attended together with meetings and discussions with DTI staff.

Issues explored included:
- response time (levels and expectations)
- types of enquiry
- quality of response (technical and service)
- ability to relate to particular client and need types
- interaction with Business Links/ITCs
- role and level of DTI subsidy for the service
- evolution of patterns in Supernet use
- identification of gaps in user base and membership provision (in terms of services, technological and geographical coverage)
- evolution in access patterns (how users access Supernet) and suggestions on how these could be streamlined/improved
- options for future development, e.g., in promotion, in extending service range, etc.
- exploration of future options, such as self-funding

6. A brief history of Supernet

Activities during the first year of operation centred on setting up and promoting the Supernet system. Internal mechanisms were established within PERA including the creation of a database to support the networking activity, and the establishment of a team to provide the 'intelligent front end' to the system and to liaise with ITCs and others making enquiries. In addition a number of promotional activities took place designed to introduce the Supernet concept to Business Links staff, to ITCs, to potential Supernet members and others. (It is important to note that for most of its life Supernet was not promoted directly to end-user firms but rather to the intermediaries working within Business Links and other support agencies).

After the first full year of operation Supernet had processed 439 enquiries, of which around two thirds came from ITCs and the remainder direct from user firms. This compared with an expectation of 1500 enquiries by the end of year one as set out in the original proposal. The nature of these varied, from simple requests for information which could be dealt with over the telephone [1] through to more complex queries which required development work; in a number of cases dealing with Supernet eventually led to a user firm taking up membership of an RTO. (ITCs and others had access to 'Innovation vouchers' which could be used to support an element of project work on behalf of particular qualifying firms).

On the supply side 55 member organisations were registered, which matched the target figure in the original proposal. These included RTOs, some university departments, government laboratories and bodies like the Patent Office.

Activities during the second year focused on extending the Supernet infrastructure on the member side and on enhancing promotion to various agents on the demand side. This included continuing work with the growing number of ITCs and DeCs plus extending the target audience to include Personal Business Advisors (PBAs) and other Business Link

staff. Potential demand increased because of the expansion of the Business Link network, but its translation into real demand was slow and heavily dependent on the speed with which ITCs and others within the newer BLs were able to establish their own operations. It was also constrained by the lack of awareness on the part of specialist counsellors of the full range of national technology support services as opposed to local services with which they were familiar.

On the member side work went into extending the base (including the addition of foreign sources of expertise) and on identifying more focused pockets of specialist capabilities, particularly within HEIs. By the end of the second year there were 78 Supernet member organisations registered. Following a workshop with members and users in late 1995, an increased number of activities took place to promote and update awareness of Supernet and to receive feedback from members as to its progress.

Promotional work throughout the life of Supernet included regular issues of a news bulletin and a number of targeted events designed to raise awareness. Some of these had a regional focus whilst others were designed to bring together particular Business Links staff with a range of Supernet members.

By the end of year 2 (November 1996) Supernet had processed 1216 enquiries, with the pattern of demand stabilising at around 75 enquiries per month. However, increasing concern at the relatively low level of enquiries (especially those requiring sophisticated technical input from Members) led to the decision to close the PERA-managed version of the scheme in May 1997, some six months ahead of the planned expiry of DTI funding.

7. Supernet performance

It will be useful to look at some particular aspects of Supernet operations and performance in more detail. The first issue concerns the evolution of the demand side.

7.1. Demand for Supernet

In the original plans for Supernet some ambitious expectations were raised regarding the number of SMEs that could be helped through the system—for

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[1] One feature of the scheme was an agreement on behalf of the members to provide an element of free advice, if the query was simple and could be answered directly on the telephone within 2 h.

example, in the original Pera proposal year 1 had an expectation of some 1500 enquiries. (This was based on their own experience as an RTO where the annual volume of enquiries from their 1000 members was around 15,000.) Experience with actually operating the system saw these expectations revised downwards sharply; for example, by the end of year 2 (November 1996) Supernet had processed 1216 enquiries, with the pattern of demand stabilising at around 75 enquiries per month.
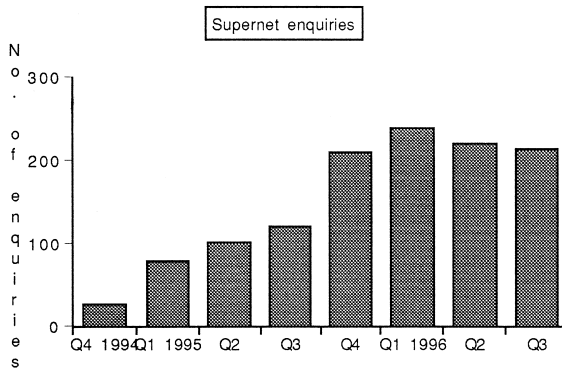
Of these around two thirds came from ITCs and DeCs with the remainder split between other BL staff and direct enquiries from users. Given that the emphasis throughout the life of Supernet was on channelling enquiries through the BLs this is not surprising.

There was a marked regional difference emerging in usage of Supernet, with areas like the West Midlands accounting for 22% of enquiries whilst others like the North East only accounted for 4%. There may be several explanations for this—for example, there may be more sources of local support in apparently 'low user' regions which mean that potential demand was met via other routes than Supernet. It also reflects differences between ITCs/DeCs and their approach to using Supernet.

Of considerable significance is the breakdown by nature of enquiry. Using a simple classification it is clear that over half of the enquiries were of the 'signposting' variety, concerned with identifying suitable suppliers of a specialist kind, or providing simple answers to queries. Interviews suggest that many of the other categories also involved relatively

simple information transactions, rather than detailed work.

This is not to say that the enquiries were trivial—as far as the SMEs were concerned this information (and the ease and speed with which it could be accessed) was often of considerable value. For example, if a production line in an SME is stopped because of the failure of a hydraulic valve, then finding a source of advice on repair or replacement is of critical importance.

Equally the ability of a Supernet member to deliver a quick response depended on the long-term process of accumulation of expertise within a specialist area. But the resulting transaction was rarely of sufficient size to justify charging by Supernet members, and this raised one of their major concerns. We will return to this discussion later.

Supernet enquiries by type
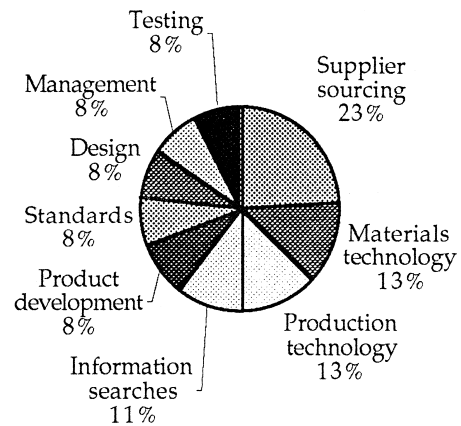
7.2. Supply side

In terms of the pattern of referral, the majority of enquiries were dealt with by Supernet members, although there was a gradual decline in this level (from around 60% to just over 50%). The remaining enquiries were dealt with by the Supernet Unit itself using Pera's specialist Information Centre (especially for simple signposting type work), by the Business Links themselves, or by other non-member technology sources. It is likely that this trend towards substitution of Supernet member service by non-members would have continued, reflecting the grow-

ing development of Local Service Providers (LSPs) (sources of *local* technological expertise) by ITCs/DeCs and others. Again this suggests (and interviews confirm this view) that the typical enquiry was often of a relatively simple kind which could be dealt with by local providers rather than requiring the services of national centres of excellence.

Amongst the members, the distribution of enquiries varied, with the majority having dealt with less than 20 enquiries since the inception of Supernet. By the end of year 2, only 7 members had received over 50 enquiries, and only 1 (ERA—the former Electrical Research Association) had received more than 100. In part this reflects the fact that there are 'fashion' trends in enquiries; for example, much of the ERA volume of work was associated with electro-magnetic compatibility (EMC) and related enquiries which was a highly topical issue. But it also indicates a second area of concern to the members, since the majority received very little extra 'business' as a result of participating in Supernet. Taken with the relatively simple nature of many of these enquiries, it is clear that the potential for business growth through Supernet participation was probably much lower than many Members had originally expected.

Interview data confirms this pattern, with many members reporting relatively little overall volume of enquiries and levels of conversion of enquiries into project work running at or near zero. In part this matches the observation above that the nature of enquiries coming through to Supernet was essentially simple—signposting, etc.—and therefore there was no need to engage the full technical skills of the Member organisations. (It is important to put this in context; most RTOs would have to deal with a proportion of 'cold calls' from enquiring firms which might also lead to no firm future business; thus Supernet could be seen as offering a form of 'filtered' marketing to them.)

Sample monitoring of enquiries during the period November 95 to March 96 by Pera Group suggested that, of 41 enquiries addressed to 6 Members only 12 led to the Business Link contacting the Member after having received referrals from Pera Group. Of these only 6 led to direct contacts between clients and Members, and of these only 1 was reported as having led to a fee-earning project. To some extent this might reflect the lengthy communication chain involved, with the Business Links effectively interposing an extra layer of processing between the problem-owner and the specialist solution provider.

A similar picture emerged from surveying the Business Links. Of 27 initial enquiries originating from 5 Business Links relevant information (about potential solutions, appropriate Supernet members, etc.) was returned to the Business Links and forwarded to clients. However only 5 clients took this further and established contact with the Member. Thus there was a 'conversion rate' (in this small survey sample) of initial enquiry into direct contact of only 20%—a figure again confirmed in interviews with ITCs and DeCs. It is also important to note that even this contact did not imply that there would be project work with Members, only that a linkage had been made.

This suggests that the process of building *awareness* of links was working well within the Supernet system, but that making them 'live' was taking place to a much lesser extent. The analogy could be drawn with a telephone system; the cables had been laid but there was relatively little traffic actually using them. The picture was further complicated by the fact that much of the potential traffic began using local exchanges (Local Service Providers) as a viable alternative. We can speculate on reasons; interviews with BL staff suggest that these include the local nature of the services, the development of closer relationships with local providers, and a perception of lower cost.

7.3. Internal management of Supernet

Although performance of Supernet in terms of number of enquiries on the demand side or volume of business generated on the supply side might be considered disappointing, there was general support for the view that this was not a function of poor management of the system itself. Indeed, in many interviews comments passed were positive and complementary, suggesting that the original design concept of adding value to a networking database by having an informed and knowledgeable human interface was valued. The technology transfer problem is not simply one of availability of information but also of being able to articulate and frame questions, search quickly and in focused fashion for solutions and present the results in a coherent and accessible

way. The general impression was that Pera Group managed the development of the Supernet infrastructure and monitored and developed it according to emerging concerns and issues.

The structure for project monitoring and development involved regular feedback and meeting with DTI and most emerging concerns—such as the poor feedback to Members—were identified and addressed quickly. Promotion of the service was sometimes criticised but the number and range of events suggest that considerable activity did actually take place; the main problem here was the limits on outreach which resulted from Supernet being identified in DTI policy primarily as a vehicle for Business Links rather than for promotion direct to SMEs.

8. Emerging issues

It is possible to view Supernet in terms of the model pictured in Fig. 1, below.

Here the network is seen as a mechanism for improving the connections to the infrastructure for SMEs, and there are a number of ways in which this

can be measured—level of access, geographical coverage, client satisfaction (problems solved, etc.), member satisfaction, etc. After just over two years of operation the results gave grounds for both optimism and concern. On the positive side there was clearly a developing linkage, as evidenced by the rising level of enquiries. (These reached a peak of 93 in March 1996 but fell again to around 60 per month by the end of the scheme.) A small number of individual case studies, such as those featured in the news bulletin, also testify to the success of Supernet in helping SMEs access the innovation infrastructure.

That said, there are some areas of concern. First, the development of access was variable; for some regions take-up was much more extensive than others. Perhaps of more importance was the variation between different Business Links; it was clear that many had begun using local services in preference to Supernet—something which was originally envisaged but which has implications for the overall role which a national resource like Supernet and the related national centres of technical excellence could play.
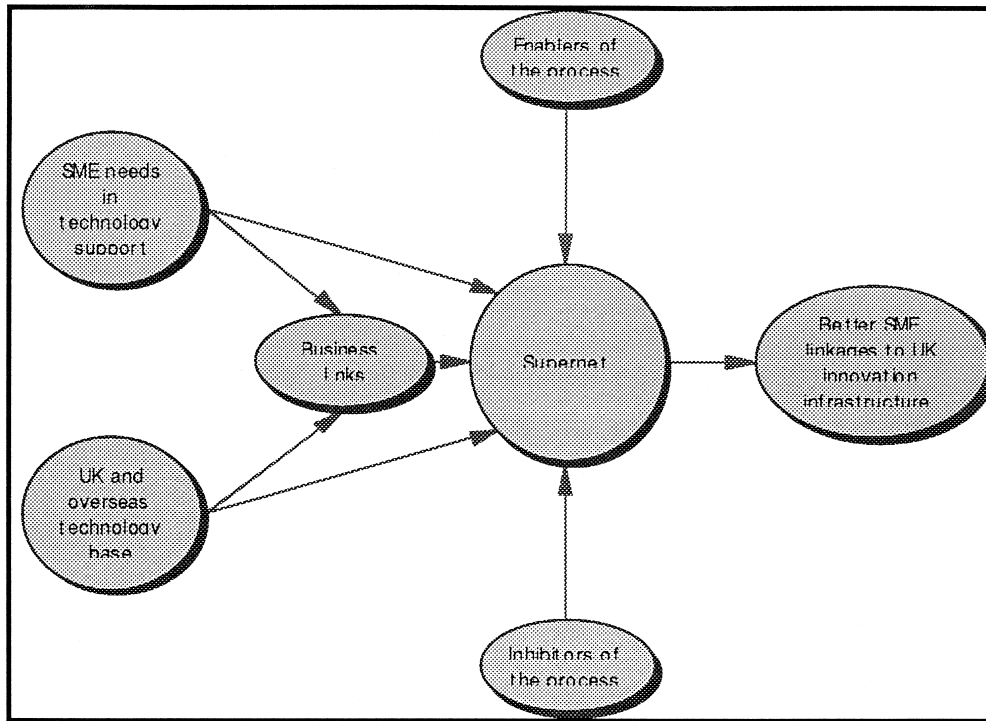

Fig. 1.

Related to this is the 'S'-curve pattern associated with the adoption of the service. Because of the political decision to operate Supernet through the Business Links infrastructure rather than promoting it directly to SMEs its take up was strongly dependent on the evolution of the BL infrastructure. The pace of their evolution—and particularly the fact that the relationships between them and potential SME clients had to be developed—meant that demand for Supernet was always going to be limited. Specialist agents such as ITCs and DeCs also had to 'learn the ropes' of their jobs, establish themselves and a working relationship within their Business Links and build an understanding and presence amongst their client base. All of this took time and had the effect of throttling back demand for Supernet.

As far as end-users were concerned, the main issue would seem to be the lack of implementation following advice received from Supernet. Where it was possible to track enquiries it appears that very few SME users actually chose to do something with the information provided by Supernet. There may have been cost barriers which restricted them from moving forward but other factors—for example, timing of investment, availability of management resources to look after development projects, fear of working with external consultants, etc.—are also likely to have played a part. This reflects the traditional problem in technology transfer of moving from awareness of possible options to actual implementation.

On the Member side, Supernet was able to mobilise a healthy network of potential contributors, including the first of a range of overseas agencies. Whilst coverage of technological fields was exten-

sive, the distribution of work amongst the members suggests there was considerable variation. Some members received a large number of enquiries (although many of these were simple signposting and sourcing in nature) whilst others received very few. This reflects not only the pattern of demand but also differences in levels of specialisation (some larger members cover a wide range of activities whereas some HEI groups were single departments chosen because of their focused expertise in one area), and in orientation towards, and experience in dealing with, this kind of market-place.

9. Enabling factors

There are a number of factors which acted to promote or enable more effective operation of Supernet (Table 1); these included the following.

·   Promotional activity. There was significant expansion over the life of Supernet in both the range and number of events organised. These included specialist events held at Business Links to which various members were invited and vice versa, and regular issues of the Supernet news bulletin. Despite this activity concern was expressed at the level of enquiry coming into the scheme compared with the likely volume needed to make a viable self-funding business operation. At the 1996 member's conference it was suggested that a target level of 10,000 enquiries per year (vs. approximately 500 at the time) would be needed to make the scheme viable for them. This would clearly require considerable expansion of the promotional including exploiting additional and complementary channels such as the Internet or a national

Table 1
Summary of enablers and inhibitors

Enablers	Inhibitors
Member good will and interest	Poor financial returns
Competent Supernet management and added value through 'intelligent' signposting and filtering of enquiries	Enquiry processing and feedback
Completion of the Business Links infrastructure	Substitution effects of 'Local Service Providers', etc.
Promotional activity	'Throttling' of demand by using Business Links as the primary channel
Financial support from government	Unarticulated/low demand from SME users

telephone service, both as a promotional resource and possibly as an enquiry handling option.

· Supernet management. As indicated above, the general view from both members and BL users was that the scheme was well-managed and that the handling of enquiries by Pera Group staff added value to the overall process. In particular there was effective signposting to relevant sources of expertise, and filtration of low-grade enquiries which could be handled without needing to access members. This theme emerged in many interviews and it is clear that the basic operation of the scheme in terms of enquiry handling was seen as robust and effective. Where there was some concern was in the process downstream of the Supernet manager involvement, when referrals had been made but where the BL or the end-user failed to follow up. Some monitoring was carried out of this feedback problem and a number of proposals made to improve the situation, but this appeared to have had relatively little effect by the time the scheme stopped operating.

· Completion of the Business Links infrastructure. One of the problems which affected the level of take-up in the early months of Supernet operation was the incomplete nature of the BL infrastructure. Since all the planned BLs were in place by mid-1997 there might have been some increase in levels of usage resulting from this, although it is likely that there would still have been a further lag before their staff could make effective use of Supernet. In similar vein the number of ITCs and DeCs increased substantially and there were clear learning effects through which those individuals who were in post early help to shape how more recent entrants behave. A consequence of this is that usage levels amongst newer ITC/DeCs might have been expected to rise.

· Member good will and interest. On the supply side, there was still considerable support and enthusiasm for working with Supernet, partly in order to learn about and access the SME market and partly out of (for some members) a sense of duty to the national industrial community. The effects of other activities—such as the Focus

Technical reviews—also increased the attention being paid to the SME target market. However there were signs that for many members—especially those under more commercial constraints—the continuation of this position was under consideration, given the relatively poor returns in both volume and scope of enquiry coming through from Supernet.

· Financial support. Although there was some evidence of demand from SMEs for access to Supernet members, there was concern about how a matching mechanism might operate in the absence of government funding. Amongst many actors (both members and on the BL side) there was a view that Supernet played a useful part in the national infrastructure and should be funded as such. In the absence of such funding it is unlikely that Supernet—or any successor—would be able to operate in the value-adding mode described above.

10. Constraining factors

Although there was general agreement that Supernet was a useful idea and that its operating mechanisms functioned well, there are several major problems which acted to inhibit its effectiveness and its long-term chances of survival (Table 1). These include the following.

· Using Business Links as the primary channel for access. As indicated earlier, Supernet was promoted as a resource for Business Links to use and this probably led to a significant throttling back of demand since the scheme was not been formally promoted directly to SMEs and thus relied on BL intermediaries. Volumes of enquiries were always relatively low and appeared to have reached a plateau, (although there was probably some scope for further growth as more BL staff (PBAs, Information Officers, etc.) started to make use of the service). But even with considerable expansion of the BL usage the volumes are unlikely to have been significant.

· Substitution effects. Over the life of Supernet a second problem emerged associated with the pressure put on BLs to source many of their

services locally. This may well have had the effect of diverting enquiries which might have been made through Supernet to more local providers—and thus reducing the volume of demand for Supernet. There is some evidence, from interviews, that ITCs and others were establishing and using various kinds of local network, drawing on local and regional services and building links into other specialist sources, including establishing direct links with some Supernet members. There was also more sharing of contacts and networks amongst the ITC and related communities—for example, the networks formed amongst the London ITCs or in the south-west region. As this network-building process continues, there would probably have been a fall-off in demand for Supernet as a primary channel for easily solvable technological problems and it would increasingly have become a resource for highly specialised queries which could not be addressed locally.

A related type of substitution effect occurred within the Business Links themselves which are offering a wide range of services. Supernet was only one of many which ITCs/DeCs/PBAs and others could choose from and it had to compete for attention. This argues for maintaining and extending the level of awareness and ensuring that any subsequent scheme is simple and easy to access.

· Unarticulated/low demand from SME users. One of the issues which Supernet has highlighted is the lack of understanding of the nature of demand for technical and innovation support for SMEs. Whilst it is clear that SMEs form the bulk of UK companies, and also clear that a proportion of these are key players in economic and employment growth, there is less information about the nature of their innovation needs. Studies tend to suggest that these are biased more towards internal process innovation than product development, and that the levels are often relatively low in terms of novelty and technical complexity. The policy issue is thus often one of technology transfer of established practice and technology (rather than cutting edge R & D) into the unfamiliar environment of an SME.

Two themes emerge from this. First, it may be the case that the potential work for Supernet members will need to take account of this different pattern of demand, for technology transfer (of appropriate technology) rather than generation and problem-solving. This is an issue already being explored through other programmes, notably the Focus Technical reviews. Second, the need for help in identifying and articulating technological innovation requirements within SMEs implies that the ITC/DeC and other intermediary roles will be crucial in raising the level and quality of demand for services like Supernet.

· Enquiry processing and feedback. Throughout the life of Supernet there was considerable concern about the ways in which the enquiry process operated; monitoring and interview data suggests that there were particular problems associated with establishing clear contact between members and end-users in the current system, in part due to the interposition of the Business Links.

· Poor financial returns. Probably the biggest source of concern to members was the low level of usage of their services and the perception of poor return on their investment of time in the scheme. Not all members were seeking direct financial returns but most required a more substantial relationship (for example, taking out membership) with SMEs which used the scheme. Throughout the two and a half years of Supernet operation both the volume of demand and the level of enquiry were low for the majority of members, and the resulting benefits (in financial or other terms) equally so. Whilst this was acceptable in the early stages of establishing Supernet it became a source of growing concern for some members who began to question the opportunity cost in continuing to provide support.

Although most were still willing to support the scheme for its next year of operation it is unlikely that the members would have been prepared to take on future funding of Supernet in its original form. Equally, whilst Business Links staff and end-users found the service valuable, interviews suggested that there would

also have been little support for paying the direct costs of enquiry to Supernet, unless these costs were brought down to a low level. (As an indicator, the costs of running the scheme at the actual levels of enquiry equated to a cost per enquiry of several hundred pounds.) The view expressed by many members and users was that Supernet represented a part of the national infrastructure and at least part of the operating costs should be funded centrally.

11. Lessons for SME technology transfer policy

Supernet was in operation for two and a half years of its planned life under DTI subsidy and a number of valuable lessons emerge for policy intervention of this kind. The first is the need to obtain more focused information on the technology support requirements of different kinds of SMEs. At present much UK and European policy-making is predicated on the assumptions that SMEs are important numerically and as a source of economic growth. Whilst this is true, it is still not clear *which* SMEs are likely to have growth potential and *how* they could best be supported. For some high technology SMEs access to specific technology resources is probably a matter of finance and signposting—they already know what they need and why. For many others the need will be for assistance in articulating the problem and providing enough definition to trigger appropriate responses; this group is likely to benefit increasingly from the help of specialist counsellors within Business Links or their equivalent. And there are likely to be many SMEs who have no need for technology support at all; the problem is that existing research does not define these populations accurately enough.

Viewed in this context the experience of Supernet is not surprising. As a stand-alone mechanism to help SMEs access the technology base of the UK it has probably been something of a 'sledgehammer cracking a nut'. Most SME users have relatively straightforward technology support needs and these could easily met by Supernet members, mostly on the end of a telephone. Increasingly these services are being taken over by local providers of general technology support, accessed as part of the Local Service Provider networks being built up and shared by ITCs and DeCs. The mechanics of the scheme have operated well but the volume and content of enquiry has been relatively low.

But Supernet has been useful in specific cases, especially where the technology problem is of a higher order of difficulty and where the specialist support available from the national research base is relevant. Here—and this is evidenced in the small number of cases and in some anecdotal interview data from ITCs and others—the needs are for the kind of framework which Supernet has been offering. It is also where the added value of an informed and experienced human interface is relevant, because of the technological uncertainty involved in what may often be highly innovative development projects.

The implications for future technology transfer policy would seem to be: (i) to develop an improved understanding of the nature and distribution of SME demand for technological support; (ii) to develop a 'broad spectrum' response to meeting these needs, composed of both Local Service Provider provision via Business Links (for general and relatively simple requirements) and a small Supernet-style operation for specific and exceptional technological problems. (It may also be necessary to ensure better awareness of the specific and advanced capabilities of national centres of technical excellence); (iii) to continue to develop the supply side to improve its marketing to SMEs—particularly with reference to the package of services it makes available and the pricing and positioning of these.

12. Conclusions

During its two and a half years of operation Supernet largely succeeded in establishing a mechanism through which SMEs could access the extensive technology base of the UK. Its limitations were less in execution (indeed, overall management of the operation was generally well regarded) than in positioning. As a stand-alone venture it was probably too specialised a service for the needs of many SMEs (although valuable for a few) but as part of a broad spectrum of innovation support it filled an important niche, complementing the Local Service Provider networks being developed by Business Links. The relatively low level of usage can be seen in part as a function of this specialisation (potential users were

able to meet their needs locally) and partly as a consequence of the decision to concentrate Supernet as a Business Link service and not to promote it directly to end-users.

In the wider context of technology transfer policy it is clear that further policy development is needed to ensure effective access by SMEs to the national technology base. Increasing interest is being shown in intermediary agents and organisations as a way of bridging the gap—by articulating and framing questions on the demand side and by helping identify and connect with providers on the supply side. This model requires a supporting infrastructure which enables such intermediaries to become aware of, and connect to, a wide range of technological resources and to stay abreast of new developments across a broad technological frontier. Whilst Supernet itself is no longer in operation it can be argued that reviewing the experience of its design and operation helps provide a blueprint for policy action in the future development of such an infrastructure.

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