

**THE BEER BENEATH THE FROTH: PRELIMINARY FINDINGS
FROM CASE STUDIES OF 25 SMALL HIGH TECHNOLOGY FIRMS**

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Abstract

Across Europe those who create and run high-tech SMEs have become a primary focus of industrial policy. Part of the rationale for the focus on small high-tech firms lies in the desire to emulate the experience of the US, particularly Silicon Valley and Boston in which spinning off new ventures from research institutions has been seen to play a key role. By comparison the performance of Europe's research base has been less dynamic. A more pro-active stance towards new ventures created by HEIs is welcomed, however to focus policy too narrowly on this group has inherent dangers. There is a danger of implicitly promoting a particular business model: one emphasising personal financial gain and venture capital funding, which may be at variance with those prevailing among the broad spectrum of existing high-tech small firms.

The characteristics, pre-occupations and problems of the vast bulk of small firms operating in high-tech sectors, and making a contribution to international competitiveness through innovation and export may be overlooked in the current policy climate. By way of redress this paper reports the preliminary findings from a qualitative study of 25 existing small high technology firms in the UK. The themes outlined include: the motivation and drivers of entrepreneurship, the nature of collaboration with HEIs, relationships with customers and the development of 'customer empathy' and experiences of venture capital.

JEL Codes: L21, L25, M13, O39

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1. Introduction

Recognition of the economic significance of small firms grew during the last quarter of the 20th century (Loveman, and Sengenberger 1991; Acs and Audretsch, 1993). It has been suggested that small firms played a major role in net new job creation (Birch, 1979, Storey, 1980; Labour Force Quarterly, 1993), in providing counter cyclical protection of employment (Storey and Johnson, 1987; Davidsson et. al. 1999), and have characterised rapid growth activities, particular those based on new technologies (Phillips, 1991; SBA, 1999).

In the UK, several strands of policy have coalesced into concern for ‘international competitiveness’ in which the creation of new technology-based firms (ntbfs) plays a leading role (Wren, 2001). This focus reflects desires to emulate US experience. Across Europe policy-makers and popular press alike have been fired by the role of HEIs in generating ntbfs witnessed in the US. Initiatives aimed at encouraging and facilitating research base spin-outs have proliferated throughout Europe and elsewhere¹. This more pro-active stance is welcomed since compared to the US, the performance of Europe’s research base in generating ntbfs has been less dynamic (Acs, et. al. 1999; Gill, et. al. 2000).

There are inherent dangers however, of small high-tech HEI spin-out companies becoming the sole focus of policy and academic interest, and popular perception. The number of such companies is small. A recent study revealed in the 5 years up to 2001, UK universities spun out some 554 businesses (Lockett, 2002). To focus too narrowly on the needs and problems of high-tech university spin-out companies may distort policy such that those of the majority of small high-tech firms are overlooked. Furthermore narrow focus on HEI spin-outs may constitute a variant of ‘picking winners’; a policy approach much debated and criticised (Oakey and Rothwell, 1986; Storey, et. al. 1987; Freel, 1998).

In addition the particular business model implicitly promoted by policy may be at variance with those prevailing among the broad spectrum of existing high-tech small firms, which are diverse, relatively little understood and yet contribute to the economy at both local and national levels. That ‘model’ is based on US experience during the 90s and emphasises the importance of equity finance, the role of venture capitalists and business angels, the achievement of early fast growth, the adoption of a distinctive set of employment practices and policies, and the pursuit of personal financial gain realised through the ultimate objective of IPO (Gill, et. al.

2000). Many high-tech entrepreneurs, regarding this model as ‘alien’, may feel their problems ignored, and perceive of themselves as less important.

This paper seeks redress by describing some of the preliminary findings from a qualitative study of 25 small high technology firms. It focuses on entrepreneurs’ motivations and drivers, and their collaboration with the research base, relationships with customers and experiences of venture capital. Before describing the findings the background to the study is outlined.

2. The study

The qualitative study is part of an ongoing comparison of small high technology firms in the UK and Japan. UK firms were surveyed in 1998 and again in 2001. Criteria for inclusion in the 2001 survey were employment size (less than 250) independent status, and high-tech activity.² Of the 237 firms taking part in 2001 (a response rate of 34%), face to face interviews ranging from an hour to 2½ hours were conducted with 25 selected from various regions in the UK. Interviews were transcribed and analysed using text analysis software. Twelve of the case study firms were in instrumentation (3 medical diagnostic, 4 medical devices and reminder industrial and photographic instruments), 6 were software firms³, 3 manufactured chemicals and the 4 remaining firms were in telecommunications, industrial design and testing.

The extent to which the firms were studied could be considered as economically relevant and can be illustrated by looking at them in terms of the ‘competitiveness indicators’ set out by the DTI (DTI, 2001)⁴. Table 1 outlines the characteristics of firms⁵ in the 2001 survey and those of the subset of 25 case study firms. The majority of firms surveyed would be regarded potentially contributing to UK international competitiveness. This is even more pronounced for the case study firms. These were strongly engaged in R&D⁶, predominantly novel innovators⁷, collaborators, and exporters, and their workforces were well qualified. The majority was strongly growth-oriented and displayed an open approach towards risk⁸. Most had grown in terms of employment and turnover in the two years prior to 2001, with turnover on average doubling.

Table 1. *Performance of case study firms compared to all firms surveyed*

‘Competitiveness indicators’	All Firms in Survey with employees	Case Study Firms
	(N=221)	(N=25)
Mean age of CEO (at time of survey)	51	48
Mean age of firm	22	12
R&D Mean R&D/sales ratio	13	14
% Undertaking R&D	75	96
% Patenting	33	46
% Licensing	8	32
Collaboration % Collaborating	59	83
% Collaborating with research base*	18	64
Innovation % Not undertaking	18	8
% Novel innovators	56	75
Exports % exporters	66	70
Mean % of turnover exported	38	52
Turnover Growth % Recording Growth	62	71
Mean % growth 1998-2000	78	221
Employment Growth % Recording Growth	52	62
Mean % growth 1998-2000	43	34
Growth aim % None	10	0
% Moderate	48	46
% Substantial	42	54
Risk % Open to risk	55	71
Workforce Mean % ft employees with degrees	26	42
Mean % ft employees with any tertiary qualification	54	69
Profits % recording profits	88	73
IPO objective % ‘Not at all’	52	21
% ‘Significant/crucial’	10	29
Venture Capital % seeking/sought	21	34

* Evidence from the case study firms suggests that such collaboration may have been under-reported in the survey

3. Young academic founders?

Policy focuses on ntbfs spun out of the research base by relatively young academics or researchers. These were not found among the case study firms. Of the 23 firms in which there had been continuity of ownership, in only 5 had any of the original founders been their 20s. In 10 the founders had been over 40 (3 cases had included people over 50) and 14 firms had been set up by people over 35 at the time.

The spin-out company based on explicit technology developed within the research base, in respect of which the research base organisation may have some IPR claim, can be distinguished from the spin-out based on technology or know-how embodied in the person. The former, seen as the potential high growth, venture capital backed company, is the focus of policy. The latter gives rise to two types of company: the life-style scientific/technical entrepreneur is akin to the craftsman entrepreneur seeking self-employment rather than enterprise creation (Stanworth and Curran, 1976). The second is the transitional or 'soft start' business beginning in consultancy and only after several years becoming more growth- and/or production-oriented (Segal, Quince and Partners, 1985; Vohora et. al 2002).

Of the 22 companies in which one of the original founders was interviewed three approximated to the types of academic spin-out outlined above. The nearest to the life style spin-out was a company set up by three members of a government research establishment, two of whom took early retirement to do so, this was a 'grey haired spin-out'. The nearest approximation to the transitional starter began as a trading arm of a university department. After experiencing management difficulties, it was subsequently spun out by the then 49-year old academic responsible for its operations within the university. Neither firm involved transfer of IPR. In the only firm close to the model of a spin-out based on technology developed within the research base the founders played a 'surrogate' role (Radosevich, 1995). The initial application of the technology, (the application of neural networks for monitoring 'vital' processes) was developed by a student but the development of the subsequent application was taken over by a couple of serial entrepreneurs. The student herself did not become involved in the business, but receives part of the royalties.

However, in 10 of the firms interviewed one member of the founding team had been employed in the research base either at the time of founding or just prior. But

this link between research base and emerging business was often disjointed, either in terms of time or organisation confirming the iterative nature of venture creation. Two examples illustrate this. In one, a member of a government research establishment was invited by a friend in academe to set up a testing/analysis consultancy with 4 other people. After a year of exceptional growth this business fell apart when one founder decided on an alternative lifestyle. The former government scientist was left with a potential contract so providing him with the opportunity to set up on his own. In the second case, the principal founder had worked in the respiratory unit of a hospital where along with 2 colleagues they had ‘fiddled’ with a number of ideas for a hand-held device. Although he left the hospital to join a commercial firm, initially in a technical capacity but later in sales, he maintained interest in the development of the device eventually marketing it through the company to which he had moved. The device formed the basis of the company, which the 3 eventually set up, with one founder remaining in medical research.

This tendency for the link to persist through one founder remaining in the research base occurred in 7 of the 10 businesses. In some cases after a few years there was parting of the ways with the research base founder ‘selling out’, usually amicably. Confirming the view that entrepreneurship, particularly in high-tech activities, is collaborative, of the 23 firms in which there was continuity of ownership, only 3 had been founded by an individual acting alone. These 23 firms also included 8 in which one or more of the founders had previously set up a business. A high level of fluctuation in ownership was also apparent: with changes recorded in 16 of the 25 firms (excluding 2 firms in which ownership had been redistributed among members of a founder’s immediate family).

The benefits firms derived from this persistent link with the research base varied: for some it provided access to IPR, and to equipment and/or testing facilities, for others it was the channel for TCS students, and in others it facilitated links with other parts of the research base.

4. Motivation: ‘the buzz’

Much has been written about entrepreneurial motivation that demonstrates that autonomy and independence are more important motivations than financial gain (Townroe and Mallalieu, 1993). The case study entrepreneurs were driven by a holistic complex of factors, in which personal aspirations and beliefs were

expressed in the need to effect beneficial changes through the actions of others brought together in a business entity. Three components in this complex can be identified: 'intellectual', 'instrumental' and 'indirect', the fusion of which may differentiate entrepreneurs in high-tech sectors from academics and self-employed technical consultants. The first component operated at the level of intrinsic intellectual satisfaction, was concerned with 'creativity' in its broadest sense and expressed as a need for 'novelty', 'problem solving', 'challenge' and expanding 'learning' and 'experience'.

'there must be an element of challenge, something new to learn..... The pursuit of knowledge and challenge are important on a personal level'.....if I'm not learning something is wrong' Instruments SI

Intellectual challenges need not be solely technical or scientific, several entrepreneurs commented on their changing nature.

I've ended up doing more and more managerial roles... and that's been a different challenge. I've enjoyed that just as much as the technical challenges'. Instruments MM

While this need for intrinsic intellectual satisfaction was a necessary driver it was not a sufficient one. The second component: being 'instrumental', was the excitement of seeing what those solutions lead to, particularly in terms of what they enabled others (customers or potential customers) to do. This links to the notion of 'customer empathy' outlined later. But it was often vaguely altruistic: wanting to effect beneficial changes.

'That that investment has changed someone else, added value for those customers who have invested in our products. To add value to others' businesses, I like the positive feedback..' Instruments H

The final motivational component was satisfaction derived from effecting change 'indirectly' through the actions of others. This was not just about being part of a team, about wanting to share enthusiasm and objectives as described by Katzenbach and Smith (1998). It was about taking pleasure in the achievements of others in a context created and maintained by the entrepreneur.

I like solving team problems in a team manner. We all get esteem out of thinking something first but I love to see other people succeed.
Instruments CO

It was the fusion of the three components which was important in the motivational context, as the following illustrates:

'You solve the technical problems and then one day you walk into a company and someone says 'Is that from your company?' And all that part, the technical part, is what you yourself did and there are dozens and dozens of them around. And that feels pretty good. And that's a real achievement..... the next stage is that it is not just one thing out there working it's a whole stream of things that have been put together by a group of people and that group of people is being held together by the job that I do. So you then start to identify as a company rather than as an individual andstart to praise the work done by all the people in the company....., and that gives you a good feeling. Everybody is..... feeling the way you felt when you started it.You get enjoyment from watching the forest grow rather than tending the plants. Instruments GCS

There were two additional aspects of the 'intellectual' motivational component. The first was the orientation towards personal development. The qualifications obtained by the entrepreneurs on leaving formal education varied: some left school with few qualifications, others had progressed through the system gaining first and post-graduate degrees. Regardless of qualifications gained early in life there was a desire to continue to learn. For some, this manifests itself in gaining formal educational qualifications, either through part-time or distance learning courses or by returning to full time education, such that the range of their educational qualifications was far narrower when interviewed than it would have been when they were 25 years old. Other entrepreneurs took more specific and applied courses and some undertook self-taught activities. This orientation was reflected in the importance placed on personal development for employees.

The second aspect of the need for intellectual stimulation was what happened when it diminished. Some entrepreneurs reported either feeling less challenged or that the nature of the challenge had become less intellectually stimulating. In both situations the feeling was that the opportunities to learn and be creative had shrunk.

'I'm bored because I'm not learning..... and I want to learn..... it gets more and more challenging everyday because of the market situation. But that is an operational challenge as opposed to an intellectual challenge..... I need that next intellectual challenge...Software DT

These CEOs faced dilemmas about the development of their business and some had begun to look at opportunities for personal financial gain.

I've created value in this business and I'd like to realize some of that. now I want to look after myself personally because that's something I've not done'. The same entrepreneur as above.

It may be that it is only when the intellectual satisfaction they need from their business diminishes that some high-tech entrepreneurs start to ask *'What else can I get out of this'*. The suggestion that personal financial rewards are some kind of substitute for intellectual satisfaction not only flies in the face of neo-classical economic explanations of entrepreneurial motivations but also undermines the business model implicit in current policy.

A clear and important distinction was apparent between personal financial gain and wealth, and the financial health and profitability of the business. The former was eschewed by most entrepreneurs but being profitable was clearly important for the business: money was the facilitator.

'Not driven by money, we have underpaid ourselves.....But we are interested in money from the sense that it enables us to invest and develop new products. Instruments H

5. Collaboration with the Research Base

Almost two thirds of the firms interviewed had collaborated and had contacts with the research base that extended beyond founding links. Fourteen of the fifteen manufacturing firms collaborated with the research base. For the medical devices and diagnostics instrument manufacturers collaboration was often a statutory requirement and for some of the former there was also the issue of 'clinical' trials: either again because of regulation, or because it assisted market credibility. Such

links were often multifaceted: medical consultants were frequently at one and the same time, customers, and the source of new product ideas and IPR.

*'For us to develop a product we do have to have the co-operation of what they call a **Competent Medical Practitioner**. ..It's the sine qua non of developing these things..... We quite like paying a royalty but in some cases we haven't'.* Medical devices EP

Two features about links with the research base were first the number of universities that firms had links with; it was not unusual 4 or 5 to be listed, and second the diversity of type of link. The most common link was sponsoring students.

At the moment we have a master's student, a PhD student, a TCS student and a major European Framework project all linking us in with local universities. Instruments PS

Other modes of collaboration included product development, often under SMART and SPUR awards, sponsorship of projects, use of academics as consultants and licensing. Another side of collaboration was where entrepreneurs became involved in university activities. This was reported by 6 firms: in one case the entrepreneur was an external examiner and visiting professor, in another there was active involvement in student projects.

'Their second year students have an annual design project that they run with us and we mentor' Instruments CO

Two-way relationships were found with the firm providing products that the academic could not obtain from other sources and the university enabling the firm to keep its grip on developments.

' we can supply him with product that he couldn't get elsewhere..... to continue his research.we have registered one of our guys for an external PhD with him and our purpose is to maintain up to date views on what is coming through as potential new products for us.' Chemicals LCM

In an unusual case the academic had acted as a ‘marriage broker’. Approached by one of the entrepreneurs with a view to starting a PhD the academic suggested that, rather than study the topic, the entrepreneur should ‘*just do it*’ and put him in contact with a mature student unable to fund further studies. The mature student and entrepreneur jointly set up the business.

There was overwhelming support for, and endorsement of, the TCS (Teaching Company Scheme). However, it was apparent that, as the balance of support changed with successive use, for many it became less attractive and a less viable option.

In the main these non-founding contacts and collaborations were effected through, and depended on, close personal relationships, often established in previous employment and persisting over many years; 15- to 20-year relationships were not uncommon.

Technology transfer is a ‘Body Contact Sport’. Its about people, it is not about places. Instrument PS

Where academics moved to other institutions so the collaboration followed them.

‘It all just comes through personal relationshipsThe connection at Oxford that all came through me. And the connection with Essex came because some the people I knew at Oxford moved on to Essex’.
Instruments GCS

Collaborating with universities was not without its problems. IPR problems were most frequently mentioned. Some entrepreneurs complained of universities being ‘greedy’ particularly in situations where the work was sponsored by the small firm.

‘, sponsored by us, but we pulled out when the university demanded 40% of the rights’ Medical devices F

Others complained about the complexity of the licensing process particularly where the TTO was seen as inefficient.

'I'd licensed products before..... but, this (licensing from a university) was just horrendous. I've never seen so much paper work.they probably spent more on their solicitors than they got out of me for the royalty or are still getting.' Chemicals VO

Some reported a worrying lack of IPR clarity in situations where the company was sponsoring a student, involved in TCS or CASE or collaborating on a SMART award, which had potential detrimental effects

IPR has even been difficult under the TCS..... ... I'm not sure who owns the IPR on that (which we) did under a SMART award.. And that's not good if you really want to use the technology. ... I think it is down to the Technology Transfer Office....., they should be able to establish a clear view on these things. Chemicals VO

The second problem reported in the collaboration with universities was the failure of academics in some universities to understand the gulf between making a prototype or working model, and a commercially viable product.

'people from universities think they've finished when they've got a working model..... But that's a long way from something that we can sell..... The gap between making the thing work and putting it into a product, which is commercially viable, is still very much underestimated. Academics see it as just a 'task' whereas in fact there are real skills involved.... Instruments DI.

6. Customer Relationships

The entrepreneurs interviewed sought long-term relationships with customers based on integrity and trust rather than maximisation of individual contracts or deals. The establishment of such long-term relationships, often expressed as 'partnerships', depended on integrity, reliability and excellence in performance.

Integrity is very important. If you start lying to yourself and to your customers then you are on a slippery slope, that means you can never be the best because you are not trusted'. Software BCS

We are always seeking continuous and repetitive business, even if that means sacrificing some margin in the short term.We will tell customers a lot more about how things are made and show them a lot more than if we were a big corporation. And that builds trust....
Chemicals LCM

'it's an attitude of mind to be the best, and if you are not the best you won't be in business'. Software NG

It was suggested above that one entrepreneurial driver was the need to be instrumental, usually expressed in terms of effecting some benefit for customers, as the earlier quote illustrated. This required 'customer empathy': the ability to see the product or service through the eyes of the customer, what it enabled them to do and where improvement for the customer could be made.

It's partnership because although we'll develop the material for them, it is often the case that the formulation they give us is crap. We go back to them and say look we know that we can improve on this. Chemicals VO

Customer empathy had been developed through various routes but it was rarely achieved quickly: some entrepreneurs had strong sales and marketing backgrounds and had collaborated with technical people. Others had a depth of technical or scientific experience, and had either gone through a process of 'soft start', or had collaborated with marketing people. In a few cases individual entrepreneurs combined both backgrounds, starting on the technical or scientific side but moving into sales before setting up the business.

7. Venture Capitalists

By and large, experiences of venture capitalists and business angels had been negative. Those with the most experience, the serial entrepreneurs tended to be the most vociferous. VCs were seen as exploitive, having short-term orientations, little regard for employees, subject to the whims of technological fashion, having a superficial view of technology and not really interested in high-risk projects.

if these people are outside of the discipline I think they really find it difficult to understand the developments and what they mean.
Chemicals UFC

'They are not interested in anything which they see as being a risk. What's the point of 'venture' it's a joke' Medical devices S

They were very keen, saw this at the time as leading edge software. But 2 years later they'd changed their minds and decided that wasn't what they should be interested in, and we were too small..... they have no concept of long term planning. it's a very fashion driven industry Instruments H

'if you ever want to finish up with any percentage of the business you don't go early to the people who provide start up money..... you put in all your skill, expertise, entrepreneurship.. and you're really relying on people whose only interest is making money out of it and they will manipulate the fact that you've got nothing left Instruments C

However from both the negative stories and the recent positive experiences of two firms, important insights emerged. In respect of business angel two specific problems were identified. First the failure of business angel networks to vet members leading problems of time wasters and uncertainty as to members' real intentions.

'anyone can put their name on the Business Angel listbut nobody screens them.there's no way of telling the genuine from the others.....Some of them are simply spies, out to steal other people's ideas. My main complaint is that they waste time Medical devices S.

The other problem was that of the inability of some angels to step outside of their own experiences:

I had one who'd run some shoe shops and another one who was in fish paste... all kinds of people, have done well, have got money,.....become part of this nice angel group but actually know bugger all about managing international businesses. And yet they feel that because they've done well you have to listen to them, of course they have a controlling element in the business. It's very difficult to manage those people. Instruments C.

The second insight was that money was only part of what was looked for in the relationships with the VC. Not simply understanding the technology but also being

able to offer technical expertise, providing management help and contacts were all important.

they had technical specialists they could bring into the equation so that they could demonstrate to us that they were not just a finance house Instruments SI.

Disappointment and resentment emerged if the promised assistance failed to materialize.

When they put the thing in they said they would give us some management assistance to help us develop the business,..... But it just never happened.....They were very distant. I decided the best thing was to get shot of them,.....we weren't going to put a lot of extra effort into the company if they were going to get the rewards. Once they were out of the way it allowed us to focus and become market leaders. Software BCS

What many entrepreneurs looked for was a personal relationship in which an individual VC or group of individuals could demonstrate that they had 'bought into' and shared the vision. They were looking for personal commitment.

we selected them on the basis of the people we met and how much we thought they would be committed to our company Instruments GCS.

The model of VC funding is based on US experience but the extent to which it can be successfully transferred to the UK depends in large part on the VC industries in the UK and US being similar: they may not be.

It (US VC industry) bears no relationship to venture capital here..... they are harder, they're a lot tougher.....But when they get involved ... they stick with the company..... They don't do it in a trivial way. Instruments C.

8. Conclusions

The opening comments of many interviews was '*We don't fit the model*', '*This is business as it shouldn't be done*'. The 'model' sees enterprise inception within a relatively narrow time frame, and emphasizes personal material rewards, rapid growth and equity funding through venture capital. The case studies reinforce the view that high-tech enterprise creation is iterative and collaborative. The studies suggest a complex of motivational factors: the 3 'i's of intellectual satisfaction, being instrumental in effecting change and obtain satisfaction indirectly through the actions of others. Although generally seeking substantial growth, the entrepreneurs were cautious about recruitment. Their own orientations toward personal development were reflected in promoting employees' personal development. Within a local area they potentially contributed to improving the workforce and providing better quality jobs.

By definition the firms operated in niche markets, some were market leaders but their position depended on developing 'customer empathy'. Such empathy takes time, effort and mutual trust to achieve. Similarly the personal aspects of the relationship: the extent to which the vision was shared and technology truly understood were important factors in respect of venture capital. Developing and testing out such relationships takes time and arguably a broad perspective on both sides. Finally, the firms studied had extensive links with the research base but again these were effected through personal relationships and achieved through mechanisms far more cost-effective than those supporting nascent academic businesses. It is the crucial role of personal relationships which emerges, and which simplistic policy measures cannot address.

Improving the UK's international competitiveness depends on both new high-tech venture creation and the health of existing high-tech firms including small firms. Schemes such as the TCS which are tried, tested and well supported may have a diverse and long term impact on high-tech small firms' prosperity as yet unacknowledged. There is a need for policy and popular perception alike to recognize the importance and concerns of the main body of existing high-tech small firms: the 'beer', and not be blinded by the attraction of the 'froth' that is the research base spin-out.

Notes

- ¹ Initiatives at the regional or national level include in the UK the University Challenge Fund and Science Enterprise Challenge, in France in the establishment of 31 regional incubators and changes in the law concerning the rights of researchers at public research institutes to be actively involved in companies.
- ² Classification based on modifications to Butchart's 1987 definitions based on a work by Hecker 1999.
- ³ Firms undertaking routine computer services were excluded from the survey.
- ⁴ Studies of this type invariably involve self-selection by those who participate. This raises questions about representativeness. We cannot claim that the firms were in any statistical sense 'representative' of small high-tech businesses. However a number of points suggest that we are not dealing with an unduly co-operative or supportive group of firms. First, not all those taking part could be described as successful. Second, considerable effort was expended telephoning to win over agreement to participate and, finally, several of the CEOs of the case study firms commented that they 'did not normally fill in questionnaires'.
- ⁵ Self-employed sole traders were not included in the survey but a number of firms comprised several working partners or directors and no full-time employees.
- ⁶ Spending on R&D as a percentage of turnover in 1996 was on average 4% among service firms and just under 4% among manufacturing firms DTI.
- ⁷ A novel innovation is the introduction during the past 2 years of a product, process or logistic innovation, which was new to both the firm and the industry.
- ⁸ Respondents to the 2001 survey were asked to describe their approach towards risk in an open question.

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