

ECONOMIC PERSPECTIVE 1

COMMERCIALISING ACADEMIC RESEARCH

by Edward Cunningham¹, Business Options Ltd

Britain's performance in converting research into commercial opportunities is overlaid with cliches. It is said that the British are good at pure research, as evidenced by the significant number of Nobel prizes and other distinctions, but no good at converting it into marketable products; others do that, the Americans or the Japanese. British research is more often than not achieved on a shoestring, whereas others invest sensible sums. The British are less focussed; they want to do what the individual researcher perceives as important; and, so it goes on.

Some are overstatements and some are not entirely fair, but it is a fact that we are missing out on a disturbing number of industrial opportunities created by our research efforts. So, before even introducing the subject of whether or not more funds should be made available for research, how about a higher conversion rate from what we have? And how about starting with the research that exists in our Universities and similar institutions?

The sections that follow examine, first of all, the place of academic research and the potential that exists for spin-outs development. The real challenge is to exploit that potential and so an assessment is then made of the principles which need to be accepted and which provide the basis for the process of realising that potential. But, that process cannot take place without support, especially financial. So, an approach is outlined for utilising Government resources with a meaningful, rather than token, involvement of the private sector.

The Place of Academic Research

In looking at Universities as sources of innovation, and for that matter other research and higher educational institutions, we need to establish the importance of their research to industrial development, because it can be argued that it is not the function of these institutions for their research output to be necessarily relevant to the market place. It can also be argued that if industry wants research undertaken, then it should do it itself or pay for it to be done.

To avoid being dragged into the tiresome debate over the role of academic institutions, let us accept that some of it will be industrially relevant and some will not be so. The issue for us here is not about how much should fall within these categories nor is it about the principle of whether or not these institutions should be more industrially relevant. What we want to examine is how those components of research, which are industrially oriented, can be converted into commercial opportunities. Here we will confine ourselves to the research which results in new products and processes, the distinguishing feature of which will be that the output will not have an already established demand in the market; the challenge will be to gain market acceptance.

Talk of the market starts to raise the question of why these institutions should have anything to do with it. After all, this is not their function. Indeed, if the activity is to have a commercial future, why should not the matter be left until this becomes so self evident that someone from industry will take it on. This happens quite often, especially amongst companies that are research oriented. In theory, therefore, all worthwhile developments should be capable of being picked up. In practice, this does not always happen. The reasons are varied but they come down to a communications gap. In too many cases for comfort, one party is unclear as to what the other wants.

Even so, some further points arise. In particular, why should not the problem of this gap be left to industry to solve? Part of the answer is that a collective approach by industry will not work because of the competitive environment. Another part is that individual companies, other than possibly the large ones, cannot hope to monitor the output of all institutions. The next point stems from the prospect that there may be commercial benefits; if so, the question becomes, why should not the institutions benefit? And, in seeking these benefits, should they not develop ways of closing the gap? And, in answer, there is really no good reason why not. This response gives rise to the further and more problematic question of, how should they do it? But, first let us look at the chain of activity involved.

¹Edward Cunningham is Chairman of Business Options Ltd, a corporate development consultancy specialising in medium sized companies. He is also Chairman and Director of a number of companies. Previously he was for thirteen years Director, Scottish Development Agency.

For new products and processes, the chain begins with the testing of a hypothesis or the evolution of some concept. Whatever the origins, the activity will proceed through various phases until something specific begins to take shape. Whether or not that something will be taken to the stage of patenting will depend upon the originator's belief that there could be some future commercial advantage or, at least, a wish to preclude anyone else from using the result. The culture of academia encourages the results of research to be published without necessarily paying regard to the requirements of patenting. If, however, a patent is secured, then the holder, whether it is solely the academic institution or some part ownership with it, can choose to sell it; or, to take it through subsequent stages of prototype development in order to sell it better at a later stage; or, to retain and develop the patent as the basis for a new commercial venture.

There will be instances when a patent will just not be capable of being exploited within the UK or when its value within the UK will be less than that obtainable elsewhere. Equally, there will be a number of patents that can be exploited within the UK. The transference of patents or the technology transfer process is one which was the responsibility of the National Research Development Council, and is now a function of the British Technology Group (BTG). The process requires a very considerable international network of potentially interested parties as well as the resources to police patents. In this, BTG has a distinctive competence, even though the scale of its operations is small.

Commercialisation as the next link in the chain of activity can take a number of forms. Over time, a variety of schemes have been launched which have sought to assist with the marketing of patents as well as with promoting development to a point that is closer to the market; more recently, industry has been encouraged to collaborate in these latter stages. However, the consequence of these efforts is to disperse the output of the research beyond the institution and, often as not, beyond the community in which the institution is located.

Little attention has been given to creating enterprises out of this research until quite recently. Even then, the effort was largely taken over by the more visible and easily implementable attractions of Science Parks and the like. Consequently, the challenge of enterprise creation still remains to be taken up. Of course, there has been some response but it is certainly not a common feature. And yet, the potential is there to contribute more effectively to industry as well as, at the same time, to benefit the institutions along with their local economies.

The Commercialisation Process

The first steps towards commercialisation cannot be taken until the gap has been bridged between where research funding ends and where commercial investment starts.

Just to confuse matters, the limits to each side may vary quite considerably depending upon the circumstances of individual cases. Nonetheless, the essential requirements can be identified. The important point is that they must be anticipated on the research side of the gap. That anticipation must incorporate the three crucial principles which will see an enterprise proposal through to being a commercial venture. The first of these is that at some stage in the chain, the research activity must start to adopt a recognisably commercial format that will be capable of incorporation, preferably with a share structure. The next is that the proposal must come with a full time manager or more recruited from industry who will have the credibility to take the proposal into its enterprise phase. In addition, the availability of one or more outsiders who will be selected for the input they can provide and who will be able to act as non-executive board members when incorporation takes place. The final one is that the financial structure must enable the terms to be consistent with the activity and the time required to complete the development process.

Although the time required to work through the chain will be uncertain, the interdependence of each link is such that they will have to be tackled at around the same time. In general, the integration of prototype work with the assessment of market and cost factors will be desirable from the beginning. Without this, it will not be possible to direct the prototype work so that the results relate to the market place. This, in turn, will provide a guide, as well as a check, on the resources to be allocated and on the time to be spent on these aspects.

The question of how long an interim structure will have to be in place is somewhat easier to respond to by saying that it will need to continue until it becomes a completely commercial entity. A caveat will have to be introduced to counter the possibility that the transformation will not be achievable within any reasonable time frame. A certain amount will depend upon how much potential is at stake and what costs are being incurred. As every situation will vary, the decision to call a halt will be a matter of judgement. But the willingness to do this will be a crucial responsibility of management and the funders. Judgement can, however, be influenced by the gamblers' double or quit syndrome. Whilst it will be a fact that expenditure up to any one point in time will represent sunk costs and that further increments should be viewed against the total benefits of the development succeeding, this line of reasoning can be highly dangerous and should be recognised as such.

The management for seeing a development through these stages will need to fulfil certain general requirements. For instance, someone will have to have the skill to co-ordinate the inputs which will enable the product ultimately to enter the market; as well as the skill to negotiate market entry, including the financial aspects of this move. While these attributes do not require experience of the research and prototype development, nor indeed of the market and costs aspects because all of

these are most likely to be best sub-contracted out, industrial experience of some of the technology involved and of industrial product development will be valuable. Because as much as practical should be contracted out, the management team can be kept to a minimum and, in general, just one person may well be adequate initially to cover this interim phase. How will such a person be secured?

The problem will be that the appropriate person will already have a substantial market value, thereby adding to the cost of the development. A more significant part of the problem is how someone with these attributes will be attracted to a venture which is inherently risky and possibly, in career terms, could be of short tenure. The first concern could be offset through a guaranteed remuneration package for a specified period which would probably have to be for a minimum of three years. That minimum will be fairly close to the time period over which it will be reasonable to run with the early stages of any development. Thereafter, a decision will be need to be made on whether to continue or to stop. These alternatives will provide the framework for handling the other concern over tenure. An assured three years with the possibility of continuing, if the venture goes into the market place, will probably attract the right person, provided that the compensation package is more than competitive. Without these terms, the requisite capability will not be attracted and if it cannot be attracted, then the enterprise route should not be attempted. A further general requirement concerns work on the market and cost aspects. In order to intensify the introduction of industrial disciplines, it will be essential for as much of this work as possible to be undertaken by outside experts. The effect of doing that will be to incur costs for which provision will have to be made.

A number of key points concerning the raising of finance also need to be acknowledged. To start with, it is obvious that the funding should be adequate. It will be an advantage for funds to be released for definable stages of development so that each of these can be re-evaluated, as long as the overall funding requirement has been specified. Otherwise, repeated requests for additional financing will undermine the credibility of the development. Moving on to time scales, these will obviously vary. On the whole, the feasibility and commerciality of a proposal should be sufficiently advanced within a period of three years to provide the basis for further decisions. Certainly, this stage should be reached in most cases within three years and therefore the initial funding arrangement could reasonably be calculated to cover this period. The ultimate period may well extend further, but the advantage of a first stage time limit is that a re-think of the whole enterprise will be ensured before any further commitments are made.

A particularly key point concerns the risk reward ratio which is not always understood by academics nor indeed, more generally, by the holders of intellectual property rights. There is no single formula, but what will be true

is that as the transition from academia into an increasing number of commercial enterprises is achieved successfully and as they subsequently demonstrate that financial returns generated, so the financier's perceptions of that risk will change. A particular difficulty intrudes at this point which stems from the fact that the track record of commercialisation is far too meagre for finance to be forthcoming from private sector institutions. As a consequence, what we have been talking about will go by default.

A Role for Government

In these circumstances, there is really only one source and that is Government. But, should it get involved? An important argument for involvement is that it will enable some of the vast amount spent on research, which is not presently commercialised, being translated into benefits for the economy and, more especially, local economies. If these local economies are already poor performers, and some clusters of institutions will undoubtedly be in such areas, then the contribution will have an enhanced social and economic value. Significantly, the amount of finance required will be exceedingly small in relation to the total spent on research.

If a role for Government is proposed, then certain practical aspects will have to be accepted. For example, there will have to be a willingness to accept the inherent financial risks of promoting such new ventures, and an acknowledgement that the failures come first and the successes only emerge later. Also, the period over which performance is measured should be consistent with the development characteristics of the enterprises involved. And, the initial funding must be capable of covering the up front costs of management, market research and company formation. Finally, as the performance of more traditional forms of venture capital should not be judged on each individual case but rather on a portfolio basis, this feature will apply all the more strongly to this type of financing or pre-venture capital.

The primary argument for accepting these risks is that success will enhance the image and standing of the institutions in the minds of prospective students as well as of industry. In time, these perceptions will add to the motivation of key academic staff. All in all, the benefits over time can be expected to be significant by securing the benefits of technological advance together with the employment and enterprise creation that go with it. And, the ratio of costs to benefits will certainly emerge as highly favourable when compared to the 'do nothing' alternative.

Unfortunately the principal types of Government finance are not appropriate. For instance, Public Dividend Capital comes with near commercial requirements in its use as equity, while the conventional grant sources have proved difficult to reconcile with commercial structures and, in particular, the taking of equity. A middle course was pioneered by the Scottish Development Agency

was pioneered by the Scottish Development Agency (SDA) which was allowed under its act to apply grants to any purpose subject to the approval of the Secretary of State for Scotland. With that approval, the SDA funded a number of joint ventures with Universities and institutions. However, if the principle involved in using Government grant finance in this way is to have wider application, then the process will have to be placed on a more sustainable basis than the requirement for constant case by case vetting, however well that may be handled at a particular point in time. Also, the arrangements must enable the private sector to be introduced into the process at the earliest stage it can be encouraged to do so. And, as a final comment, the innovation process is very diversified and consequently a diversity of responses will be required. Government, on the other hand, operates in a highly structured way. Also, the nature of risk taking requires a close association with the decisions; over centralise, and the intimacy of that linkage cannot be sustained. Indeed, what will stifle innovation will be a nationwide monolithic response.

A Proposal for Pre-Venture Capital Companies

A possible way around this would be for there to be a number of regionally based outlets for Government funds in the form evolved by the SDA. Geographically, they could be sited to serve clusters of Universities. They would be given delegated powers of investment within a framework that required associated financial participation from independent venture capital companies. These outlets would themselves be incorporated as companies and they would therefore act as venture capitalists specialising in the pre-venture capital stage of innovation development. As a company, the Board would be structured to ensure a balanced representation from those with science based backgrounds and those with industrial experience. Each company would have a funding agreement with Government which would specify the scope of delegation, which must include the ability to offer flexible terms as well as to offer the amounts that will be appropriate to the process. Most vitally, full decision-making authority must rest within the company. While these companies will be encouraged to focus on their designated clusters of institutions, each should be permitted to operate beyond them, probably up to some specified proportion of their portfolio, in order to stimulate some competitive activity and to provide that diversity of sourcing referred to earlier.

The full time staff requirement for each company will comprise appropriate professionals recruited from the private sector, most probably on secondment, and need only number from two to three for each company. The overhead costs that will be incurred will have to be funded up front in the expectation that the portfolio, when it has been built up, will meet these within a time scale that is accepted as reasonable for this type of pre-venture capital. There is the possibility that cumulative overheads up to that point could be met from

portfolio gains over the longer term, and certainly this should be an objective. Realistically, however, the initial and uncovered overheads should be regarded as a development cost by Government which should be evaluated in relation to the economic gains achieved through the start of new enterprises.

In order to encourage performance, a system of incentives which recognised progress towards the key objectives of creating new enterprises, introducing financial partners; and achieving a complete divestment should be introduced to the extent feasible and should acknowledge the extended time horizons involved. For the latter to work, and as staff assignments are likely to be of shorter duration, the system will need to incorporate the distribution of some rewards after staff have left. Indeed, this will be a way of generating the quality of commitment that will make an important difference to the outcome.

As this approach is new and as yet untried, there will be a case for initiating it on a trial basis with possibly two or three institutional clusters being selected in the first instance. Because of the time scales involved, the trial will need to run for up to three years before the assessment of progress will be sufficiently meaningful to propose further companies. In selecting the location of these clusters, certainly one or more should be considered for regions that are performing poorly because, for these, their institutions may offer the only remaining source of innovation.

These new and small pre-venture capital companies will become dangerously isolated unless they are provided with some supporting arrangements. Part of this will be achieved by locating the office on one of the campuses within the cluster being served. The more important part will have to be secured through a national level group which should be designed to provide not control; that is the purpose of the agreement; but support. The group will need to include the key players involved in the process and these will comprise the research councils, the institutions and Government departmental source of finance. The most significant player, however, will be the venture capital industry itself because it has experience of risk taking and enterprise promotion. And, because it will have a particular interest in the results as its members will be the logical source of the further rounds of financing that will be required. For these reasons, the venture capital industry should provide the leadership of the group together with representatives of the other players, preferably one each to keep the group small and manageable. While this group will not control the pre-venture capital companies, it should be asked to select and supervise the evaluation teams, which will review the performance of these companies at the intervals specified in the agreements and will do so on behalf of the Government department concerned. The cost of this support should be kept to a minimum and should form part of the overall development cost of the initiative.

Conclusions

The concern over the role of Government in promoting industrial development that emerged during the 1970s stemmed in part because of poor results. And, in part, because interventions were seen as frustrating the more logical and better founded development through market forces. The concern still leaves open actions to promote technology. The proposal made here to institute a mechanism for encouraging and assisting new enterprises based upon institutional research falls within this open area. Nonetheless, the action may well be construed as interventionist. But, Government funding of institutional research is itself interventionist and all that is proposed is to make some more of it. The concern over management of public funds is very relevant and it is for that reason specialist companies to perform the pre-venture capital role are being advocated. There remains, however, the issue of accountability. The more private sector directed the companies are and the more delegation that is given to them, the more acute becomes the need for accountability for the use of public funds. However, the amount of money involved will be modest in absolute terms and will be minuscule in relation to the overall total for Government funding of research. The second is that the boards of these companies should indeed be accountable and there is no reason why they should not be as answerable within the terms of the agreements struck with them as other recipients of public money.

So, to conclude, a considerable amount of research effort is not being translated into new indigenous enterprise by default. Opportunities exist for doing so and the Government, utilising private sector expertise and adopting commercial principles, could make the realisation of some of these happen in a way that contributes towards local economies.