
Briefing Paper

GOING INTERNATIONAL: THE DEVELOPMENT OF EXPORT-ORIENTATED INDIGENOUS ELECTRONICS FIRMS

James McCalman, Centre for Technical and Organisational Change
University of Glasgow Business School

This paper examines the development of indigenous electronics firms and argues that there is a need to develop growth onto international markets of a number of Scottish electronics concerns. The paper argues that the emphasis of companies which operate at international trading levels should be supported by government agencies, such as the Scottish Development Agency (SDA) by the encouragement of a greater degree of indigenous spin-off which stems from the foreign base in Scottish electronics, is highly technological in its product base, is export-oriented, and over time will develop multinational characteristics in its own right.

The emphasis of SDA policy in the electronics industry has hitherto been the attraction of inward investment, which it has managed to achieve very successfully. However, the presumed indirect benefits of a cohesive indigenous support sector which develops potential of its own has not developed as a result of the attraction of foreign electronics firms. Scotland's level of local sourcing by foreign-owned firms has been falling during the 1970s and 1980s and there is no evidence that any dramatic policy initiatives aimed at reversing this decline have been forthcoming. Although there have been efforts on the part of both the SDA and foreign firms themselves to increase local content it still continues to decline. Quite simply the policy goal of a "critical mass" of electronic firms has not been attained in the sense that foreign presence, although substantial, has not generated increased local content and spin-off enterprises.

This paper argues that it is a lack of enterprise culture in the Scottish economy

which prevents this development occurring, and stresses the need for an increased level of awareness of opportunity both on the part of organisations, such as the SDA, and within the electronics industry itself. Middle managers in large foreign-owned companies in particular may have the potential and opportunity to develop successful start-ups which, although initially tied to larger firms, may be able to break out of this dependency by manufacturing sophisticated products which can be sold on international markets. Given the increasing level of R&D work being allocated to Scottish subsidiaries there should be no reason to suspect that the level of spin-off enterprises in 'Silicon glen' cannot at least follow those of 'Silicon valley'. What restricts these developments is a lack of enterprise in the Scottish economy coupled with poor management team cohesion, and minimal external support.

The indigenous electronics sector

The problem faced by the indigenous sector in trying to develop onto international markets via increased levels of exports, and eventually establishing Scottish multinationals in the electronics industry, is that the product base of the sector lies in two main product areas - industrial and commercial applications and subcontract design and assembly work. These areas account for 68per cent of the

Note:

The funding from this research work was provided by the Scottish Economic Society through their small research grant scheme. The author would like to acknowledge their backing.

indigenous electronics firms. A third product area, components (excluding semiconductors) accounts for another 18 per cent of Scottish firms. The SDA in 1982 pointed out that few indigenous companies had experienced significant expansion and growth in employment although a limited number might have growth potential. The reasons for this lack of growth were that the majority of indigenous companies were in specialised low-volume product markets or offered local design/consultancy services and their growth prospects were therefore limited. Similarly, the output of indigenous firms tends to be aimed at the Scottish market and shows very little impetus to develop export potential. Buxton (1986) argues that there may be a strong case for relating investment grants and allowances directly to the proportion of output exported to encourage changes in the structure of production and composition of output in favour of exports.

However, the SDA study (SDA, 1982) noted that there were a limited number of companies which appeared to have a sound technical base and credible market niches capable of substantial exploitation. Similarly, new indigenous start-ups at the beginning of the 1980s were spreading themselves throughout the major product growth areas in electronics. Companies were being set up in data processing/systems-related, medical, industrial/oil-related, sub-contract/printed circuit boards and software/design consultancy fields. What was important about these start-ups was that they were drawn primarily from Scotland's existing electronics industry, especially the foreign-owned sector.

The foreign sector has progressed from a branch plant image of the 1970s with increases in both the development of products for the European market and the level and sophistication of R&D work. Haug, Hood and Young (1983) provide evidence that the, 'emergence and growth of R&D activity was seen to be largely induced by the need for response to market signals ...(and)... seemed to provide a mechanism for facilitating technology transfers from the parent multinationals, and the proportion of commercial applications from the research results was

high and tended to be based in the affiliates themselves.' Growing R&D intensity at the level of the affiliate in Scotland offers the opportunity for new enterprise spin-offs. Young (1986) notes that, 'the number of spin-offs, encouraged spin-outs and associated companies related to electronics has been growing quite rapidly in Scotland over the last five to seven years, even although their employment record remains a source for continued disappointment'.

However, the emphasis in foreign-owned subsidiaries remains with productive activities, and this distinguishes electronics in Scotland from that in south east England. Sayer and Morgan (1984) argue that, 'The overseas sector remains poorly integrated with multiplier effects which afford little secondary employment and, perhaps most important for long-term prospects, a significant indigenous sector has not developed. What is notable about indigenous firms (eg. Rodime) is that to keep abreast of international leading-edge innovation, they feel obliged to expand outside Britain (in the US in this case) soon after birth.'

Firn and Roberts (1984) take a more optimistic view of the development of indigenous enterprises stressing the growth of firms, such as Rodime, Fortronic and Prestwick circuits and University spin-off companies. They identify factors, such as increased venture capital availability; the demonstrative effect of early successful entrepreneurs; changing attitudes towards the private sector; and the increasing base of electronics engineers and managers in Scotland who have experienced the entrepreneurial spirit during periods of employment in foreign firms at their US locations. Their policy recommendations stress the need to encourage new science-based companies by Scottish entrepreneurs and, 'a change in Scotland's corporate ethos towards more effective competition in international markets, based on an enhanced ability to manufacture and market goods and services profitably in an increasingly harsh competitive environment.' There does appear to be a growing awareness that the indigenous sector has to develop export market potential if it is ever to progress beyond the boundary of domestic supplier status.

For those indigenous spin-off firms which have developed there is an awareness that many are poorly managed and under-capitalised (Hood, 1986). The indication is that not enough are launched under the direct surveillance of mature management teams with direct experience in larger companies while many are academic spin-offs with high technological skills and low managerial competence. Hood (1986) argues the case for specific, radical and controversial schemes to ensure that projects are better founded. This gives an indication that to be able to survive the earlier years of start-up, firms in the high technology sector do not only have to compete in terms of technology, quality and price but also have to have within them the right mix of managerial and technical skills. Many new start-ups suffer because although they have the right product, they lack the management team framework to sell that product to the outside world. The industry could certainly do with fewer gifted engineers setting up in business on their own and more experienced teams which combine the necessary management skills needed for business success.

As far as the growth of those indigenous firms which can be regarded as successful is concerned, Young (1986) identifies an internationally orientated sub-group within the total population of indigenous high tech firms in Scotland. An important factor involved in the push towards internationalisation on the part of Scottish electronics firms are the remarks made relating to small UK market size and the need to penetrate the American market. Manufacturing facilities and an American listing are regarded as crucial for Scottish firms to break into the lucrative US government contract market. This appears to be the pathway to success for indigenous firms. There are several examples of indigenous electronics firms in Scotland which have become international primarily because the market itself is international. The willingness to service the local market for particular electronic products restricts growth opportunities. Indigenous firms become tied into the growth patterns of those foreign-owned firms in Scotland which they service. The attainment of a 'reasonable' level of profit as the vendor firm of a major American multinational appears to satisfy most Scottish companies. What it does not do however is provide the nation with the level of export potential which it currently requires. It has been noted

elsewhere that the need to achieve export surpluses in the Scottish economy should influence development and grant aid provided to new start-up business and there is some argument for positive discrimination in favour of firms with the potential of becoming international in their own right (Buxton, 1986, p.12).

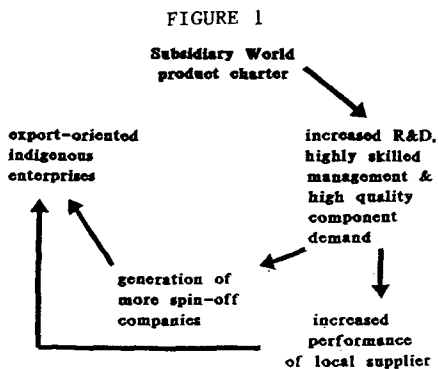
Young (1986, pages 25-28) also believes that there is a need for change when one examines the issues related to higher technology products and the internationalisation of Scottish firms. His assessment of the positive impact of achieving or maintaining indigenous high technology manufacture and the foreign income this generates are tempered by the belief that in some cases Scottish companies are perceived as being too small at the moment. To stimulate overseas activity Young recommends three particular strategies:

- i) Short-term: Encouragement of exports from Scotland;
- ii) Long-term: Joint ventures, Licensing, Back-up foreign investment in sales and service sectors and in the manufacture of spare parts;
- iii) Alternatives: Merger and diversification of Scottish electronics firms.

His analysis of 21 indigenous hardware and software companies with active overseas interests relates the major reasons for movement abroad as small UK market size and the need to penetrate the American market, topics raised in the two case studies below. Added to this, however, are future projections which are likely to encourage the outward movement of Scottish firms. These are related to low economic growth in the UK economy and the continued globalisation of markets.

To the extent that some indigenous firms have specific advantages at the moment one has to recognise the limited scale of

these. For the remainder of the sector there may be some hope that through collaborative ventures and close liaison with the foreign sector present in the Scottish economy indigenous enterprises will survive and prosper. There appear to be two development models open to Scottish firms, both of which depend on the continued and expanding role presence of the foreign sector. The model (figure 1) indicates the importance of the MNE subsidiary to the successful development of indigenous enterprise. In terms of spin-off companies and 'piggy-back' exporters the central key rests with an expanded foreign sector which achieves higher levels of autonomy, and which gains R&D capability and world or European product market charters (defined as subsidiary responsibility for all aspects of R&D, manufacturing and international marketing).



There would appear to be a logical stepping process in the model from the establishment of R&D facilities in Scotland with associated technology transfer from the parent to the subsidiary through the need for higher quality supplier and higher grade management and professionals at the subsidiary plant, to the creation of more spin-off enterprises and export-orientated suppliers. Although this model is simplistic and open to criticism that it does not reflect corporate centralisation there is evidence (Buchanan, 1987; Young, 1986) that several Scottish based MNEs are moving in this direction and this should give hope for the future. What is needed therefore is a change in what the SDA (1986) describes as the 'cultural and management weaknesses' in the indigenous sector to be able to take advantage of opportunities which

currently exist and may increase in the near future.

Two Case Studies of Indigenous Success

It is against the background of growing foreign-owned R&D activity and the potential this has for a larger number of spin-off companies, the need to develop export potential, the ability of firms to compete in an international sense, and the presence of an internationally-orientated sub-group of indigenous electronics firms, which led to the analyses of two particular Scottish companies - Prestwick Circuits and Flexible Technology. These case studies attempted to determine the development of the companies towards international markets, their relationships with the foreign sector, and their views concerning the development of electronics in Scotland. It is not the intention to detail the studies here, but they do provide a number of general conclusions which are relevant to the analysis of the future prospects of indigenous firms in the electronics industry in Scotland.

Although the data are qualitative and what is true for two firms in the industry may not be generally applicable across the broad sub-divisions within electronics, the case studies are valuable in providing milestones of achievement from which others may learn. They are also important in pinpointing the fragile relationships which exist between the foreign-owned sector and indigenous enterprises. This is particularly true in two areas. First, the level of 'presumed' autonomy which subsidiaries in Scotland have is called into question. Second, the treatment of the spin-off entrepreneur by his previous employer does not follow the 'Silicon valley' model. Leaving the larger organisation to go it alone seems to be an anathema to the senior management of foreign-owned subsidiaries where one would suggest that there are net benefits to be had by the subsidiary in encouraging spin-offs.

Although it is difficult to generalise from two case studies of indigenous electronics development, the studies do emphasise several important points about the nature of the industry in Scotland, the impact of foreign presence, and the general climate for entrepreneurship in Scotland. The main conclusions which can be derived from this study were:

1. The development of entrepreneurship in the Scottish economy needs a major injection of effort on the part of government, industry and universities.

Given the availability of start-up finance a major policy initiative from industry, supported by government and academic institutions is needed to encourage more new enterprises in electronics, and other industrial sectors. One of the major ideas which the managing director of Prestwick had, in his role as vice-chairman of the Scottish CBI, was to have the chairmen of major companies embrace a new enterprise initiative encouraging middle managers to set up in business for themselves.

2. To succeed, the new enterprise culture needs directly to attack the two major negative enterprise cultures which currently exist in the Scottish economy.

There are marked differences in the encouragement given to new start-ups in the United States and Scotland. These differences are strongly apparent in the treatment of failure by potential financial backers, and the attitudes of organisations towards employees who leave to set up in business for themselves.

These negative cultures stem from two areas. First, the desire on the part of larger organisations to maintain their middle management elites for succession purposes without recognising the possible advantages of supporting spin-off companies. Second, the intrinsic culture that favours security of employment at the expense of risk and the unpopular connotations associated with setting up in business for oneself when the result ends in failure.

3. The successful examples of indigenous electronics firms are more likely to be product innovative, export orientated/import substituting concerns which eventually become international in their own right.

Those indigenous firms that recognised the market potential of providing

products at an international level were likely to be those with the major levels of success. A two-tier indigenous sector exists with firms who serve international markets by exports, or become multinational in their own right being the major examples of indigenous success.

Electronics firms in Scotland are faced with the alternatives of supplying major foreign-owned subsidiaries based in Scotland and maintaining these linkages, or expanding beyond these confines to operate on international markets. To do so requires that they are either product innovators in the mould of companies, such as Flexible Technology, or they compete on cost and quality criteria, or do both.

One possibility is that firms which currently have close relationships with foreign firms use these relationships to build up their own quality, cost and product innovative potential and take these onto wider markets. The crucial step is breaking out of the restrictive boundaries imposed by buyer/vendor relations to become more independent and therefore able to concentrate on import substitution or export orientation. At present, the best hope appears to be from a series of new start-ups coming from within larger electronic companies, with their specific backing, and aimed at substituting for imports with eventual development of export potential.

For example, Flexible Technology's main markets for high quality flexible circuits were military, computer and communications manufacturers. The growth markets for these products were in the United States and the company had always intended being export orientated.

In setting up the two firms, the founders were aware of the failings of those firms already in existence. These failings reflected the lack of firms in particular markets and the benefits of being 'first to the market place', an inability to serve the market demands with high quality products which were priced competitively, and the growing demand from larger firms for flexible circuits

and standard pcbs which encouraged the start-ups.

4. **Product and management experience were crucial factors for success.**

The management teams which set up the companies had a broad range of technical and management skills to ensure the success of the venture. The future establishment of spin-off or new indigenous enterprise in Scotland should view this as a pre-requisite for success.

These conclusions lead one to suggest that in its current format the indigenous sector of the electronics industry is not geared towards exports. Policies which encourage the birth of new start-ups particularly from within the foreign sector, should therefore stress the need for export-orientation. The existence and attraction of foreign enterprises and the growth of a strong domestic supplier base are unquestionably important to the Scottish economy. However, there is also a need to penetrate international markets. The pay-offs will be substantial and several indigenous high-tech firms appear to be pointing the way. What is required is an initiative which encourages firms to develop foreign markets and compete at international levels.

References

- Buchanan, D A, 1987 'Job enrichment is dead: long live high performance work design', **Personnel Management**, May 1987.
- Bollinger, L, Hope K, and Utterback, J M, 1983, 'A review of the literature and hypotheses on new technology-based firms', **Research Policy**, Vol. 12, North-Holland
- Buxton, N K, 1986, 'Performance and problems of Scotland's industrial economy', **Scottish Council Development and Industry**, The International Forum, December 1986.
- Firn, J, Roberts D, 1984, 'High-Technology Industries', in N. Hood and S. Young (Eds), **Industry Policy in the**

Scottish Economy, Edinburgh University Press.

- Haug, P, Hood N, and Young S, 1983, 'R&D Intensity in the Affiliates of US-Owned Electronics Companies Manufacturing in Scotland', **Regional Studies**, Vol 17, 6, pp 33-392
- Hood N, 1986 'Future of the Multinational in Scotland', Working paper for the conference on Scotland and the Multinationals, **IRM and Strathclyde International Business Unit**, Glasgow
- McCalman, J, 1987 'What's wrong with Scottish Firms? Local sourcing in Electronics', Fraser of Allander Institute, **Quarterly Economic Commentary**, University of Strathclyde, February.
- McCalman, J, 1987 '**Going International : The development of export-orientated indigenous electronics firms**', Glasgow Business Schol Working Paper Series, November.
- Roberts, T, 1980 'Getting new ventures off the ground', **Management Review**, June 1980.
- Sayer, A, and Morgan, K, 1984 'The Electronics Industry and Regional Development in Britian', in A. Amin and J B Goddard (Eds), **Technological Change, Industrial Restructuring and Regional Development**.
- Scottish Development Agency, 1982 **Scotland's Electronic Strategy**, final report to the SDA by Booz, Allen and Hamilton Consultants.
- Scottish Development Agency, 1986 'Electronics Scotland', Newsletter of the **Electronics Division of the SDA**, Glasgow.
- Young, S, 1986 'Scottish Multinationals in the Scottish Economy', working paper for the conference on Scotland and the Multinationals, **IRM and Strathclyde International Business Unit**, Glasgow.