C. COMPETENCE DEMANDS FOR TODAY AND TOMORROW: QUALITY PROGRESS THROUGH INTERACTION WITH INDUSTRY

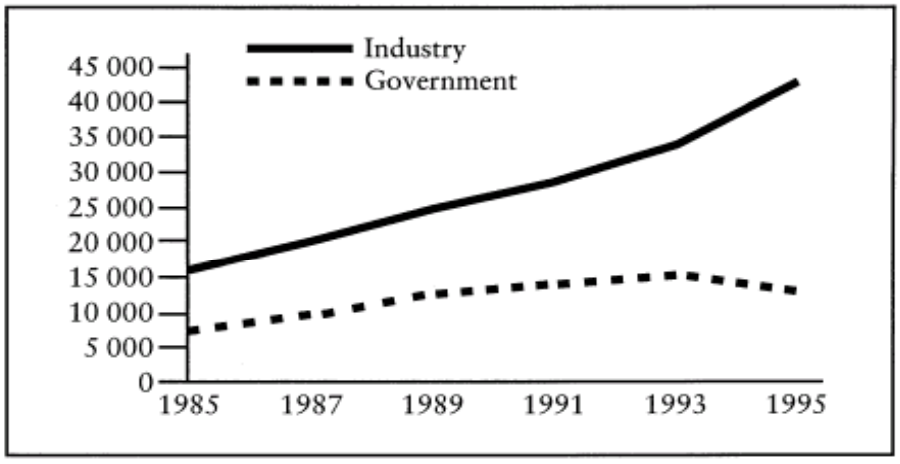
by

Camilla Modéer, Federation of Swedish Industries, Stockholm

The perspective from Industry

Industry today is characterised by rapid change, the emergence of new structures and production of high-tech value-added products. Global competition sets the framework within which companies must act. The rapid diffusion of knowledge, especially information technology, has resulted in increasingly knowledge intensive products, shorter and customer oriented product cycles, more efficient production and increased specialisation. Companies focus on satisfying customer needs by delivering systems and goods with extensive software and service elements integrated. Global competition is fierce for all companies and countries but only the best are successful. The importance of knowledge in the economy is illustrated by the increase in R&D performed in industry (Figure 1). It can also be seen by the change of "competence

Figure 1 R&D in Sweden, MSEK



Source: MSEK.

profile" or the skills profile of the labour force in companies (Figure 2). There is a clear relation between the investment in R&D of enterprises and their growth and number of employees that can be shown by OECD data (Figure 3). Industry needs an increasing supply of well-educated and competent professional staff at all levels: skilled workers, engineers, academics and researchers, generalists as well as specialists.

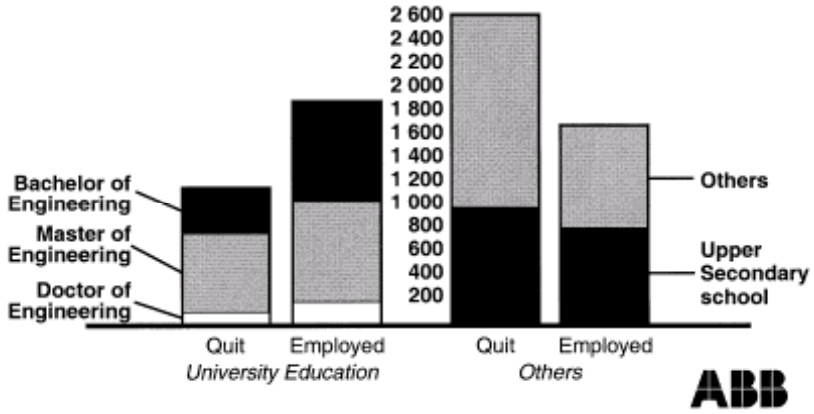
To meet these challenges, companies are radically changing their structures and organising their activities differently. Companies are concentrating on core businesses, outsourcing more peripheral activities forming networks and integrating services with hardware production. Employees are being given a wider range of tasks and responsibilities, managers are becoming "coaches". Traditional hierarchical structures

are being compressed and decentralisation in favour of autonomous teams. As this is occurring on an economy-wide level, the classification of businesses into manufacturing and services is becoming obsolete. As society is moving into a new era, not just from an industrial to an information society but into a different industrial world, the transformations in the economy should instead be discussed in terms of larger industrial systems. Such systems encompass large and small enterprises, manufacturers, R&D-companies, software companies, marketing specialists, suppliers, maintenance etc.

Figure 2

Change of Competence 1996-1998

The level of education has increased



Source: ABB.

Examples of such larger industrial systems are pharmaceuticals and instruments, energy supply and transmission, food supply and packaging, etc. These should be looked upon as integrated entities. Interactive industrial services like transport, financing, engineering consultants, software specialists, and others are an important part of these systems. When analysing employment in such industrial systems, it appears that at least 25% are employed in pure service companies. If all employees within industry involved in such service activities are included, the figure rises to more than 60% of employees in industrial systems. The number of employees in this area is rapidly increasing while the number employed in pure manufacturing remains unchanged or has decreased. The characteristics of successful companies are the same for all kinds of enterprises, large or small, domestic or international, manufacturers or service companies. These can be summarised as follows, whereby to be successful, companies must:

- Change quickly.
- Rapidly integrate new science and technology.
- Adapt new forms of work organisation.
- Develop new leadership.
- Focus on continuous development of competencies.
- Conduct active collaboration with schools and universities.

Figure 3 Employment and R&D

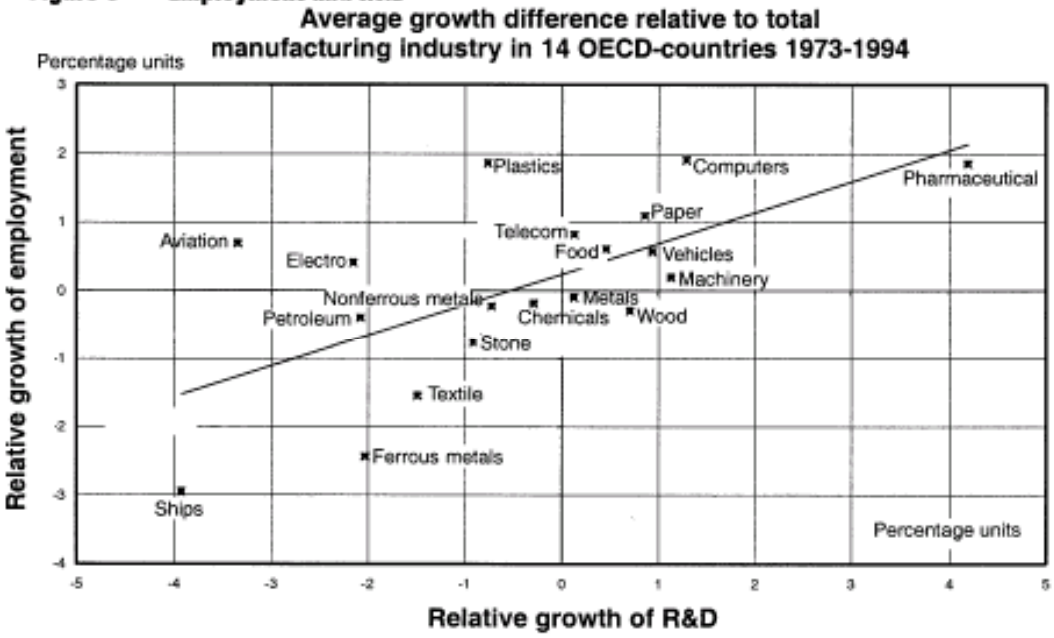
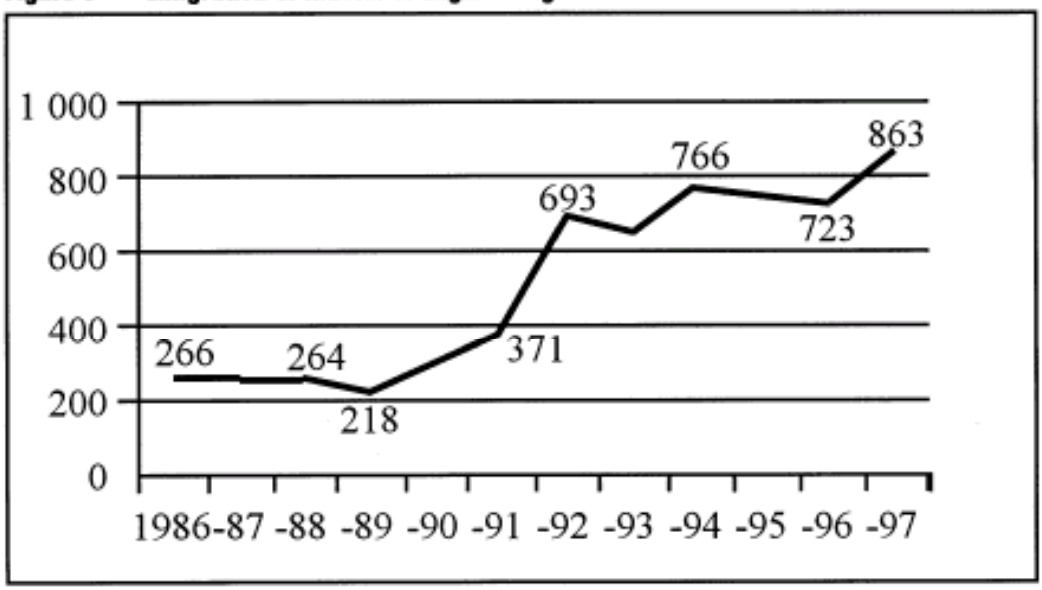


Figure 5 Emigration of Master of Engineering



Source: Author.

To accomplish all of these objectives, highly skilled personnel are needed – especially personnel in science and engineering, including at the PhD level. Because nearly all successful companies must compete on a global market, an important part of their competitiveness is their stock of skilled personnel and the ability of this staff to act internationally. In Sweden, the propensity of skilled workers such as engineers to migrate abroad has increased rapidly during the last decade. This can be illustrated by Figure 5. It would be interesting to know if other OECD countries have experienced a similar trend and what are the underlying push and pull factors.

While industry needs an increasing number of well-educated scientists and engineers, numbers are not the only aspect. The core issue is real competencies. Quantity without quality is meaningless. And quality includes several aspects. On the one hand, advanced knowledge in S&T is absolutely necessary, but it is insufficient. There is also a need of social competence and other abilities. The ability to co-operate with specialists and customers, creativity, responsibility, marketing are all demands that are crucial for today's businesses. Continuous personal development is also necessary for today's professionals. The will and aptitude to learn and utilise new knowledge and providing the means and tools for this is a joint responsibility that must be assumed by the individuals and companies. There are three main qualitative demands by industry for employees, that can be stated as follows:

* Knowledge
  - Of relevant disciplines.
  - Expert and general.

* Abilities
  - Comprehensive view.
  - Creativity, entrepreneurial.
  - Initiative, responsible, implement.
  - Forcible.
  - Personal development.

* Social competencies
  - Co-operation.
    Customer skill.
  - Communication skills.
  - Language and cultural proficiency.

Higher education must adapt to the new demand of enterprises. The most important fields in demand are in science and technology. It is imperative that the higher education system evolve accordingly and at a faster rate. But the programmes should be developed continuously in close collaboration with industry. This means changing educational programmes and research profiles, opening up new fields, establishing new courses etc. To achieve this in a continuously changing world, the producers of supply, the universities must -- just like firms -- listen to and interact with their customers. Their customers, however, are not just universities, the scientific community and politicians and the public sector. Their customers are to a larger extent industry and the business sector in general. In the future, the demands on education in science and technology will require enhancing the focus on i) advanced science and technology; and ii) the integration of training, abilities and social competencies (i.e. not divided and separate).

Ultimately, progress in quality is driven by interaction with the outside world. Thus universities, colleges and schools must open themselves up to civil society. Governing boards, education and research committees, those bodies that decide on content and structure must include professionals from the outside, including the public health sector, services and industry. Interactive networks must be formed and their role strengthened. There are many forms and structures possible, but the essential issue is to build close co-operation. Quality also means satisfying demands. To be competitive, universities and politics should have the same characteristics as successfully competitive companies.