

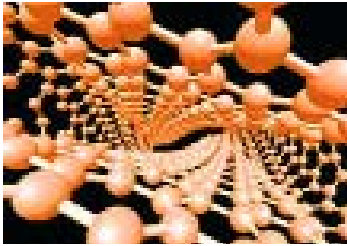
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CHAPTER 4

Value Chain

4

The value chain



The value chain gives an overview of the process leading from the inception of a scientific concept to delivery of the product to the end consumer. It not only involves production and distribution of the product, but also takes in the consumer's needs. The aim of the value chain is to ensure that the user's needs are met by the characteristics of the new product, i.e. to create value for the customer. This value is generated throughout the various phases making up the chain.

As we saw in the previous section, some nanotech advances are already available on the market; however, the main development of the industry is still to come. This chapter will try to explain how the value chain for the nanotechnology industry could be created, taking into account its various phases and the agents and human resources involved.

4.1. Stages in the value chain

It normally takes around twenty years from the time when the scientific concept sparking the R&D process is born and the point where the consumer can pick the product off the shelf in his local shop. During this long period of time, the scientific idea has to be given expression in a practical application, which in turn has to be accepted both by legislation and industry. Suitable mechanisms also need to be found for manufacturing the new application in order to ensure that a reasonable balance is struck between production costs and the benefit passed on to the buyer, and that the final product is worth marketing.

The added difficulty of this process therefore lies in the gap that exists between the base science and the marketed application.

The frame below shows the four essential phases in the value chain.



Increasing nanotech research is vital to allow applications to reach the market. The link between R&D and applications is a key one in the value chain, given that on its success depends the conversion of nanotechnology into a viable industry; otherwise, it will never get beyond the realm of science fiction. The move from nanoscience to nanotechnology will therefore mark the entire development of the value chain.

The practical applications eventually created currently face high industrialisation costs. These high costs prevent many applications from achieving commercial viability, thus creating a bottle neck. One example can be seen in single wall nanotubes, which cannot be produced in economies of scale using existing equipment; their high cost makes them unviable. In order to overcome this barrier, the priority objective must be to find new materials and processes that will reduce costs.

In these early days of nanotechnology, consumers still play a secondary role, given that nanotech products are only beginning to be marketed now. The R&D phase currently takes up the greatest time and effort.

There is still considerable uncertainty as to when the industrialisation and marketing of nanotechnology-based products and services will really be able to take off. The FTF experts consider that the turning point may come in 10 or 15 years time when R&D work and the search for applications will be overtaken by large-scale production and the introduction of nanotech advances onto the market.

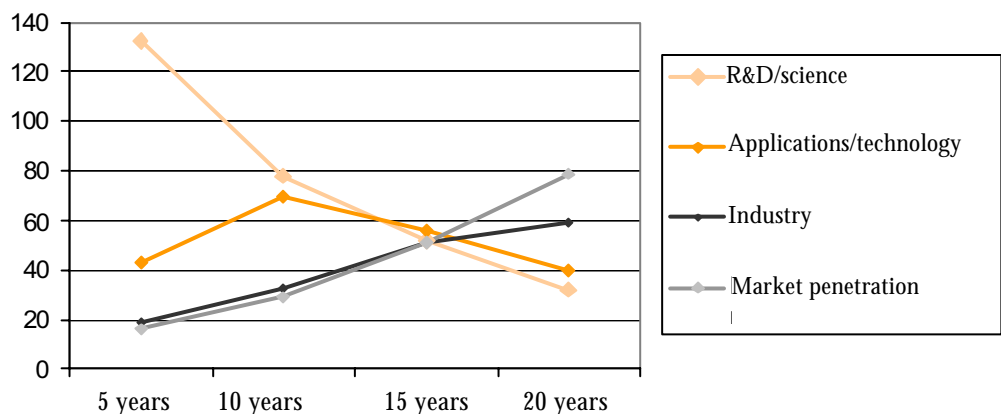


Illustration 12. Stages in the value chain over the next twenty years

Source: own preparation.

4.2. Agents who can promote the nanotechnology industry

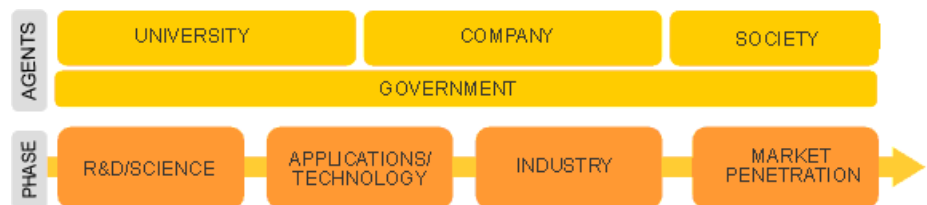
This section will analyse the agents responsible for promoting nanotechnology so that nanotech industrialisation and market penetration can continue.

On many occasions, the first innovative ideas come in academic circles, where work is not initially conditioned by the cost effectiveness of the inventions. Naturally enough, at a second stage, in order to achieve financing, the universities and other research institutes need to demonstrate the practical applications these innovative ideas could have for the market. Nanotechnology has followed this pattern and it is amongst the academic community that the sector's first steps are now being taken.

In parallel, the business community is of key importance in developing any market. Normally, companies may play a twin role in this scene. On the one hand, they can invest in R&D and foster the development of new applications. This is the role most generally played by large corporations with significant investment capacity. Business also generates demand and pressure to keep the phases of the value chain moving, demanding that the theoretical applications be turned into hard reality by incorporating the advances into production cycles.

On the part of society there might also be a certain degree of pressure, since consumers are always looking for ways to improve their quality of life. However nanotechnology is still a great unknown for most people and it therefore seems unlikely that final consumers will act as an agent of change promoting the emergence of this new industry.

Government support throughout the nanotechnology development process may play a decisive role. In the US, for example, the national nanotechnology initiative (NNI) has given a great boost to research, leading to an increase in both public and private investment. Indeed, this initiative has been replicated by several other countries.



We could divide the agents involved in the process into two categories: the ones who generate the supply forces (the pushers), who include universities, industry and government, and those that generate the demand forces (the pullers), including multinationals, SMEs and consumers.

The FTF experts consider that nanotechnology will be turned into a viable industry as a result of a push from university and government, i.e. from the supply-side forces. Companies and consumers (the pullers) are still a long way from playing a leading role in nanotechnology.

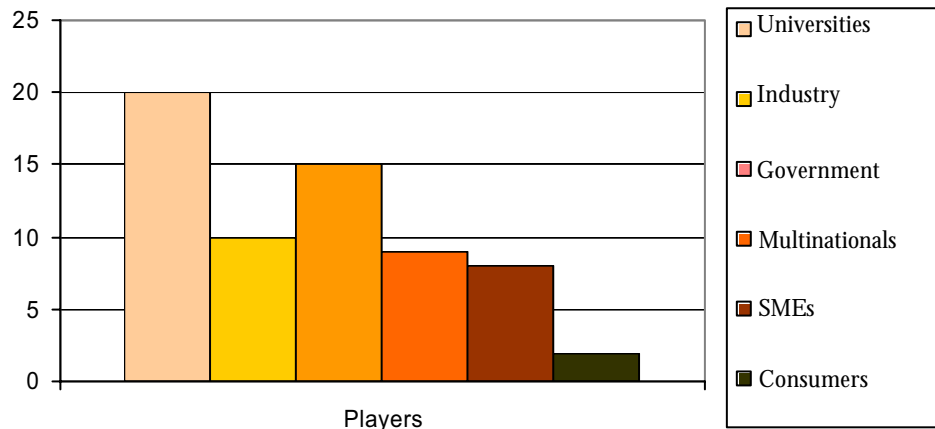
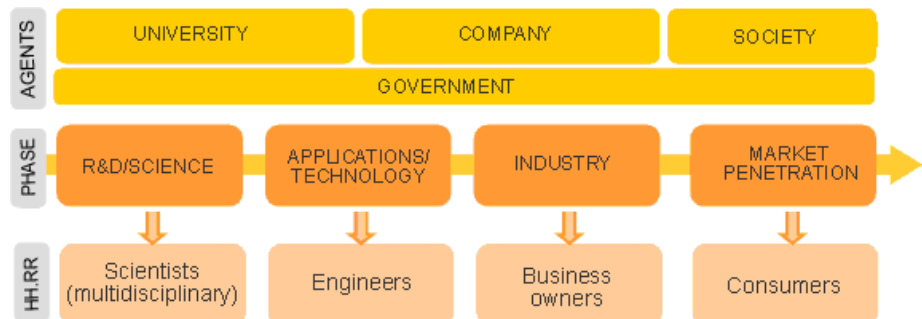


Illustration 13. Influence in the development of nanotechnology at the present time
Source: own preparation.

4.3. People with an influential role in nanotechnology

The current emergence of nanoscience and nanotechnology requires well-trained individuals who can contribute expertise in the various phases of the value chain. They will play an essential role in developing the industry.

Whereas scientists have to make further progress on research into the different areas of application of nanotechnology, well-trained personnel who are capable of finding real applications that can be brought to market are also needed. In turn, the industrialisation and marketing phases must have backing from the business community who will commit to innovation, and companies that are willing to assume certain risks in exchange for the possible rich pickings of being the first in a very promising market.



According to figures from the European NanoBusiness Association's 2005 survey⁵⁹, finding people with the right profile to work in the nanotechnology industry is a complicated task-or at least, just as difficult as finding specialised personnel for other industries.

59. Website: <http://www.nanoeurope.org/>.

The fact that this branch of science is still at an infant stage and the need for multidisciplinary training that has yet to be developed with formal programmes are two of the main obstacles explaining the shortage of human resources in this market.

How easy is it on scale of 1 to 5 to find personnel with the right skills?

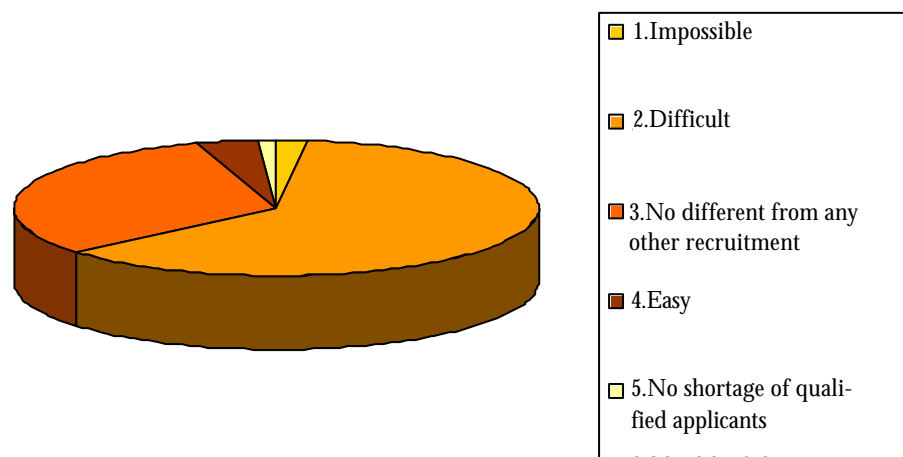


Illustration 14. How easy is it on scale of 1 to 5 to find personnel with the right skills?
Source: The 2005 European NanoBusiness Survey (ENA).

With regard to the perceived quality of the people currently involved in nanotechnology, the FTF experts make a number of differentiations. According to the results obtained, two groups can be distinguished: on the one hand are the business community, which still has to get more involved and more educated about these nanotech developments before this new branch of science can become a strong, profitable industry; and on the other hand are the scientists working in R&D who are looking for practical applications, with a very high level of training, capable of contributing great value to the phases of the production chain in which they are involved.

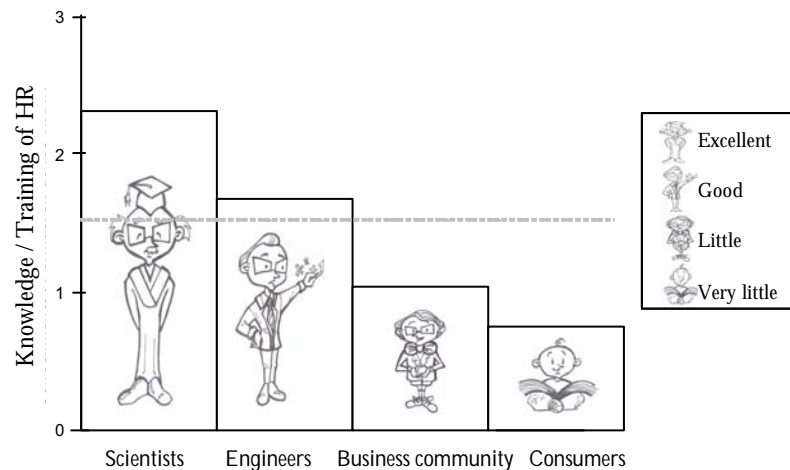


Illustration 15. Training level of human resources Source: own preparation.

As a final note, it is worth noting that consumers will take some time to become aware of the potential of nanotechnology. Indeed, many may never be fully aware of the developments, noticing only the improvements in products they were already using without knowing anything about the technology that has made it possible.

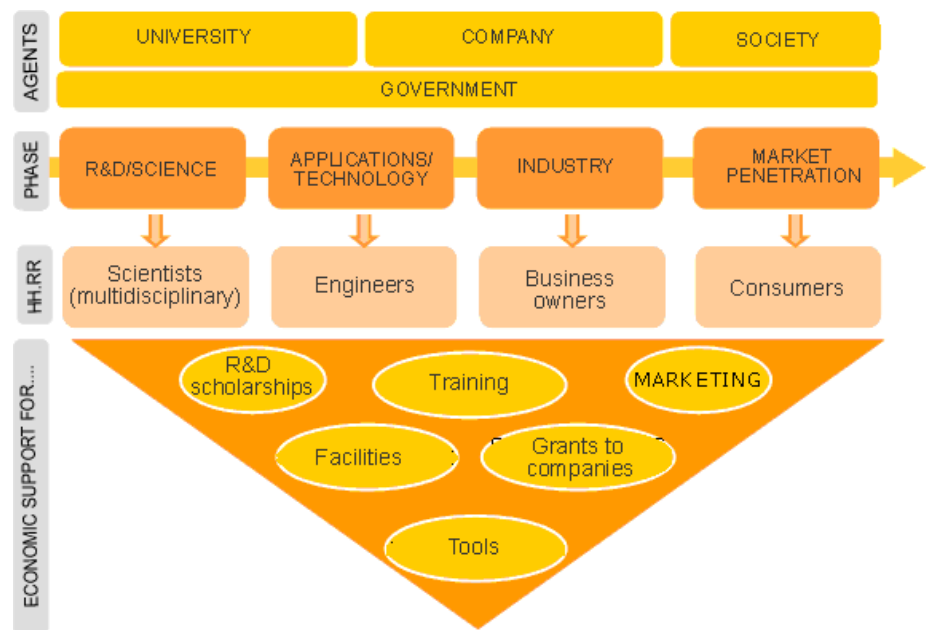
4.4. Economic support in the value chain

Financial support plays a key role in allowing a transfer of technological knowledge from research centres to industry and the market. In order to initiate the development of new products and processes and penetrate new markets, investments are required, especially at this point in time. Close cooperation between the financial community and nanotech companies can help achieve these goals.

Investments, for example, can cover different aspects of the value chain, from R&D projects to projects designed to publicise nanotechnology's potential. Two aspects will be vital to the success of these investments: selection of the target and the moment.

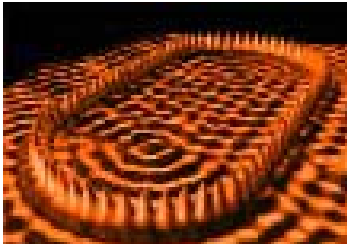
The frame below shows the complete value chain with all the necessary components that will allow a scientific concept to be turned into an everyday product.

Notes



The areas on which economic support focuses could be classified as follows:

- Scholarships and other grants to R&D: the first phases in the value chain must be supported by investment if they can convert science into technology.
- Facilities and infrastructures: the creation of facilities in which nanotechnology can be developed, applied and generated is a key factor for its future. Many of the people involved in nanotechnology will converge in the same infrastructures.
- Tools: Providing researchers with the right tools at a competitive cost is essential to continued innovation in nanotechnology.
- Grants to business: the awarding of grants and other kinds of benefits (including tax incentives) will give businesspeople an impetus to create new nanotech companies.
- Marketing: society needs to be made aware of the potential nanotechnology holds out for their everyday lives in order to generate an increased market demand.



- Training: the main agents in the development of nanotechnology throughout the entire value chain need to receive the right training, giving them the skills they need in their work.

As Illustration 16 shows, the FTF experts believe that economic backing, regardless of the source, must be distributed amongst all the links in the value chain. There are only small differences: for example, the awarding of scholarships and other types of grant for research and development and the creation of infrastructures must receive more public funding. However, private investment should play a somewhat more predominant role in disseminating nanotechnology among society and in encouraging multidisciplinary studies.

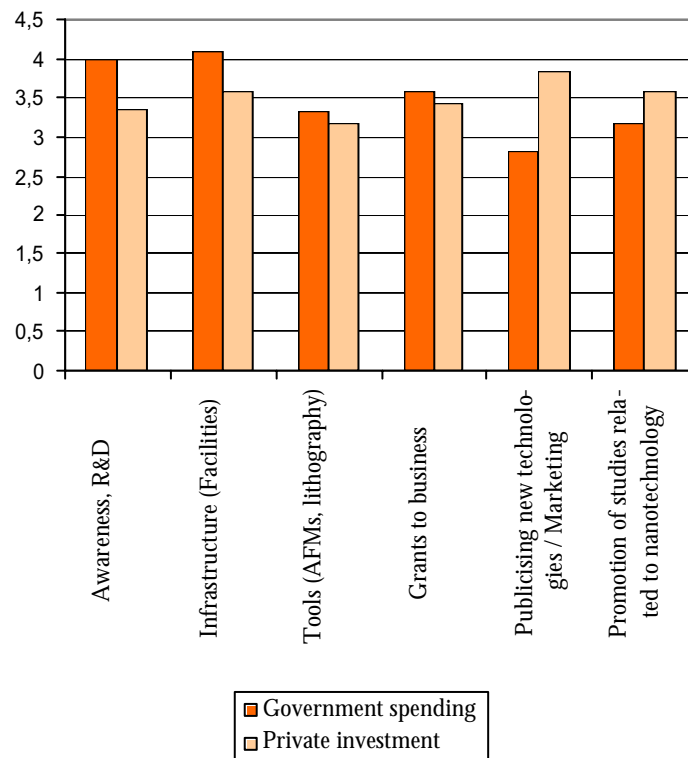


Illustration 16. Priority of spending by government and the private sector
Source: own preparation.