

Innovation-square

Changing strategies for business innovation

Summary of *Innovatie²: vernieuwingen in de innovatiefunctie van ondernemingen* by Dany Jacobs and Jan Waalkens (in Dutch; ISBN 90 14 08152 9)

1. The question

The starting point of this study was the question posed by the Advisory Council for Science and Technology Policy (AWT): “How will R&D in enterprises evolve over the next 10 to 20 years and how should we respond to this in our policy?” In the AWT’s working programme for 2001, this question was elaborated as follows: “The role and position of R&D in enterprises is changing rapidly. Some companies have opted for more decentralized management of their R&D in recent years out of a desire to bring R&D closer to the market, often with the result that less fundamental research is being conducted. The number of companies consciously pursuing a R&D policy is also increasing rapidly, especially in the services sector and among small and medium-sized enterprises. In addition, many companies are displaying a growing willingness to collaborate with others. The nature of research is also changing, with a greater emphasis on technology-related scientific research, on service activities, on simulation research and on entrepreneurship.”

These comments raise the following questions:

- what are the trends in R&D in practice?
- do they differ according to the nature of the sector and/or the company?
- what are the expectations for the coming 10 to 20 years?
- to what extent do ‘traditional’ R&D policy instruments need to be adapted?

We were not intended to limit ourselves to what is traditionally defined as R&D, since classical definitions of research and development are inadequate to cover the full breadth of corporate efforts at innovation, especially if our analysis includes innovation in the services

sector. We have therefore defined the innovation function as the function within the enterprise which is engaged in a relatively structural way in innovation over the longer term. This can involve innovation in processes, products, changes, transactions and concepts, as well as the development of new ‘business models’ (including the innovation function itself!).

The question posed by the AWT called above all for a *future perspective*. Naturally, we also looked at some recent developments, but were not asked to investigate which developments were most representative, which would have called for a more extensive study, including quantitative research.

2. Renewal of the innovation function

The question from the AWT concerning the development of the innovation function in enterprises is entirely understandable. After all, we find the most diverse stories on this point in the media, both the popular press and professional literature, which makes it difficult to discover deeper underlying structures in them. Table 1 presents a brief survey of reports on recent reorganizations in this field.

Enterprise (sector) [source]	Renewal of the innovation function	Reason
Pfizer (pharmaceuticals) [<i>Financial Times</i> , 20-11-00]	Creation of eight internal R&D centers of excellence competing with each other for resources. The final phase of testing of new medicines is centralized in one place.	To restore small-scale nature of research and combine it with competition and commercial approach in the research function, but utilizing advantages of scale in the development function.
DaimlerChrysler Research & Technology North America (DC-RTNA) (cars) [<i>Research & Technology Management</i> , Nov-Dec 2000]	New R&D model inspired by the Silicon Valley model, located at Stanford University in Palo Alto. Investment of 100 million dollars in venture capital to create an ‘ideas market’, aimed at a combination of incubation projects, partnerships and <i>technology licensing</i> .	To invent new business models as well as new technologies themselves in response to the required speed of R&D in the Internet era.
BT (telecom) [<i>Financial Times</i> , 4-12-00]	Creation of its own incubator Brightstar (at the site of BT’s research lab at Adastral Park in Ipswich), which is designed to organize spin-offs from the enterprise on the basis of BT’s technologies and in which (together with investments by venture capital funds like 3i) BT will retain a minority shareholding.	Better exploitation of BT’s 14,000-plus patents (‘generating value from hidden assets’), strengthening BT’s market capitalization. Increasing R&D department’s exposure to the market.
Schering-Plough (pharmaceuticals) in collaboration with Phase Forward [<i>Business Week</i> , 11-12-00]	Use of Internet to store and accelerate checking of data from clinical tests and data about patients.	Acceleration of the development process of medicines by around 30% (1 to 2 years).
Shiseiso Cosmetic (cosmetics: largest in Japan, 4 th largest in the world) [<i>Far Eastern Economic Review</i> , 14-12-00]	New (8 th and largest) R&D lab in Tsuzuki-ku is far more integrated than the last, which was split into divisions by type of technology and product. Annual ‘idea contest’ for last 13 years.	‘Creative integration’ and ‘cross fertilization across department boundaries’. Sharper focus on customer. Generates 200 to 300

		suggestions from employees annually, of which around 10% are seriously investigated.
Alcatel (telecom) [<i>Internet press release, 24-01-01</i>]	Start of venture capital funds in Silicon Valley. Investment in Internet start-ups. Alcatel is the largest partner and investor in a fund worth around 300 million guilders.	Besides monitor function, new investment instrument expands possibilities to acquire new critical technology quickly.
Janssen Pharmaceutica [<i>De Standaard, 21-02-01; Trends 12-04-01</i>]	Saving on fundamental research: merger of the Janssen Research Foundation in Belgium with the Pharmaceutical Research Institute in the United States under the umbrella of the Johnson & Johnson group.	Cost saving (245 out of 500 research jobs scrapped in basic research) and shifting of risks of fundamental research to external laboratories. To increase profitability.
GlaxoSmithKline (pharmaceuticals; 2 nd largest in the world) [<i>Financial Times, 23-03-01</i>]	Part of the R&D department is being split up into six autonomous biotechnology units organized on the basis of therapy lines and competing with each other. For the rest of the enterprise the fundamental research is divided into two departments (Genetics Research and Discovery Research), the final development (for instance, testing) of products remains collective because of the advantages of scale.	To increase productivity; stimulate flexibility and entrepreneurship.
Cisco (Internet hardware) [<i>Business Week, 26-02-01</i>]	In recent years Cisco has acquired 42 companies, which now together account for 40% of its turnover. In January 2001 Cisco set aside more than one billion dollars for a venture fund that would be run by Softbank in Asia. Further similar initiatives will follow.	Rapid growth and build up technology competencies. Ensure that the innovation pipeline does not run dry.

Table 1. Recent initiatives with respect to renewal of the innovation function.

3. Less fundamental research, or just conducted elsewhere

Reports like the one mentioned in table 1 about Janssen Pharmaceutica in Belgium (which has traditionally operated independently in the American Johnson & Johnson group) seem very worrying and reinforce the idea that enterprises are still unwilling to invest a lot in fundamental research.¹ This is a pattern that has been evident for some time, but it is probably less worrying than it seems at first glance. because at the same time companies outsource more fundamental research to universities and increasingly form public-private partnerships, such as the technological top institutes in the Netherlands.

Table 2 combines recent data from coordinated surveys of the members of the American and European organizations of R&D directors, the Industrial Research Institute (IRI) and the European Industrial Research Management Association (EIRMA). It should be noted here that the number of respondents to these surveys was small, just 109 and 33 for the United States

¹ Ajit Shetty, delegate director of Janssen Pharmaceutica, in fact denies that this strictly speaking involves spending cuts but rather a better focusing of R&D (Trends, 12-4-01).

and Europe respectively. The best way to read table 2 is along the rows, which show what changes the R&D directors in this sample of industrial enterprises in the United States and Europe expect for each category of R&D expenditure. A striking feature is that on balance expenditure is not expected to decline for any of the categories, so not even for basic research. But it is also interesting that a relatively large amount will be invested in new products and services (new business development). The table also shows that there will be above-average growth in the categories 'R&D alliances and joint ventures' and outsourcing to universities.

Regions	US	EU	US	EU	US	EU	US	EU	US	EU	US	EU
Expected change in R&D expenditures	-5% or less		-5% to 0		0 to + 5%		+5 to +10%		+10% or more		Total	
Total R&D expenditures	7	3	17	12	47	61	21	24	8	0	100	100
R&D expenditures at universities	8	0	13	6	55	70	20	21	4	3	100	100
Relative distribution of R&D expenditures												
▪ support of existing business	5	6	25	21	50	46	16	27	4	0	100	100
▪ basic research	8	3	30	43	45	39	15	15	2	0	100	100
▪ <i>new business</i> projects	6	3	10	0	32	33	40	46	16	18	100	100
Size of R&D staff	3	3	20	21	56	52	16	24	5	0	100	100
Size of R&D alliances and joint ventures	0	0	7	6	46	70	39	21	8	3	100	100
Hiring of recent graduates	6	0	14	6	58	73	20	21	2	0	100	100

Table 2. Changes in R&D-expenditures by industrial enterprises.
Source: Figures from IRI (2000), EIRMA (2000)²

4. What have we learned?

1. An important conclusion from our study is that it provides further confirmation of the argument that the knowledge-based economy is to a larger extent also a network economy. The trend is for many enterprises to conduct less in-house research, and especially fundamental research, but to perform more through outsourcing and alliances. This occurs to such a degree that in the services sector a 'second', private knowledge infrastructure has been created alongside the primary public knowledge infrastructure, consisting of a broad range of knowledge-intensive commercial services, including private R&D labs. In addition, enterprises increasingly sell findings they do not plan to use themselves on the market, for instance via Internet exchanges. In that sense, R&D-intensive enterprises are increasingly creating something akin to a third knowledge infrastructure for each other. Internally, enterprises are also organizing themselves less as – in Oliver Williamson's words – monolithic hierarchies and more as internal networks and markets. On the one hand, they allow more competition between teams, and even entire R&D departments; on the other,

² With thanks to the IRI for providing the data. The basic document is 'IRI Trends Forecast for 2001' together with brief comparable tables for Europe, Japan, South Korea, Canada and Mexico. The trends in the latter countries are in the same direction.

many enterprises have in recent years formed their own venture capital funds with which they also try to mobilize and organize new initiatives from outside.

2. For anyone who has followed the theoretical discussions in the last decade some of these developments may seem less new than they really are. After all, there is something to be said for the argument that many ideas that have come to prominence in the literature on management and innovation over the last 10 to 15 years are now also increasingly being put into practice. For instance, Kline and Rosenberg's interactive innovation model is already 15 years old but is only now slowly becoming a conscious element of the innovation practice of leading enterprises. An approach that builds on this model is the so-called fourth generation R&D. In third generation R&D, companies tried to incorporate explicit market demand in the development process; the fourth generation also incorporates unexpressed (latent) needs. More generally, innovation has increasingly become an element of the primary processes of enterprises and core competencies in the area of innovation are increasingly linked to other strategic core competencies.

3. A consequence of the previous point is that in the knowledge-based economy the earlier identification of innovation with the R&D function no longer really applies, and certainly not if we include innovation in the services sector. It is not only a question of innovative technological development but more especially the successful integration of new technologies and concepts in a broad range of products and services, whose added value is recognized and appreciated by the customer. The innovation function is therefore defined in this study as *the function within the enterprise which is engaged in a relatively structured way with innovation over the longer term*. Besides the familiar product and process innovation from R&D research, the concept also includes organizational, chain, transaction and concept innovation, as well as the development of new business models.

4. The need for this extension of the innovation function is recognized by a growing number of enterprises. This is why in recent years we have seen many enterprises establish separate departments for (new) business development. These are usually small units positioned relatively close to the general management, and their purpose is to give shape to this broad innovation function. While they assess the degree to which bottom-up initiatives could have a broader relevance for the organization; they are, however, usually also expected to introduce their own more radical initiatives for innovation outside the traditional framework of the enterprise.

5. Another important distinction is still that between incremental and radical innovation. In practice, the – otherwise very useful – ‘hype of the day’ means that large enterprises generally tend to be engaged only in incremental innovation. There is a growing recognition that to bring about radical innovation the enterprise needs to discover new ways of ‘learning to learn’, to create different innovation mechanisms and so also accept more risks. This is one reason why greater efforts have been made in recent years to accommodate this special innovation function by developing initiatives outside the enterprise itself (external ventures). This was in fact encouraged by another hype, the attempt to jump on the bandwagon of spectacularly successful venture capital funds around Silicon Valley. The recent bursting of the Internet bubble has cooled enthusiasm in that direction, although it is equally clear that a number of larger enterprises that have enjoyed success with it for some time are determined to go further in the same direction. This is because they, in contrast to the more financially-oriented venture capital companies, opt for this form of organization as a

way of bringing about radical innovation and the associated focus and entrepreneurship. More generally, we also note that innovation is less frequently achieved through a purely internal structure, but more via networks and internal and external market relationships. A number of companies also explicitly say that they have shifted from a model of R&D to one of A&D: *acquisition* (of successful innovators) and *development*.

6. This brings us to an important element that cropped up again and again both in the literature and in interviews for this study: speed, and associated with it focus, commercialization and entrepreneurship. It is clear that promoting speed of creativity and innovation is a difficult and subtle process. Nevertheless, this is clearly a target for many enterprises. This is related entirely to the increase in competition and the shortening technology, product and concept life cycles. There are several mechanisms that companies have tried to use in this context:

- sharpening strategic focus;
- Human Resources policy aimed at retaining the best employees, for instance through the use of new remuneration systems;
- alternative portfolio management techniques;
- time pacing, the programming of innovation according to the calendar;
- competition between various departments and teams;
- concurrent engineering and competitive research;
- support of product development via ICT and Internet.

7. The necessary developments can be observed in the innovation function of enterprises. At the same time, we have pointed out that many developments described in the media as new are in fact movements or adjustments within a number of continuing trends or areas of tension that have existed for some time and will not lose their relevance any time soon. In that sense there is less new under the sun than is often suggested. The areas of tension are:

- formalization of the innovation function in separate departments, or an implicit drive for innovation throughout the entire organization;
- the relative weight of technology push and market pull within a generally more interactive approach;
- centralization or decentralization;
- location of the innovation function in one place or internationally dispersed;
- 'go it alone' versus collaboration with others.

The interesting thing about these areas of tension is that in practice fewer and fewer companies find themselves at just one place on the continuum. Enterprises are increasingly inventive in finding ways to combine the strengths of both poles of the various continuums: certain departments are decentralized locally and others are centralized; they combine *technology push* with *market pull*; they strengthen their *core*, but also work together in networks. More generally, it is also increasingly true to say there is no single model of innovation. Both within and between enterprises, more and more mechanisms and forms of organization are being combined in this respect.

8. With respect to the services sector, our book qualifies the impression that innovation is, in the terminology of Keith Pavitt, mainly 'supplier dominated', in other words to a large extent initiated by technological innovations from the capital goods sector. We have described a number of models of innovation in the services sector which show that the role of the services sector is usually at least that of co-innovator. In fact, a large number of professional commercial services stress co-innovation to such an extent that they are developing in the

direction of a second, private, knowledge infrastructure complementary to the public one. We also found that a small number of service enterprises are establishing separate service labs. These might come under pressure if there is a recession, but in the long term we still expect this form of organization of innovation to become more widespread in the services sector.

9. To sum up: the innovation function of enterprises is changing across a wide spectrum. Innovation is being addressed in increasingly innovative and diverse ways. Hence our title *Innovation-square*. Of course, this is not so surprising since competition in the knowledge-based economy is mainly about capacity to innovate and learn. At the same time, we found that new approaches that have already been propagated in the literature for some time are only slowly being put into practice and that a number of existing areas of tension and around which the innovation function must be organized are far from losing their relevance. Our book analytically dissects and presents various developments in innovation. We will therefore present one more case study that illustrates how most of these developments in fact also converge and are interconnected.

Various developments converge: Philips

According to Philips' website, the new Nat. Lab. Research center is intended to be a world-class center of expertise in the field of scientific research, development, process and product technology. The company states that its motives for concentrating these activities in the new Philips High Tech Campus are to maximize synergy, increase efficiency and increase the return on investment. In four years the 170,000 m² of floor space in the new research facilities should be able to accommodate up to 80,000 people, including the staff of existing laboratories who are now dispersed around the city of Eindhoven.

In principle, R&D at Philips is fairly centralized. However, it appears difficult to attract new people in this way, which is why the R&D is also partially decentralized at locations where these highly educated staff can be found. Venturing also enjoys a prominent place in Philip's R&D policy, and will continue to play a certain role in the new home. These ventures are internal and so are not independent enterprises. But HR policy does differ from the usual one in the Philips organization in the area of remuneration. The pioneers of the ventures can, for instance, receive Philips options in order to share in potential profits. Stimulating intrapreneurship is clearly a goal here, but the most important motive is the contribution made to Philips' objectives. A striking feature at Philips, which may run contrary to prevailing opinion, is that venturing in R&D is essentially seen as a form of technology push. After all, it is impossible to ask customers their opinion about electronics that don't yet exist. The integration of customer wishes is, however, sought at an early stage. Another aspect of the R&D process is the early development of business plans, at almost the same time as development of the technology.

The role of Philips Design in the development process has also clearly increased in recent years. This part of the organization now has around 500 employees dispersed over 13 locations. Its role can be seen at three levels within Philips.

- 1. At the macro level it is involved in formulating strategy. The remit here is to link socio-cultural developments to economic developments. The design of products must in that case reflect the aspirations and ambitions of Philips.*
- 2. At meso level, contextual themes, such as the home, street and the city, are formulated as a framework for developers.*
- 3. At the micro level, the various products are actually designed within the studios.*

The whole process is an iterative one, in all phases and at all levels of the development. Design is not only the cornerstone of developments, but also actually initiates them. All things considered, Philips therefore seems to provide a good example of concurrent research.

10. What are the consequences of all this for innovation policy? First, policy makers must look at far more than just R&D. We now regularly hear from the ministries that ‘Dutch industry’ is not innovative enough, while it is clear that they do not have a clear picture of the full scope of the private sector’s efforts to innovate. In fact, *Syntens*, the Dutch government agency whose role is to support smaller enterprises in the area of innovation, has been taking this broader view for some time.

Moreover, a number of principles with respect to the government’s innovation policy remain intact. The role of the government lies mainly in the organization and (partial) subsidizing of fundamental research because the ‘public good’ nature of innovation is clearest here. At the other end of the innovation spectrum, the government can play a role as major customer in demand-driven demonstration projects.

Previous research has shown that relatively high quality and standards, e.g. environmental, are a driving force in (adaptive) innovation. But otherwise most of the respondents in this study hastened to stress that the government must not interfere too much with the innovation activities of enterprises since this can quickly distort the market. Innovation here is best stimulated by a strict competition policy.

The most exciting developments are in fact taking place in the widening middle ground between pure basic research and purely commercial product development. Where fundamental, groundbreaking and problem-solving applied research overlap, there is a danger that the results will become less accessible to the public. Especially where there is a public-private partnership, it is important to use the public funds invested in it to preserve the ‘public good’ nature of the more fundamental research which is so important for innovation.

At the level of pure applied research the role of the government seems to be exhausted. Where an innovative ‘second’ and even ‘third’ private knowledge infrastructure without much subsidy appears viable in this area, it is increasingly difficult to demonstrate the added value of a primary knowledge infrastructure financed from public funds. The role of the government as supplier of venture capital is also exhausted. After all, the Dutch capital market also functions well in this regard, and the hedging of risks in the past quickly led to *moral hazard* (privatization of the profit and socialization of the loss). *Twinning*, the ICT incubator initiated by the Dutch government, may have set an example, but it no longer has any added value in relation to similar private initiatives.

List of enterprises and organizations interviewed

Achmea Zorg	Health care insurance
Dialogic	Software
DSM	Chemicals
EIRMA	Wolf Gerhrisch, Deputy Secretary General
Endemol	Entertainment productions
GorillaPark	Venture capital
ING	Banking and insurance
IRI	Maria R. Grucza, Director Research Services
Key Gene	Biotechnology

NBS&D
KPMG
Organon
Philips
Randstad
Shell
Unilevers
VNU

Consultancy
Consultancy
Pharmaceuticals
Electronics
temporary employment
oil
food, skin care & cleaning products
publishing