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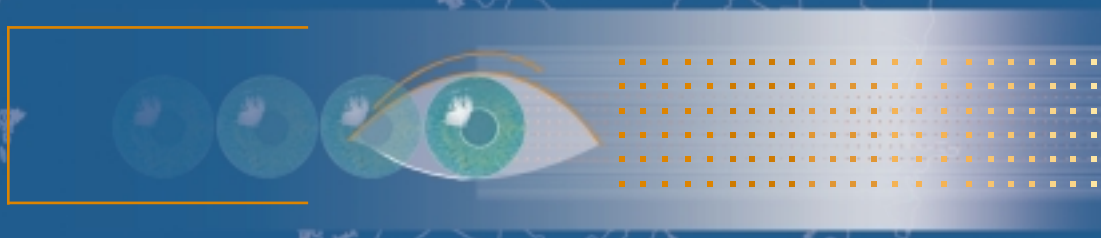

Corporate Foresight in Europe: A First Overview

Patrick Becker

Institute for Science and Technology Studies , University of Bielefeld, Germany

October 2002

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WORKING PAPER

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This document was prepared during P. Becker's training period within the K-2 Science and Technology Foresight unit

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Executive Summary

With the advent of the knowledge economy, decision-making in the R&T area has become increasingly complex, with science and technology being both a driver of, and driven by, social change and economic development. Against this background, future foresight activities promise to generate a clearer picture of the possible long-term challenges and opportunities arising out of these interdependencies, thus providing a crucial input for strategic planning in the area of research, technology development and innovation (RTDI).

In the context of the general mission to create an European Area of Research and Innovation (ERA) and its contribution to the goal of making Europe the most competitive knowledge economy in the world ("Lisbon strategy"), the EU-Commission was interested in getting a first overview of the current uses, practices and impacts of foresight in the private sector – so far, a true „white spot" in foresight activities. Consequently, this study has been launched to take a closer look at the current state of affairs in corporate foresight – its forms and functions, its main topics and issues, and its practical problems and potentials. The study was based on personal interviews with 18 selected enterprises, mostly from the high-technology (automotive, electrical engineering, ICT, chemical/pharmaceutical) industry, the consumer goods and the service sectors (utilities, transportation, banking/insurance). Its major findings can be summed up as follows:

- Nearly all companies described their competitive environment as highly dynamic, with a continuous pressure to engage in RTDI activities. This led all of them to engage in foresight, although in different forms.

- Most corporate foresight activities are grounded in two motives – either they are a consequence of a companies' business operation which inherently demand such a long-term orientation (as in industries with long product cycles), or they are undertaken as a proactive step to better cope with uncertainties in the business environment in general.

- Although the specific forms and purposes of companies' foresight activities differ, three overarching ideal types could be identified – the "collecting post", the "observatory", and the future "think tank". Their main differences lie in the degree of specialisation and scope of their future-related work.

- The main thematic areas of foresight are still technology trends on the one hand and market trends on the other. Broader social, political or regional aspects are taken into account only by "think tanks" or by firms that operate in sectors characterised by an obvious societal embeddedness.

- Regarding the information sources used for foresight, personal information takes a clear predominance over the information that is openly available; likewise a majority of firms consider external knowledge more useful and important for their foresight work than information that is internally generated.

- Complementary to this, there also seems to be a preference of methods based on the interaction between different (internal or external) players that are rather

person- and communication-orientated. Nevertheless, also quantitative instruments are still widely used in specific areas.

- Finally, two points were identified as deserving more attention in current corporate foresight practice, as they might hold huge potentials for successful foresight work: Firstly, there must be a better communication and a more focused impact of foresight results in the company; and secondly, a better interfirm co-operation and consultation between different foresight exercises might save a lot of double work, create new synergies and generate a broader knowledge base for their RTDI decision-making.

Above all other results, however, the main concern of all participants was that one should further discuss the results and the possible opportunities of a European-wide networking. The Unit K-2 (Science and Technology Foresight) of the General-Directorate RTD has taken up this request and will organise a workshop that will take place on the 19th of November 2002 in Brussels. On the basis of this study, the workshop wants to explore if there is a potential for action and co-operation on a European level, and which role the European Commission and other international associations could play in this development.

Introduction:

Why analysing foresight activities in Corporations?

Foresight (a.k.a. "technology foresight")[1] is about thinking, debating and shaping the future. As such, foresight activities play a pivotal role in today's decision-making processes within organisations that try to formulate forward planning strategies or future-orientated policies.

In particular, foresight activities are an increasingly important tool in the process of developing research and innovation (RTDI) strategies. It reflects the fact that decision-making in the R&T area is becoming more and more complex, with science and technology (i.e. scientific and technological innovation) being both a major driver of and strongly driven by social change and economic development. Innovation is now seen to take place in larger heterogeneous entities – be it within sectoral, regional, national, or even international innovation systems. Against this background, foresight has a huge potential to raise awareness and to generate better knowledge of those interdependencies among the different actors and the possible long-term challenges and opportunities arising out of this, as well as providing them with a point of entry in the process of shaping their common future.

In the context of the general mission of the DG RTD to create an European Area of Research and Innovation (ERA), the Unit K-2 „Science and Technology Foresight" within the Directorate K has been established as a think tank that explicitly aims at strengthening the strategic dimension of the ERA by stimulating the use of foresight in Europe - be it by supporting the development of different foresight institutions and methodologies, by promoting an "European Area for Foresight" (EFA) that promotes and integrates foresight activities at all levels, or by mobilising and networking all relevant (foresight) actors within the RTDI-System.

As an integral part of K2's strategic approach to develop a foresight awareness in Europe, this study has been launched to address a true „white spot" in foresight activities: So far, foresight has mostly been used for decision-making and priority setting in the public sectors of systems of innovation, while the other parts of the RTDI system – most notably all the entrepreneurial actors on the private side (who actually bring the innovations to the market) – have been largely left out of picture.

Consequently, this study wants to shed a light on the current uses, practices and impacts of foresight in the private sector, with a particular view to the possible contributions to innovation that foresight activities might bring in an entrepreneurial context. To this end, a questionnaire was developed and formed the basis for personal interviews with representatives of 18 companies in Europe that were considered to use „good practices" in foresight activities.[2]

The following paper describes the results of the comparative analysis of the 18 interviewed firms. The structure follows the core questions of the interview questionnaire and is clustered in the following four sections:

---

[1] *The term « technology foresight » can be misunderstood as dealing only with specific technologies in a very narrow sense. In this paper, however the term foresight and technology foresight represent the processes focusing on the interaction between science, technology and society.*

[2] *Background information on the characteristics of the enterprises included in the survey, as well as the detailed questionnaire, can be found in the Annex.*

I. The objectives of corporate foresight
II. The organisational characteristics of corporate foresight
III. Foresight processes in the firm
IV. Problems and potentials of corporate foresight

Background information on the characteristics of the enterprises included in the survey, as well as the detailed questionnaire, can be found in the Annex.

Before turning to the analysis, however, some preliminary comments regarding the premises of the study must be made - namely, a closer examination of the concept of "foresight" and its affinity to innovation.

What is meant by „foresight"?

In this paper, the term foresight is used in the following sense:

> *"Foresight should be understood as a participatory, future intelligence gathering and medium-to-long-term vision-building process that systematically attempts to look into the future of science, the economy and society in order to support present-day decision-making and to mobilise joint forces to realise them."*

Two aspects of foresight should be stressed: One is that foresight should be a process, not just a set of techniques. It involves consultative procedures to ensure feedback to and from relevant actors. Secondly, the starting point of foresight is the belief that there are many different futures. Precisely which of these futures one will arrive at depends in part of the decisions taken today. Thus, foresight involves a consciously „active" attitude towards the future, recognising that the choices we made today can shape or even create the future tomorrow.

As already mentioned in the introduction, this paper sees a close affinity between two future-orientated activities, namely foresight and innovation activities. There are two reasons for this:

- *A structural one*: One main reason for the great attention given to foresight lately seems to lie in the socio-economic setting under which innovation now has to be fostered: In today's knowledge-based economies, decision-making in the field of RTDI takes place under uncertainty and highly complex societal conditions, and thus explicitly demands the kind of input that are generated by foresight activities, such as

- anticipatory intelligence
- a better understanding of and openness for the different possible futures and hence the opportunity of shaping them
- the broadening of perspectives and the encouragement of thinking outside the box
- a higher flexibility and societal embeddedness (i.e. public participation) in decision-making and implementation

- *A procedural one*: Foresight also has a close affinity to innovation with regard to its particular procedural requirements and success conditions: Both innovation and foresight must be considered as a process that requires good communication involving (and gaining commitment of) all those likely to be affected, if the end-product should be successful. Thus, besides the importance of foresight input for

innovation activities, it can also give rise to very important innovation *process* benefits: If properly conducted, foresight can encourage the forging of better communication, collaboration, and shared commitment within and between individual companies, across different sectors, and among industry, academia and government. Such links are also essential if new innovative ideas and technologies are to be exploited to their full potential.[3]

The Structure of Corporate Foresight Activities in Europe

I. Objectives of Enterprises Engaged in Foresight

There is no generally accepted term for foresight among the companies in the survey. Expressions such as trend analysis, technology monitoring or future research are used to subsume everything referred to in the literature as future foresight. Although there was a general consensus among the companies for the need for such a foresight, the firms have quite different understandings of foresight and engage in it in with varying degrees of intensity and interest.

In the following, a more detailed overview about the different motives and reasons, the degree of specificity and the main functions of the corporate foresight activities are given.

A. Overarching philosophies of foresight

First of all, foresight activities can be classified in terms of the overarching goal or rationale that underlies their implementation. Generally speaking, most corporate foresight activities are grounded in two main motives: Either there are specific characteristics of a companies business operation that inherently demand such a long-term orientation, or foresight activities are undertaken as a proactive step to better cope with the uncertainties in their business environment. In other words, there are both reasons *internal* and *external* to a company that provide an impetus for doing foresight.

Summarising the interviews, *two typical internal drivers* for foresight could be identified:

1. In *industries characterised by long product cycles* and high development/investment costs (such as the automotive or chemical/pharmaceutical industry), *long-range monitoring and planning is an inevitable prerequisite to any strategical RTDI decision*: To successfully innovate, one has to early identify changes in markets and technologies, as both the product development and the restructuring of the corresponding production system needs a long time. (As one participant put it, “it needs at long-term perspective to identify potential new areas in which to build up competence, because the actual development of new competencies and human resources does at least need 10 years.”)

[3] *In this context, another link between foresight and innovation activities must be noted: Often enough, there is also a close conceptual interdependence between foresight and innovation processes, that is to say your model of innovation defines your model of foresight. For example, an organization based on the „technology-push“-model of innovation usually ends up with a rather technology-driven/technology-orientated foresight process as well.*

2. Also for *firms that pursue an "innovation leader"-strategy*, foresight seems inevitable, as they *have to constantly monitor and react on the innovation activities of their competitors* to secure their technological leadership in the market.

As *external drivers* for a foresight activity the following points were mentioned:

- A major motive (especially for firms in fast-changing sectors such as consumer goods and ICT) was to "never be surprised by future developments in the (business) environment", but to be aware and possibly influence them. Thus, companies use *foresight as part of an early warning system* in order to identify future threads and opportunities for their businesses.
  In a similar vein, some firms also employ foresight to *prepare for possible „wild card"-events and sudden shocks* (like the 9/11-terrorist attacks) in the political, economic and societal sphere

- In order to better understand the social/cultural context of the use of technology, firms in particularly technology-intensive sectors (Philips, Ericsson, IBM, Siemens) also use foresight more broadly *to build up knowledge* both about emerging technologies and their future users.

- Foresight could also be way *to open the company to the outside world* and to find starting points for innovation transfer, co-operation and best practices.

- Finally a lot of firms felt that foresight provides important background information about the future conditions and contexts in which the company will have to operate, Thus, foresight *analyses of the business environment* often serve *as the starting point for the development* of a corresponding *corporate strategy*. Such foresight activities that help to better embed the corporate strategy in their socio-economical context are found in a lot of sectors.

B. Objectives and functions of foresight

The ultimate objective of all foresight activities is to ensure that developments in the areas of science, technology and society that are likely to ensure future social benefits are identified promptly. Although all corporate foresight activities share this final goal, it is useful to categorise foresight in terms of its more intermediate functions and impacts for the company: a) *anticipatory intelligence*, i.e. providing background information and an early warning of recent developments; b) *direction-setting*, i.e. establishing broad guidelines for the corporate strategy; c) *determining priorities*, i.e. identifying the most desirable lines of R & D as a direct input into specific (funding) decisions; d) *strategy formulation*, i.e. participating in the formulation and implementation of strategic decisions; e) *innovation catalysing*, i.e. stimulating and supporting innovation processes between the different partners.

Most of the foresight activities mentioned in the survey could actually be subsumed more or less easily in one of the categories above; only a few firms reported to use foresight for many different purposes which demanded a combination of the individual functions. Most notably, Decathlon and Volvo and IBM seemed to employ

foresight tools for a wide range of tasks from intelligence gathering to strategy development.

Around half of the firms in the sample use foresight mainly in an illuminating and advisory role that may influence issues and decisions, but that seldom is directly involved in the decision-making process. For Company C, British Telecom and Procter & Gamble, foresight has a clear mandate to spot critical events in the future or to detect possible „stumbling blocks" for their businesses (and to alert decision-makers if necessary), not to formulate strategies (function (a)). Likewise, a number of firms (BASF, IBM, Ericsson, Eni, Decathlon) see it as a main task of foresight to look into the future more broadly and to advice the company on what to do today, i.e. to deliver those future-orientated information in the strategy-building-process. Again, foresight is used to give better orientation and directions for strategic decision-making, but is not involved in those decisions itself (function (b)).

In contrast to this, a considerable quantity of firms use the foresight also much more proactively, namely to explicitly influence, drives and implement decisions - either in a more limited and specific field, or with regard to the corporate strategy in general. The former is true for the rather specialised and focussed foresight activities of Lufthansa and Company B, who use foresight results and recommendation quite regularly as a direct input into specific decision-making processes, and at times the foresighters even participate in their actual implementation. (Function (c)) In the case of Volvo, Company A, IBM, EdF and Deutsche Bahn, foresight and planning activities are strongly integrated, i.e. it is used to not only to look into the future but also contributes directly in the strategy development/formulation process (function (d)). In most of the cases, this integration is achieved through functional accumulation, i.e. the persons doing foresight are also responsible for strategic decision-making (such as the staff/advisors of the CTO).

A small group of firms, finally, employ foresight in a rather unorthodox function could best be characterised as a catalytic role (function (e)): DaimlerChrysler, Philips and Decathlon explicitly use foresight processes to stimulate and enhance their innovation processes, either by using foresight tools to encourage better communication and to forge stronger links between the different partners necessary for innovation, or to directly generate new product ideas.

C. Breath of coverage

Another form of classification of foresight activities is in terms of the breath of coverage: (a) *holistic*, i.e. foresight concerned with the entire spectrum of science and society; (b) *macro-level*, such as foresight that covers a range of disciplines; (c) *meso-level*, i.e. foresight relating to single scientific field, technological area or product range/ sector, and (d) *micro-level*, i.e. foresight for a specific research project or product.

With regard to the firms in the sample, the distribution across those four categories was far from being even: Out of 19 firms, only two (P&G, Lufthansa) reported that their foresight activities mainly cover (or provide only input for) an individual project or a specific decision. A much higher number of firms (DB, Volvo, Company A, Eni, Siemens, IBM) however, focus their foresight efforts on the meso-level: Here, the analyses usually cover a somewhat broader area, as they have to provide input for the strategic decision-making process in entire subject areas of research. Nevertheless, also those activities are still rather specialised and centred on specific

issues in R&D such as the long-term planning of research programmes in certain technological areas or business units.
A considerably broader foresight approach was used by those companies that used foresight information as a basic input for both the decision-making process in different business areas and for the corporate strategy development. Here, the analyses comprehend the monitoring not only of special fields of technology but also of the more general trends in the social, economical, political and regional sphere. Not surprisingly, most of the firms that undertook such a foresight (Aventis, BASF, BT, Company C, Company B) were operating in sectors that are strongly globalised (such as financial services or the chemical/pharmaceutical industry), which implies that their business activities will also be strongly dependent on changes on a global level.
Some firms finally reported to be engaged in rather holistic foresight activities (Philips, DaimlerChrysler, Decathlon, Ericsson, EDF). Here, foresight was not only used as an input for strategic decision-making, but it also served as a tool to develop a more comprehensive „visions" of the future that not only painted a picture of the company's future but that of the societies and regions in which it is embedded. Those holistic – and thus rather unspecific and broad – analyses are mostly undertaken to better understand the structural changes in science and society and intend to provide a rough orientation for many different occasions.

II. Structural Characteristics of Corporate Foresight

A. Organisational characteristics of the foresight process

Generally speaking, foresight in enterprises can take place at three different organisational levels: Firstly, at the corporate level, mainly by corporate research or by the staff of the corporate development department; secondly, it is performed – often much less extensively- by the divisions, technology centres and business units themselves; and thirdly by temporary task forces which overlay those two structural levels by a third, „lateral" or „virtual" structure.

With regard to the companies in the survey, nearly all of them reported to conduct foresight at the corporate level. Here, long-term strategic thinking predominates, and the foresight activities are usually directly attached to the administration of corporate research or corporate development. In a number of cases, there is also a special office exclusively concerned with foresight efforts. It either consists of research workers permanently (i.e. full-time) engaged in foresight activities, or it is a unit that is staffed by both permanent futurists and personnel that has been temporarily assigned for the duration of a certain foresight project.
Only a few firms differed from this organisational pattern: P&G reported to only conduct foresight at the divisional level, but not on the corporate one. The main reason for this seems to be the strongly decentralised nature of its R&D-activities, which would make a centralised approach not worthwhile. The foresight activities of Company C and IBM – although anchored organisationally at (i.e. reporting to) the corporate level - closely resemble a „lateral" structure in which researchers from different parts of the company temporarily work together in foresight projects. However, those futurists usually stay at their original positions and locations in the organisation and thus build only virtual "groups".

Apart from this general classification, it becomes difficult to compare the exact forms and structures in which the firms pursue their foresight activities, as each of them has

its own distinctive historical background and individual organisational set-up. A few points may be enough to illustrate this huge variety: Some Firms in the survey employed as much as 30 people in their foresight units (DaimlerChrysler), while others didn't even have a permanent, full-time staff or any kind of separate organisational unit for such an task (IBM, Lufthansa, Company A); likewise some firms reported to spend as much as 10 Mio Euro on foresight related activities (BASF), while others didn't seem to have an own budget for such activities at all (Lufthansa, Company A). Also when looking at the organisation's actual foresight knowledge or experience, huge differences appeared: Some foresight just came into existence very recently (Volvo, Lufthansa, and Company C are engaged in foresight just since a couple of months), others have a track record of more than two decades (EdF, DaimlerChrysler).

In the following, therefore, all those different approaches will be subsumed under three overarching „ideal types" that try to highlight their essential features and major differences:

1) The Collecting Post (Company A, Lufthansa, P&G, Volvo)
In firms with a comparatively low degree of foresight activities, future-related research is mostly done in conjunction with – and strongly embedded in – other strategic R&D activities[4]. It is mainly concerned with providing basic background information (such as competitor or patent analyses) for the decision-making processes in these areas.
Because of the relatively low need for foresight input, the persons responsible for foresight are just part-time „futurists", (i.e. foresight is only one of their several tasks) and thus only seldom form a separate unit. Because of the limited analytical capacity, most foresight activities have to focus on the search and collection of future-related information that is already prepared by others and easily accessible. In practice, this means that they rely strongly on an internal network of observers and experts to provide them with the necessary information. In addition to that, they also re-direct a lot of their own foresight work to specialised agencies or consultancies, i.e. a lot future-related knowledge is just „bought" from the outside. Not surprisingly, these foresight activities have a relatively low visibility in the company and are known only to those who are directly involved in it.

2) The Observatory (DB, Company B, IBM, Eni, Company C)
In contrast to the first type, the observatory truly is an autonomous foresight unit with a full-time staff and a budget of its own. Moreover, it also has a clear mandate to focus on future-related issues. Its particular trait is that is fulfils a highly specialised and rather singular purpose for the company, be it the identification of socio-economical forecasts (in the case of the Company C foresight group) or forecasts of future traffic flows (in the case of the Deutsche Bahn). Out of its single-minded function follows that it also has a single addressee in the company - in most of the cases, the corporate development department.
In order to provide such a long-term strategic intelligence, the activities of those foresight units include not only the re-use of already existing data, but they also regularly generated new, future-related knowledge. To do so, they all rely not so much on internal networks (and their external information sources) but on their own external contacts. Needless to say, these networks are mostly made up of specialists from the same or similar fields of expertise, and only seldom tap into the broader areas of foresight.

[4] *This embeddedness is most clearly illustrated by the fact that those foresight units don't have their own budget but are subsumed under the general budget for corporate R&D.*

3) The Think Tank (Ericsson, British Telecom, BASF, Decathlon, EdF, DaimlerChrysler, Philips)
The most broad and elaborate foresight work is done by special units who act as a forward-looking think tank for their company, i.e. a group of full-time futurists, experts and researchers who explore all kind of future-related issues not only in the immediate business environment but also in the wider socio-economic, cultural and regional sphere. They have a much wider range of tasks than the observatory, and thus have to be more generalists than specialists. This is not to say that they don't have considerable knowledge in certain areas - in the contrary, those think tanks are often staffed by a number of highly trained experts from different fields, but their purpose is especially not to analyse only the developments in their individual fields of expertise but to connect them to a bigger picture of the future.
To fulfil their tasks, the think tanks have build up a global network of experts both from within the company and the outside. Some of them even have established a job rotation or other long-term co-operation with outside research centres or institutes. In any case, however, those think tanks are widely respected both within the company and outside, and they are called upon for many tasks, some of which even go beyond and above classical foresight (such as Philips´ "Foresight for innovation"); and sometimes they even conduct foresight activities for selected external clients like major suppliers or customers.

B. Addressees and users of foresight

Regarding the addressees of foresight, a distinction again has to be made between the different organisational levels – i.e., users at the top management level of the corporate research or corporate development department, users in the middle and higher management of the different strategic planning units in the divisions and business units, and the individual user (= researcher) in the different research centres, laboratories and product development departments.

Among the firms in the survey, three different orientations can be distinguished: In the first, the *foresight efforts are strongly orientated towards providing information for the top management level* (i.e. the executive vice president for technology or corporate strategy), who presents their priority customer. This addressee group was mainly found among the foresight groups with a „collecting post" or „ observatory" – function. (Company B, Volvo, Company A). The second model is *more broadly orientated at high-ranking managers on both the corporate research/corporate development level* (such as members of technology councils or strategy committees) and in the strategic planning units of the different business units. In fact, most of the companies in the survey named decision-makers from this level as their main client group (Company C, BASF, Deutsche Bahn, DaimlerChrysler, Decathlon, EdF, Eni, Ericsson, IBM, P&G). Some companies, finally, included *a third group of addressees* in their efforts, namely *the individual researchers and other interested employees*. However, this third group of " customer" was only served in addition to one of the previously mentioned groups, that is to say that the foresight analyses and results originally produced for others were later made available to the rest of the company.

The last point leads to another important feature of foresight activities - the way the information is (freely or restrictively) disseminated and shared across the company. In a lot of firms, foresight still operates according to the „need to know" rule, i.e. the results are usually made available only to those directly involved in the process (i.e. clients, informants, and fellow researchers) (Company B, Basf, DB, LH, Company A, Volvo). In a second group of firms, access to that information is more open: All those within the company who are interested can get the results on demand, but

sometimes only after a „grace period“ to prevent their misuse (DC, Decathlon, Philips). A last group of firms, finally, puts no restriction whatsoever on the availability and accessibility of their foresight results: They are open to everyone in the company, mostly via intranet or some commonly shared databases (BT, Eni, Company C, IBM, P&G). In some of these cases, a selection of their foresight work is even accessible from the outside (i.e. it is on the internet), and thus also gives an opportunity present it to - and to possibly gain feedback from - a much wider audience (BT, Ericsson, Philips, Aventis, Siemens).

III. What Forms does the Foresight Process take in Companies?

Technology foresight is not a well-defined or structured activity in the companies investigated; approximately half the firms reported to not having formalised processes at all. They gave as their reason for this that foresight activities are in themselves non-structured and linear, and that a too strong formalisation would only be counterproductive to their activities. Nevertheless, the enterprises were unanimous in ascribing to the foresight process at least 4 different phases - (1) the formulation of the research question, (2) the selection of information resources, (3) the data analysis, and (4) the decision preparation and implementation, with the latter constituting the interface to the strategic (R&D) planning and decision-making process. As most of the interviewed stated that they usually are not the process owner of the last process phase (but the strategic planning units themselves), the following paragraph will focus on the first three steps only.

A. Determining information needs and core questions

It is important to determine objectives, core questions and research areas before starting the search phase. These decisions may be made either „bottom-up“ by individual research workers/the foresight group itself or as a result of a workshop; however it may also be a „top down“ initiative coming from the executive vice president for technology, from the R&D or general strategic planning department, or from another „client”. Among the firms in the survey, the foresight groups seems to enjoy a considerable amount of autonomy, as most of them stated that they are empowered to formulate the exact information need as they see fit it (i.e., “bottom up”). Only in a few cases (most notably, in nearly all the „listening posts“), the objectives and core questions are defined in advance from the top.

The first decision in the foresight process is whether first to delimit a specifically relevant area of observation of identification of new trends for the search („inside-out“ perspective), and then to start with an oriented search, or to commence the search with a broad, non-limited orientation („outside-in“ perspective) and evaluate the relevance of those search results for the firm in a second step. The enterprises interviewed made use of both approaches in their foresight activities, with the „inside-out“ perspective predominating, since a broad, non-specifically orientated search takes up a lot of time and an „information overload“ is fast reached.

The second decision (at least for most of the firms) then is the actual selection of the specific search areas, and the time horizon of the analysis. Here, the firms displayed a wide variety in the foci of their foresight efforts:
This is particularly true for the time horizons under observation, which lay between periods as short as 2-5 years up to a period of up to 20-30 years. However, most of the interviewed firms mentioned time horizons between 5 to 15 years (British Telecom 5-10, Company A, 5-10, Decathlon 10, IBM 10 Ericsson 5-15

DaimlerChrysler 5-15, Philips 5-15, Lufthansa 5-15, Deutsche Bahn 10-15). Companies with a time horizon of up 30 years (Basf 15 +, Volvo 10-20, EdF 10-25, Company B 20, Eni 20-30) are active in a field with long product or technology cycles, such as chemicals, engineering, and energy supply, or they are interested in long-term demographic changes (such as firms in the insurance and banking sector). At the lower end of the range there were firms (P&G 1-3, Company C 1-5) that performed foresight either only on the operational level (i.e. at the level of divisions) or in a strict „collecting post" -function.
Differences also became visible with regard to the main thematic areas of foresight: The central focus still is on technology trends on the one hand and market trends on the other. Broader social, political or regional aspects are secondary and are taken into account only by „think-tanks" or by firms that operate in sectors characterised by a strong societal embeddedness. Thus, for instance, (de-) regulative and environmental aspects in the area of transportation (Deutsche Bahn, Lufthansa) and automotive engineering (Volvo, DaimlerChrysler), or communication and leisure behaviour in the fields of ICT (British Telecom, Ericsson, Philips) and consumer goods (Decathlon) play a bigger role in those particular business fields, and consequently also in the foresight activities of firms operating in those sectors. As a result of the interviews it can be stated that the more socio-economic, political or regional aspects are seen to constitute the innovative development requirements in a particularly field, the more strongly these dimensions will be included in the foresight process[5].

B. The selection of information sources

Various information sources can be used in foresight –some are internal to the company, others are external, and both could be based either on more explicit (i.e. written down, „formal" information) or tacit knowledge (i.e. communication-orientated, „informal" information). To the question „ What information sources do you use your foresight activities?" the companies investigated thus named numerous different sources with varying degrees of intensity. The most important among them could be described as follows:

From the viewpoint of a lot of enterprises, the *formation of internal networks* and the access to internal information sources is highly crucial for their foresight efforts. This seems to particularly true for futurists in „collecting posts" who rely strongly on an internal network of observers and experts to provide them with the necessary basic information (P&G, Lufthansa, Company A, Volvo). Moreover, also foresight units in highly decentralised and multinational companies (IBM, Company C, Philips) put a high significance on those internal sources. Naturally, these internal networks are based mainly on informal information and personal contacts between individual researchers or research groups.
Another group of firms considered it to be more (or at least equally) important to bring the „outside world in", that is to say they put *a strong emphasis on the creation and use of external networks* as the major source of input for their foresight work. The external knowledge is brought in, for instance, by joint work with external experts, or through participation in professional events or international congresses. Among the firms who reported to rely heavily on such external sources, the „think thanks" clearly constituted the biggest group (British Telecom, Company B, Company C, IBM, Basf, DaimlerChrysler, Decathlon, Volvo, Philips, Eni, EdF, Ericsson). Obviously, external networks are vital to get the whole picture.

[5] *This is not to say that in practice, also futurists in those fields have to limit their activities to certain areas due to financial or temporal constraints.*

A third class of information source is mainly used by firms operating either in highly market-driven sectors (consumer goods and services) or in fields characterised by a low vertical range of manufacture (as those operating in highly interdependent industry sectors such as engineering and chemistry): Those firms often mentioned to use their *informal contacts with suppliers or customers* systematically as sources for information about possible new developments in the markets, mostly in addition to already existing internal or external networks.
In contrast to the cases mentioned before, the last class of information source is typically of a rather formalised nature - namely, *openly accessible future-related information and data* such as patent statistics, and publication analyses or market reports. These are the „classical" sources of trend monitoring, and every firm uses them to some extent, but none reported to exclusively rely on them. In this context, however some companies reported to intensively use official information such as national foresight exercises, or similar future-related data originating from institutional sources (British Telecom, Decathlon, Philips, EdF).

In general, then, informal or personal information takes a clear predominance over the information that is openly and formally available; likewise it seems that the majority of the firms consider external knowledge more useful and important for their foresight work as information that is internally generated.

C. Data processing and analytical approaches

Obviously, the strategic analysis lies at the heart of the whole foresight effort, as only here all the different data and opinions that have been collected are compared, evaluated and interpreted in order to generate future-relevant knowledge. Central to this process step is the choice of the best foresight tools, methods, and approaches for the specific question at hand. It is not surprisingly, then, that the companies in the survey used a quite varied range of instruments in order to meet their individual needs (See Box 1).

- Publication analyses
- Patent analyses
- Benchmarking analyses
- Market analyses, trend analyses
- Database research
- Company's own, delimited Delphi survey
- Technology Calendars and roadmaps
- Creativity techniques (Brainstorming, intuitive thinking)
- Various scenario techniques
- Competitive technology intelligence (Technology monitoring)
- Trend extrapolation
- Systems dynamics simulation
- Multilinear modelling
- Internal innovation or future workshops
- Systematic questioning of customers
- Risk analysis/ Cost analysis

Box 1: Tools used in enterprises for foresight

The following paragraph tries to give a systematic overview over the methods and instruments used by in corporate foresight. Beforehand, however, a related issue deserves some attention, as it will help to situate the methodological and analytic capacities of the firms in the survey: The companies were asked how long they are

usually involved in a single foresight project; the time span thus could be regarded as a rough indicator of the degree of the sophistication and complexity of the analytical approach.
Seeing in this way, quite a lot of companies seemingly do not invest too much effort in their foresight activities: Company C, British Telecom, Decathlon, Lufthansa, P&G and Ericsson reported to spend no more than three months on an individual foresight project. They explained that the foresight results are always needed rather quickly, thus not permitting a deeper involvement and differentiated analytical approach in a single research project. A second group of firms (IBM, Company A, Basf, DaimlerChrysler, Philips, Eni) mentioned that their projects usually took between 3 and 12 months, indicating a much more extensive and elaborate foresight approach. Finally, a third group of enterprises either were engaged either in continuous foresight work– i.e., in the continuous update of previous analyses (British Telecom, Deutsche Bahn, Company A, Decathlon, Volvo) - or in elaborate long-term foresight activities that lasted more than a year (Company B, DaimlerChrysler, Philips, Eni, EdF). Especially in the last case, one would therefore expect rather sophisticated and innovative ways to do foresight.

Quite in line with these observations, the interviews showed that in quite a number of firms, rather simple tools predominate: In the field of qualitative methods, this was indicated by the extensive use of cognitive methods like brainstorming-exercises, intuitive thinking, or expert consultations. Typically, these instruments do nor demand much preparation or analytical vigour, and thus can be easily employed. In the quantitative field, the same could be said for such simple statistical/econometrical methods such as patent and publication analyses, benchmarking exercises or market forecasts.

Nearly all firms reported to rely on those tried and true instruments for their foresight activities - some of them even exclusively (Company A, P&G, Volvo). Apart from that, however, also more elaborate and sophisticated approached are in use in some of the companies - especially in those with their own future „think tanks". Among those more complex approaches, causal and structural methods like scenarios and simulations are the most common. In addition to that, some firms also conduct their own mini-Delphi and future workshops/future conferences.

Thus there seems to be a definitive predominance of methods that based on the interaction between different players and which are rather person- and communication-orientated. Great importance is attached to methods involving a high proportion of interviews with internal or external experts, and to teasing out ideas in common meetings or workshops. Quantitatively orientated instruments, on the other hand, are only used for certain questions, but this general „negligence" of quantitative methods could also be seen in a positive light - it certainly indicates a paradigmatic change in the general understanding of foresight: While older „forecasting" approach often dealt with probability predictions and any sort of statistical/econometrical methods in order to give a clear forecast of the future, the „foresight" –approaches of today are seen as systematic processes to identify and explore different futures, and the increasing use of cognitive and scenario methods (and their emphasis on communication and learning processes) reflect this new view.

IV. What are the current problems in conducting foresight, and what could be done better?

A. Current problems of corporate foresight

Although most firms in the survey reported to be quite satisfied with their foresight activities, there were still quite some critical points in which improvements could or should be made. The following points were mentioned as problems of the current foresight practices:

1) Methodological Problems

- Foresight needs a better/stronger methodological grounding, especially with regard quantitative analyses and economical modelling, in order to achieve a greater accurateness of its results.

2) Organisational and Managerial Problems in the Foresight Process:

- Foresight results have to be better delivered and disseminated to the relevant target groups (such as R&D people). It has to create a higher commitment of those groups to contribute to and use the results.

- Foresight may not be done for its own sake only but must generate relevant information, that is to say one always has to make sure that it is problem-orientated and ends up in concrete results and real products.

- Moreover it also crucial those long-term trends and other typical results of a foresight exercise are „broken down“ and „translated“ into present decision options to be of use for the decision-makers in the company. In this context, one should also try to better differentiate between foresight activities that should provide an input for specific product developments and those that support the innovation activities in general.

- There is a lack of feedback from the users of foresight data - more feedback would be helpful to trigger off leaning-effects and to make foresight predictions more accurate and more „user“-friendly/„customer“-orientated.

- The positive effects of foresight-activities on the business operations are not always attributable and easy to proof. Therefore it is also important to develop ways to better measure the benefits that foresight activities have on the business success – it is much easier to communicate and promote foresight activities with clear costs & benefits indicators.

3) Overall integration of foresight activities in the company

- Corporate foresight often is too fragmented (i.e. there are no centralised offices/departments but a lot of lone hands) and too segmented (i.e. the activities are too specialised and to uncoordinated to give a complete picture).

- Foresight needs to be re-positioned in the company – it mustn't be limited only R&D-decision-making issues but could be more broadly used for corporate development and strategic planning.

- Foresight has to be integrated more strongly in the corporate culture (via monitoring systems, future workshops, or in mission/vision statements).

- A central dilemma is the current „shareholder value“ mentality in the top management that obviously doesn't put much emphasis on long-term thinking.

4) Other issues

- Corporate foresight could certainly profit from the use of more external know-how, but so far there is lack of networks of (internal and external) foresight professional.

- Because of the missing networking, there is too much double work and not enough efficient re-use of previous work.

- There is too much „uncertified“ knowledge in the field, and it is sometimes very difficult to separate the good experts from the bad ones.

- There are no efforts (and maybe no capability) so far to integrate micro-, meso-, and macro-level aspects and in foresight exercises.

B. What could be done to further promote corporate foresight?

When asked about possible ways and means to further establish foresight in the company, the following ideas came to the fore:

1) Better communication and stronger impact of its results

- *Create a sensibility for the added value* that foresight can bring to the company: It is crucial to better communicate its „use“ (i.e. how to use it) and its usefulness (for example, by illustrating the benefits with exemplary case studies, etc.); moreover it is important to establish a wide network of stakeholders/partners within the firm.

- In order to *better communicate the foresight results and activities*, it could also be helpful to develop some exemplary and concrete „hands on“ products (such as a monthly magazine, an internet tool, etc) that could be given away to illustrate the practical utility of foresight.

- Foresight has to *become more „focussed“* and should provide only relevant information, with a clear definition of the research questions and objectives. It should be more realistic and more precautious in its predictions (really revolutionary innovation only rarely takes place) and should pursue more business-oriented goals.

- In this context, it might also be helpful to *develop some standard measures and key indicators* (in co-operation with other companies) which then could be continually monitored and updated.

2) Higher strategic relevance for the company:

- Foresight has to *move from an illuminating to a more operative/decision-making role*. It should be stronger used to develop a more future-orientated

corporate strategy – for example, it could help to find the new markets or customer needs, and only then first-mover advantages and a sustainable company growth could be realised

- Foresight should not only be seen as a tool for selecting and prioritising R&D-activities, but could *be employed for vision building* as well. This, of course, would mean that one has to develop new participative tools that involve the all the different stakeholders of a company.

3) Further methodological and infrastructure development of foresight

- Organise more *generic foresight meetings* with futurists from other companies *to let them share their individual insight* on new trends and drivers, *and to jointly analyse* the interactions between those new developments.

C. Areas for further development

Further potentials of foresight were mainly seen in two fields – new methodological approaches and new subject areas for foresight:

1) New foresight approaches

- Foresight exercises and the presentation of its results must *better reflect the mentality of its „target audience"*. For example, at the top hierarchical level, managerial competencies and interest are focussed on certain, business-related areas (finance, marketing, etc) and technology is often seen as a specialist thing. To be successful, one has to do (or at least: communicate) foresight results with a mental model that fits the strategic reasoning of those people, i.e. one should think „in the client's language"

- A *better co-operation and consultation between different foresight exercises* (in different companies or different sectors) could save a lot of double work and would provide a broader database for decision-making. The client in the one sector is the producer for another sector, and thus one should stronger take into view the whole innovation chain when doing foresight. To this end, one would have to develop a common methodological base and a specific professional standard in foresight in order to make common activities easier to manage and integrate. This would include efforts for a better qualification of futurists on an international level, and the development of more co-operative processes and methodologies.

2) New fields for foresight activities:

- Foresight might be an interesting tool for the long-term *development of brand and corporate images.*

- There is a huge lack of knowledge about the *future development in non-tirade countries* (such as China and other newly-developed countries in Asia) that will become important markets in the future. Thus, foresight activities need to focus on these regions more strongly and have to integrate the know-how of futurists and other experts from those countries.

- Likewise, there is barely any knowledge on the *future development paths of industrial relations, of future working structures and future needs of human resources*, both in new (non-tirade) markets and in Europe.

Annex

V. Characteristics of the Enterprises in the Survey

Importance of Innovation
Nearly all companies interviewed described their competitive environment as highly dynamic, characterised by an increasingly global competition and a continuous pressure to engage in innovation. A huge majority (12 out of 18) described their sector as innovation-driven, thus making innovation a sheer necessity to survival on the market. As a major reason for this, the firms explained that the European industry – due to its huge production factor costs (especially human resources)- cannot easily engage in price-cutting strategies but has to aim at the premium segments of the market, which naturally are made up by the more innovative and higher-quality products.
Only in a few sectors – most notably the transportation and insurance sectors – innovations are not of a high importance and can be substituted by other strategies (such as price-cutting, niche-filling, etc.): Obviously, in those service-orientated industries, innovations are rather easy to develop (and likewise fast to imitate) and usually do not demand as much research and development activities as in manufacturing industries. Moreover, there is a more levelled playing field in these sectors, as every competitor in the market has to make considerable investments in qualified human resources.

Budget for R&D
The budget for R&D in the interviewed firms was between 30 million (Deutsche Bahn) and 7,6 billion Euro (DaimlerChrysler). With regard to the R&D intensity – measured as the percentage of annual turnover spent for R&D – 4 main groups can be roughly distinguished: (1) enterprises in the field of ICT and pharmaceuticals with an relatively high R&D intensity (between 20% and 10%: Ericsson 20%, Aventis 16%, IBM 5-10%) (2) Chemical firms and enterprises in the fields of electronics/electrical engineering that occupy the upper middle field (between 8% and 5%: Philips 8%, Siemens 6%, BASF 5%), (3) firms from the automotive, energy and investment good sector show a slightly lower intensity (between 3-5%: DaimlerChrysler 5%, Company A 4,5%, Volvo 4-5%, EDF 2,5%, ENI 1-5%), whereas (4) firms from the Transportation and Insurance sector usually spend less than 1% of their annual turnover on R&D. [6]

Patents
It comes to no surprise that the firms with the highest absolute spending on R&D (between 1.5 and 7.5 Billion Euro: DC, IBM, Siemens, BASF, Aventis, Philips, P&G) also succeed in filing the highest number of patents (between 3.500 – 1.000 per year). A lot of those firms operate in the chemical/pharmaceutical or electronics/ICT sector, thus giving proof to the above-mentioned observation that innovation in these competition-driven sectors is becoming a key to survival. The second group of firms - mainly from the investment goods, energy and telecommunications sector (EDF, ENI, Volvo, Company A, British Telecom)- occupy the mid-field of R&D-spending (roughly between 1.5 Billion and 150 Millions), with a patent output that is considerably lower (between 100-300 patents per year). Firms from transportation and insurance sector also spend the least total amount of money on R&D and consequently barely file patents at all (less that 50 per year). Another reason for this might also be that in

[6] *A residual group consisted of: British Telecom (less than 3%), P&G (around 4%) and Decathlon (less that 1%).*

those service-driven industries, new products (i.e. services) are seldom patentable anyway.

Set-up of R&D
Despite the differences in R&D spending and intensity mentioned above, the huge majority of enterprises (12 out of 18) in the study conducted R&D both at corporate and at the level of divisions/business units: Although a few firms still have their research activities on the corporate level only (Decathlon, British Telecom, Deutsche Bahn), there seems to be a growing tendency to organise R&D more decentralised and bring it closer to the individual markets. In most cases, this means a division of work between corporate research laboratories that conduct long-term (applied and basis) research and short to medium-term technology development in decentralised technology centres.[7] In some firms, however, a truly networked R&D organisation has been established (Ericsson, Volvo, Aventis) where both (basis) research and (technology) development is done in a global network of research laboratories and research teams. The main advantage of this hybrid (i.e. neither centralised nor decentralised) organisation seems to be a better integration of all relevant actors and parts in the research process, as well as a more efficient use of time and financial resources.
A small number of firms even have abolished all central R&D-departments entirely and run their R&D-operations purely decentralised (Philips, Siemens, P&G).

Relevance of future-orientated objectives and visions for the corporate strategy
RTDI – (and also overall corporate) strategies are based on (implicit or explicit) visions of the future of science, technology and society. But how far do firms actually base and develop their strategies on visions of the future?
Three main groups can be roughly distinguished: (1) Some enterprises still base their strategy on purely economic and business goals (such as „attaining 10 % profit growth per year", or to „become the market leader") that don't really seem to reflect more long-term goals, values or future visions. (2) A considerably larger number of firms, however, formulate an at least somewhat more future-orientated strategy that contains some – usually rather vague and implicit - visions of their future, either by formulating soft targets („to be a premium provider" „ being the most innovative firm in the sector", or „to provide better customer benefit than any competitor") or by appealing to a future orientated value (such as „sustainability"/"sustainable development"). (3) A third group of firms, finally, plan their strategies on the basis of an explicit vision (such as Siemens'„ Pictures of the future" or BASF's „Company Vision 2010") that lies down important benchmarks or goals for the next 5-15 years. Telling enough, most of those firms that implicitly or explicitly formulated a company vision were also engaged in more broad and general foresight activities which were said to provide an important input for those vision-building-processes.

VI. Research approach

The study was empirically orientated and was conducted in the form of personal interviews with (either one or several) representatives of enterprises in Europe that were considered to use „good practices" in foresight and innovation activities.

[7] *It is fair to say that in some firms – i.e., those in the service sector – there are no real („technology-orientated") R&D activities at all (Company B, Lufthansa, Company C), but even their (market/financial) research activities split between the corporate and the divisional level.*

Altogether, 18 enterprises took part in the survey. Thirteen of the Companies were in the fields of automotive (DaimlerChrysler, Volvo), Energy (Eni, EdF), Electronics (Siemens, Philips) Transportation (Deutsche Bahn, Lufthansa), Investment Goods (Company A[8]), Consumer Goods (Procter&Gamble, Decathlon), or Banking & Insurance (Company B, Company C[9]). The Telecommunications/ICT Sector was represented by three companies (British Telecom, Ericsson, IBM), and the chemical/pharmaceutical industry by two (Aventis, Basf). Six of the corporations in the survey had their headquarters in Germany, four in France, six elsewhere in Europe, and two in the USA.

The following were interviewed as suitable partners within the enterprises:

a. The head of (technology) foresight, or those responsible for foresight
b. Heads (CTO´s) or members of corporate R&D planning/ strategy departments
c. Heads or members of corporate strategy/corporate development departments
d. Responsible Managers for Innovation Management/New Business Development
e. Heads of R&D centres or technology think tanks

VII. Questionnaire

The interviews concentrated on the following subjects and lead questions:

I. Company Characteristics - How would you best characterise your firm?

1. Describe your enterprises main product (goods or services) and main customer group!
2. How important is innovation
   -for your company's business success, and how important is it
   - in the sector in general?
3. What is the size of your Budget for R&D, and how much is spent on foresight?
4. How many Patents do you obtain per year?
5. How is the RTD System set up: Central/corporate research vs. technology centres on the divisional/business unit level?
6. What are the stated future-orientated/future-related aims and objectives of the company (visions, mission statements etc)?

II. What are the objectives of your firm in pursuing foresight?

1. What is the general motive/rationale and "philosophy" of the foresight activities in the company?
2. What kind of information should be generated, i.e. what is foresight-information mainly used for?
3. What is the basic understanding of foresight/ What is the core task of foresight in the company?

III. Institutional setting – How is foresight anchored organisationally in your enterprise?

1. Organisational structures and staffing?
2. Financial resources?
3. Length of foresight experience?
4. Usual duration of foresight projects (3months/6months/1 year/ more)?

[8] *Company A is a market leader for professional construction equipment worldwide.*
[9] *Both companies are among the biggest providers of insurance and banking services in Europe.*

5. What are the concrete results of the foresight activities, i.e. what kind of work is done exactly (writing reports & analyses/ organising workshops & conferences/ providing foresight training/ customised advice)?
6. What are the results used for (Vision-building, decision-making, PR)?
7. What is the impact of strategic foresight on corporate decision-making
   - regarding the level of impact (strategic vs. operational decisions)?
   - regarding the strength of impact (advisory vs. planning role of futurists)?
8. Who are the "clients" and the audiences/addressees of the foresight activities?
9. How are the results diffused and disseminated, and who has access to them?

IV. Characteristics of foresight-activities – What form does the technology foresight process take in your firm?
1. Which are the main foresight methods and tools that are employed (cognitive/statistical/causal)?
2. How would you best characterise your foresight approach (continuous vs. casewise, qualitative vs. quantitative, expert vs. participatory tools, soft vs. hard factors)?
3. What are the main monitoring/search areas, and how are they selected?
4a). Breath of analysis: Would you characterise the thematic focus of your analyses in these sectors– more broad vs. specific/ focused scenarios (sectoral vs. global foresight)?
4b). Complexity of analysis: How many different dimensions, or how many different driving factors are taken into account?
5. In what time horizons/time frames do you work?
6. What information sources and resources are used (interfirm agents, suppliers, networks and associations, etc), and how important is their input?
7. Where does the evaluation of the foresight-data take place (in-house/outside, centralised or decentralised)?

V. Issues, challenges and future potentials of corporate foresight
1.What are the 3 main problems of corporate foresight today/What are the areas in which corporate foresight has to improve?
2. What could/should be done to further promote and install foresight in companies?
3. What are the major success factors of corporate foresight, and where would you see still unused potentials?

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