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Innovating through corporate foresight in a highly uncertainty context

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INNOVATING THROUGH CORPORATE FORESIGHT IN A HIGHLY UNCERTAIN CONTEXT

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ABSTRACT

The advanced models used in the companies for future projections are based on logics of anticipation called Corporate Foresight. Despite the new and growing interest on the topic, its practical application remains still limited.

This paper contributes in increasing the knowledge basis on CF implementation. The research suggests two levels to regard to implement Corporate Foresight: orientations and spheres, respectively the levels of study of the company related to the external environment and internal one. The orientations refer to the environments scouted by CF, that are the political-environment, the competitor, the technological and the consumer foresights. The spheres are the culture, the organization and the methodology ones.

Here it is presented a success case of a company operating in the ICT industry that evidences both best practices and particularities, differences and value added respect to literature: Eurotech holding, whose deployment and strategy are deeply foresight-driven.

The findings have implications in both academic and managerial fields. From an academic point of view, the work represents a first tentative to build an integrated framework that helps in understanding the foresight activities in a company. From a practitioners' point of view, it is a basis for managers who would like to implement CF in their enterprises, which can guide them thanks to the suggestions given by the orientations and spheres levels.

KEYWORDS

Corporate Foresight, Implementation Framework, Innovation, Uncertainty, Case Study

1. INTRODUCTION

For organizations, managing innovation in a complex and dynamic environment is a more and more difficult and hard challenge. In many industries, they have to face the discontinuous conditions of the political-economical, socio-cultural and technological environment.

The growth and the continuous innovation run not only through the comprehension of the “market of today”, but also the individuation of the possible scenarios of the “markets of tomorrow”. The innovation implies therefore the need to monitor industry trends: for an organization it is necessary to be aware of its own future growth path, which has to be consistent with the industry trends. It is then opportune to build both internal and external virtuous networks to favour the anticipation and comprehension of disruptions (Christensen, 1997) and the creativity for innovation.

The literature on innovation points out a frequent lack in catching the business opportunities, underlining the importance of weak signals (Ansoff, 1987) and of discontinuities for radical innovation (Christensen, 1997). The study of weak signals and emerging markets for disruptive technologies and radical products development, in other words how the organizations can identify weak signals and the information from the periphery, anticipate emerging markets and trends and manage disruptions to prepare for an uncertain future, is called “Corporate Foresight” (Schwarz, 1991; Becker, 2002; Van Der Haijden, 2004). Despite the new and growing interest on the topic (as claimed by Schwarz, 2007), its practical application remains still limited (Liebl, 1996), perhaps due to the difficulties encountered by the organizations in identifying emerging opportunities (Day and Schoemaker, 2004) or to the lack of practical knowledge (Liebl, 2005).

Therefore this paper would want to contribute to the knowledge basis on Corporate Foresight (CF) implementation increasing, through the following research questions:

- *What is the Corporate Foresight value added in terms of discontinuous innovation?*
- *Which are the key competences and the methodologies for its development and its implementation?*

After a literature pre-screening on foresight (par. 3), we identified a gap in the knowledge of an integrated Corporate Foresight implementation (par. 3.1), the newness and the limited knowledge on the topic. In order to not proceed randomly, we based on foresight literature and other connected literatures to find a framework of analysis, that we propose to be based on four orientations and three spheres (par. 3.2 and 3.3 respectively). We decided to explore CF through the explorative case study research design (par. 2). Therefore this paper presents the use of this methodology selecting a success case that evidences both best practices and particularities, differences and value added respect to literature. It is focused on the case study of a company operating in the ICT industry: Eurotech holding. The case-study highlighted some literature confirmations and some add-ons (par. 4). Finally, we present a more detailed framework detailing the orientations and especially the spheres. This framework has a double function: from one side to analyze the CF activities in companies where these practices have been already launched, from the other side to supply a set of points to act and lever on as regards the spheres to achieve an effective and efficient CF implementation (par. 5).

2. RESEARCH METHODOLOGY

Since the literature analysis highlighted the newness of the topic, the case-study methodology is especially proper for new investigations (Eisenhardt, 1989) and the single case study for explorative ones (McCutcheon and Meredith, 1993; Meredith, 1998). We have therefore used the explorative case study research design, as defined by Yin (1994), selecting a success case (that evidences practices that are not yet clearly stated or yet investigated by literature) among the companies that implement Corporate Foresight activities.

This article is focused on the study of a company operating in the ICT industry: Eurotech holding. We chose it in order to gain insights on CF due to two main reasons. First, the promoter and first supporter of the Foresight perspective is the Eurotech’s CEO, Roberto Siagri¹. Second, he developed and configured the company he is managing, as it is widely recognized characteristics², with a peculiar organizational model for innovation and a foresight-driven perspective for its R&D and strategy.

¹ Roberto Siagri is widely recognised as an innovative and visionary leader. He won many awards, as for example the one by Ernst&Young Italy “Entrepreneur of the year 2006”.

² For example, in 2006 the Zypad, a wearable computer developed by Eurotech through CF practices, won the awards as “more innovative product Soldier Technologies 2006” in London, the Frost & Sullivan award as “More innovative product in 2006” and it was recognised as one of the 60 products that will really change the everyday life with the “Well Net tech Award 2008” in Milan.

After developing a first-proposal of a CF implementation framework based on orientations and spheres (see par. 3), the explorative case study has had the crucial role to scan and investigate it and identify if there are specificities correlated only to Foresight implementation, if there could be linkages with other literatures and what the particular and shared characteristics are. Thus, the case study had the main aim to highlight the implementation levels of Corporate Foresight, and in each one the good practices to obtain a good foresight management and consequently a good support for R&D and innovation strategies.

The direct study through the case research permitted to confirm and to complete the framework, with a double function. A first one concerns the analysis, because it permits to comprehend the evolutionary level of foresight practices inside the company and it can help identifying the lacks and then suggesting how to improve the implementation. A second function regards the action, because it permits to understand what are the main levers to act on to increment the CF capability.

In particular, the research has been developed in three phases. At the beginning of the research, it has been realized a literature review on CF, in a general and wide way, highlighting how it is an emerging research field and how it is needed further research on this field. Moreover, it has been underlined how foresight literature has been developed on its own, while it is strictly interconnected with other literatures, as Strategic management, innovation management and R&D management.

The second phase has been focused on the Corporate Foresight implementation. A second literature analysis found an external point of view and an internal one, as regards the foresight implementation in the company: and we propose a Corporate Foresight Implementation Analysis Framework based on the so called orientations and spheres of CF. While the literature gave us support on the building of the framework, it has many gaps in more deeply describing and gathering information on these levels. So we affirm how it is needed an explorative case study to research deeply and understand the micro-levels inside the orientations and the spheres.

The third phase has been therefore the study and analysis of the implementation models in a case study.

The units of analysis are the entire Eurotech business model and especially the areas of R&D, Strategy and Marketing. Moreover, Eurotech can be defined as a “foresight-driven” company, since these activities are fundamental for the CEO and the board members of this company, and they based their strategy and their innovation activities on the support of the study of technology and socio-economical trends.

The analysis of the case studies refers to a period from March 2006 to March 2007. In particular, the analysis has been conducted through different channels:

- references to official company’s documents (website and internal documents);
- reference to the company press review;
- reference to interviews by the company stakeholders (CEO, CTO, CFO, board members, etc.);
- direct interviews with three key foresight actors of the company (CEO, CTO and a scientific committee member);
- Delphi panels;
- direct observation of foresight activities;
- participation to the scientific committee as observer;

in order to be able to collect a huge amount of information and data and to have more and different information sources, with the double aim to increase the information basis and to diversify it, in order to implement an information triangulation.

3. LITERATURE ANALYSIS

Companies find themselves in an ever growing competitive and rapidly changing context, and not only the technological, but also the political, economical, environmental and sociological ecosystems are objects of the accelerated change rate. This increasing complexity results in growing uncertainties about the future (Andersen *et al.*, 2004:312; Patton, 2005:1083).

Moreover, the success of companies depends, among other factors, on their innovation capability (Brown and Eisenhardt, 1995:344). Managing the innovation in a complex and dynamic context is a difficult challenge for enterprises. The growth and the continuous innovation pass not only on the comprehension of the today market, but also on the identification of possible scenarios of the tomorrow markets (Ashton and Stacey, 1995:79-80; Brown and Eisenhardt, 1997:16-17). Companies need therefore to be aware about current and future developments and trends: it is necessary to be aware of them and verify what the own future growth path is, that has to be coherent with the industry trends. It is then appropriate to build internal and external virtuous networks to favour the anticipation and the comprehension of the discontinuities (Christensen, 1997) and the creativity for innovation (Amabile, 1996).

Foreseeing future developments in a complex environment requires the integration of foresight activities within the organization (Slaughter, 1998:384).

In a general acceptance, foresight is “the ability to judge correctly what is going to happen in the future and plan your actions based on this knowledge” (Cambridge dictionary, 2009), so it refers not only to the ability on “seeing” or on the peripheral vision, but also to the planning and the action. It enables the early discovering of major changes by detecting so-called weak signals (Day and Schoemaker, 2005:135), in other words foresight is a process that tries to look at the mid-long term future of the PEEEST (Political, Economical, Environmental, Social, Technological) environment (Ansoff, 1976:139; Ruff, 2006:281) with the aim of “identifying the strategic and emerging technologies research areas that can conduct to major economical and social benefits.” (Martin, 1995:20) and of reacting on the changes by anticipating alternative developments (Coates, 1985:30).

The foresight activities can be described on three different levels, as shown in Table 1:

- a macro-level, called Governance Foresight, related to the regional, national or super-national economy;
- a meso-level, called Industry Foresight, related to the trends of a certain industry;
- a micro-level, called Corporate Foresight, related to the organizations and companies foresight.

This distinction is interesting because foresight has different aims in every one of these levels, in fact, while the task of the Governance Foresight are connected to the legislation and governmental budget allocation (Blind *et al.*, 1999:15), the Industry Foresight aims at understand which the industry trends are, and the Corporate Foresight aims at supporting the strategy formulation and the technology and innovation managements (Lichtenthaler, 2005:389). For our research purpose, we focused on Corporate Foresight.

Table 1 – Foresight types

FORESIGHT TYPE		ACTORS	INVESTIGATION AREA	AIMS
M A C R O	GOVERNANCE FORESIGHT	Agencies and governance institutes	<ul style="list-style-type: none"> •Politics •Economy •Society 	It directs the investments of a Country
M E S O	INDUSTRY FORESIGHT	Study centers, foundations,	<ul style="list-style-type: none"> •Industry •Technology •Design 	It detects the industry trends
M I C R O	CORPORATE FORESIGHT	Company	<ul style="list-style-type: none"> •Industry •Technology •Design •Products 	<ul style="list-style-type: none"> •It provides inputs for strategic decision-making •It directs the investments on research

3.1 CORPORATE FORESIGHT

Foresight on a company level, Corporate Foresight, is defined as “the analysis of the perspectives of long term of business, market and new technologies environments, and their implication for the corporate strategy” (Ruff, 2006:34). It is the ability to look forward and to use the insights in organizationally useful ways, such as shaping the strategy or defining new markets, products, and services (Slaughter, 1998), and it allows identifying future developments in science, technology, economy, and society (Porter *et al.*, 2004).

It regards a set of methods, processes, actors and organizational forms that permit to the big enterprises to identify and evaluate the opportunities and threats, recognized as weak signals in the periphery, and act respect to them (Rohrbeck, 2007) to gather, asses, and interpret relevant information and to support decision-making (Cuhls, 2003).

Corporate foresight can be considered as a link among strategy, research and marketing, in fact:

- it is a set of processes to identify the future trends;
- it supports the strategy for the development of the and for the decision-making;
- it gives inputs to the research, identifying the trends;

- investigates on economical-social trends and on lifestyles of future consumers.

From a historical point of view, foresight finds its origin in forecasting, from which it differs primarily because of the relationship with the past and the extension: forecasting in fact regards a set of techniques that analyze the past on which they base for a linear construction of hypothesis on the future (Cuhls, 2003), while foresight is first of all not only a set of techniques, but also of processes, organizational practices, cultural aspects, etc. but mainly it does not base on the past linearization but it has an approach that tries to build different possible scenarios (Martin, 1995). Foresight is not forecasting; it does not predict the future, but prepares to meet future requirements and opportunities by anticipating a range of alternative developments (Tsoukas and Shepherd, 2004).

Moreover, the anticipation of the future in the managerial ambit has its roots on different concepts, as the one of radical change (Withehead, 1933), as a complete and deep change on economical and social level, the scenario planning technique theorized by Kahn (1967) and developed in 70s-80s also by big companies as Shell (CF comprises different methodologies among which also scenario planning), the concept of weak signal (Ansoff, 1976) as a not evident element of change in the periphery, because CF investigates these elements to comprehend trends and possible futures and finally the concepts of disruption (Ansoff, 1976; Christensen, 1997), because CF tries to study and identify the areas of possible disruptive innovation.

Some scholars underlined how foresight has developed largely in isolation to the extensive literature on strategic management (Major et al., 2001), innovation management (Smits and Kuhlmann, 2004) and R&D management (Reger, 2001). According to these claims, an our previous literature screening on Corporate Foresight highlighted that it comes not only from the field of future studies, but it comprehends different research streams: it is connected with the stream of strategy and R&D research, because it aims at supporting decision-making and to direct the research, then to innovation because it is clearly claimed on literature that Corporate Foresight has a positive impact on innovative success (Bürgel, *et al.*, 2005; Brown and Eisenhardt, 1997).

By relating foresight to these literatures it can be put into a context with a far larger pool of existing knowledge. Moreover, seeing into, and learning about, trends into the future takes special kinds of learning, of knowledge development (McKelvey in Tsoukas, Shepard, 2003), of organizational attitudes and so on. Therefore the explorative case study has the aim to identify which levels of research first and which concepts foresight can derive from different literature, in order then to focus in these analyses for further theory building or for future more focused field research.

The research investigates now the links between Corporate Foresight and the internal and external ecosystems of the organization, that are respectively the levels of orientations and spheres, that will be here discussed and that create the general shape of the framework we propose, that we call Corporate Foresight Implementation Framework based on four Orientations and three Spheres (OS-Corporate Foresight Framework).

3.2 Foresight Orientations

The strategic areas to be analyzed by Foresight are often classified as PEEST: politics, economy, environment, technology and society (Ansoff, 1976; Ruff, 2006; van Wyk, 1997). Focusing on the corporate level, Rohrbeck *et al.* (2007) highlighted how these areas can be analyzed by means of four foresight orientations:

1. Political Environment Foresight;
2. Consumer Foresight;
3. Technology Foresight;
4. Competitor Foresight.

These orientations build the first part of the OS framework of analysis and implementation of Corporate Foresight.

In particular, ***Political Environment Foresight Orientation*** identifies the trends in legislation, regulation and political-economical situation referring to the National-regional context where the organization finds itself (Day and Schoemaker, 2005).

Consumer Foresight Orientation connects Corporate Foresight with marketing and identifies socio-cultural trends relating to the needs (Ruff, 2006) and lifestyles of consumers (Rosenthal and Capper, 2006).

Technology Foresight Orientation is the most famous orientation of Corporate Foresight, called also technology intelligence, or monitoring, or scanning and so on. It is a process that investigates the trends of technologies, aiming at supporting the strategy and the decisions on research directions and investments (Porter *et al.*, 2004, van Wyk, 1997).

Finally, ***Competitor Foresight Orientation*** identifies the trends of products and services in the market and the trends of the competitors behaviours, especially related to their technological movements (Lichtenthaler, 2005),

in order to benchmark with the competitors' abilities of "seeing" and "doing intelligence" (Lackman *et al.*, 2000).

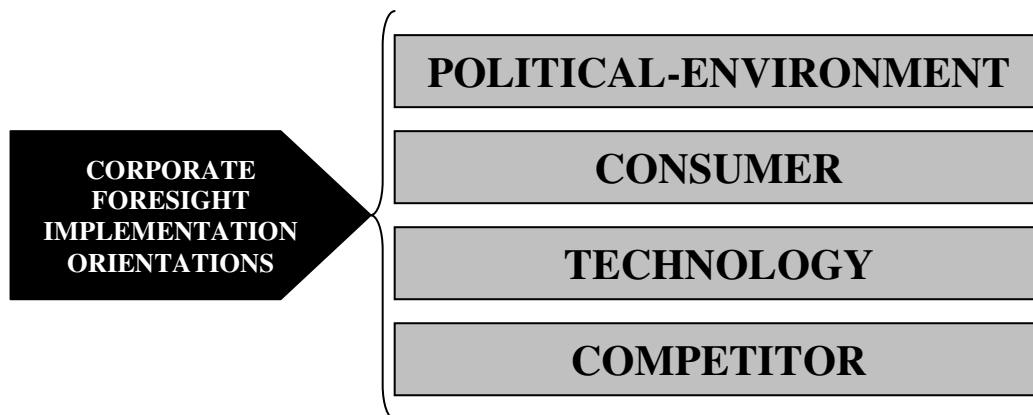


Figure 1 – Corporate Foresight implementation orientations

3.3 Foresight Spheres

As Corporate Foresight is a label given to processes, organizational forms, methods and so on that take place inside the organization, this work wants to highlight the different ambits of implementation of Foresight referring to the internal environment of the Corporate.

It has to be said that the literature on Foresight is quite young and emerging (Liebl, 1996), and, as already pointed out, it is not strictly interconnected with other cognate literatures (e.g. Major *et al.*, 2001). Thus the Foresight literature can be enriched by merging it with other literatures, but that can be done only after having identified the possible ambits of linkage.

By scanning the literature on foresight, we identified three main spheres:

1. Culture;
2. Organization;
3. Methodology.

Figure 2 shows the skeleton of the framework, based on the three spheres of culture, organization and methodology.

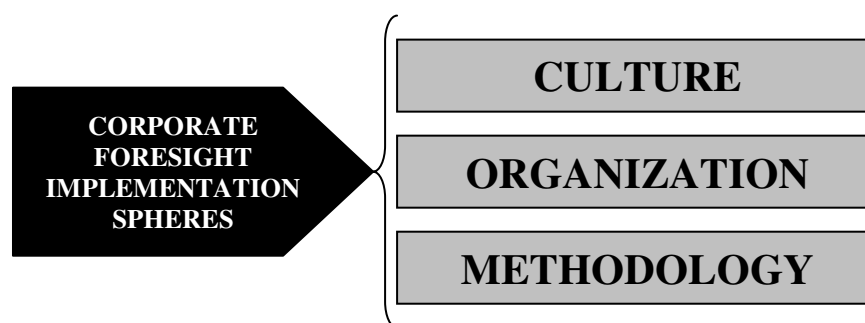


Figure 2 – Corporate Foresight implementation spheres

3.3.1 Corporate Foresight Culture Sphere

The foresight culture spheres refers to the strategy, values, commitment and rewards that the company gives for the activities related to foresight. We then labelled as "culture sphere" of foresight the aspects related to the tasks of Corporate Foresight and the soft-factors of foresight culture.

The **foresight tasks** are widely studied in the literature and it is recognised how the foresight activities can help the innovation and the strategic directions of a company (e.g. Bürgel *et al.*, 2005:32). Corporate Foresight aims at creating a support system to become aware of the present external context, imagine possible future scenarios and prepare a set of tools to be ready to react to these changes (Patton, 2005:1091-1092). It is a peripheral vision aiming at investigating the environment to identify discontinuities, threats or opportunities and emergences (Slaughter, 1998:382) in the political-economical, technological and sociological fields, identifying promising areas of research and supporting the strategic-planning and the decision-making (Coates, 1985:32-33).

Many scholars (e.g. Ratcliffe, 2006) in fact underlined the importance of critical success factors, which we call **foresight soft-factors**, different from processes or organizational choices, but related to the culture of foresight. Culture refers to the attitude of the organization in being and becoming sensible in relation to trends and weak signals. This conducts to a greater attention, availability, will and readiness in hearing from external and internal fonts of changes in the PEEST environment.

The soft factors emerge often in projects and activities where it is fundamental the human contribution and the work-group capabilities, as the participation, the communication (Ratcliffe, 2006), the sharing and the commitment (Burmeister and Neef, 2005). Among these, we add also important cultural factors as the need of an open mentality (Costanzo, 2004), or the ability of working and planning with future-projected mentality and settings (Ringland, 2008). All these factors weaves with each other and many scholars indicate them as determinants in obtaining quality of the results (Ratcliffe, 2006).

3.3.2 Corporate Foresight Organization Sphere

The CF organization sphere refers to the “where”: the location where the foresight activities take place in an organization. Therefore the sphere of organization concerns the internal organizational structure (the organizational chart and the eventual foresight function), the external organizational structure (the network of supplier and customers, external companies, research centres and universities connected to the foresight activities) and the actors of foresight (internal and external actors connected to foresight activities).

Primarily, the **internal organization** refers to the design of CF activities. Different unities with different responsibilities can be involved, in relation to the aims and to the time horizons of a certain Corporate Foresight activity (Bürgel *et al.*, 2005). These structures decisions related to the location are important (as the factors concerned to industry, internationalization, culture, orientation, and so on), because it can influence on the results of the foresight projects.

Foresight activities are often located in the departments of strategic planning or marketing (Lackman *et al.*, 2000). Foresight then refers to give directions for new research areas and target new research perspectives and to target customers and competitors, and it so considered being a way to support reaching the tasks of R&D and of marketing department respectively.

But a way to favourite the Corporate Foresight activities is to establish an *ad hoc* foresight unit. Ashton e Stacey (1995:98-100) in their study of the organization of foresight, distinguish five organizational forms connected to foresight:

- a central monitor unit responsible for every foresight activity;
- inclusion of the foresight objectives in already existing functional groups (corporate planning, R&D and marketing);
- a decentralization of foresight activities in the task units;
- diffusion of the monitoring responsibility with no formal structure inside the company;
- no foresight monitoring.

In our opinion, these organizational forms differ also for some aspects as nature of the organizational unity, coordination, centralization (Brockhoff, 1991), information need of the internal environment, complexity and uncertainty of the external environment (Bürgel *et al.*, 2005).

A second important aspect of organization is its connections and networks in a foresight optic. The **networking** is conceived both as internal networking and external networking.

Internal networking refers to the connection and communication capabilities among CF actors. The connection among external and internal experts favours a sensibility toward the CF culture and the attention on trends and weak signals. The scanning networks are particularly appropriate for the identification of the disruptive innovations (Gassmann and Gaso, 2005).

Often in the company there are project groups as scientific boards that involve experts in different subjects, in order to favour the dialogue and the contamination in various disciplines.

As pointed out by literature, external networking is very important for companies. In fact this other fundamental aspect is what Reger (2006) identifies as the fourth level outside the company and calls External Network, that is the connection with the universities and the research centres, to favourite the innovation: the technology-driven foresight researches can for example be first developed in the university laboratories and then be embedded inside the company. Other elements of this External Network are external field offices, the co-development with customers and the joint-ventures.

The third important aspect is correlated to the *actors* inside and outside the company.

Both internal and external experts are needed, because they understand more the organization's characteristics and needs, and the customers and market needs (Lackman *et al.*, 2000:19).

The CF actors can be divided into experts, decision-makers, contributors and stakeholders. While the experts manage the foresight process and decision-makers use the information and the results, the contributors are all the people that participate to the activities, and the stakeholders are the beneficiary of foresight activities.

The individual actors have different profiles, most of have a background on science, engineering, technology, business and finance. The main individuals' organization levels origins are researches, analysts, consultants, marketing persons (Patton, 2005:1090). According to Ashton and Stacey (1995), different information users have different needs: engineers for example seek technical information, while marketing persons seek information about socio-economical trends. Moreover, the literature (e.g. Ashton *et al.*, 1996:123; Reger, 2001:546) evidences some profiles of foresight activities involved persons, as for example the Gatekeepers and the Scouts. The gatekeepers understand the organization goals and the relative information needs, thanks to their internal and external information networks and good collection, communication and dissemination skills, and they are hubs of information, because they first gather and then disseminate the important and selected information. The scouts are experts with a broad background, in the technological, sociological, economical, political etc. field depending on which foresight orientation we refer (technological foresight, consumer foresight, competitor foresight, political-environmental foresight). They are able in gathering information about R&D activities, searching and focusing on new technologies or new customer, products, legislations and so on developments, also in different geographical regions. Based on this knowledge on trends, they are able to develop new ideas on their own, or through co-operations, joint-ventures or acquisitions of companies or buying of the specific new technology. In this way the company can focus and do not miss opportunities to innovate.

Actors are obviously connected to the different functions inside the organization: the actors in the Research & Development level are the CTO, the technology experts and the technicians, in the Strategy level the Innovation Strategy Director, the competitors trends' experts, in the Marketing level the Strategic Marketing Director, the product managers and the sociological trends' experts. Finally, if there is a foresight unit, the actors are the Foresight Director and the foresight project managers. It is then quite frequent that the CEO spends part of his time supporting, managing and directing foresight activities.

3.3.3 Corporate Foresight Methodology Sphere

The CF methodology sphere includes the foresight process and the techniques of foresight.

The literature on Corporate Foresight *process* is quite rich and does not accord with each other: some authors describe foresight as a linear process (e.g. Reger, 2006), some other as a circular one (e.g. Gregory, 1995), then some as a process in itself, others as a step or a group of steps in other processes.

The contributions concerning the design of the process show similar approaches. According to (), CF is a continuous process, that has to be based on users and has the aim to facilitate the decision-making.

Methodology refers also to the capability to use the suitable *techniques* in the Corporate Foresight activity, with the aim of facilitating the analysis and the comprehension of the business environment and permit a success innovation. The choice of techniques depends on different factors, as can be the context, the aims, the time-horizon, and so on.

The literature on foresight techniques is very rich: there are descriptions of the techniques in themselves, different classifications (e.g. Bergeron and Hiller, 2002; Porter *et al.*, 2004), also because most of the techniques are the same for the different types of foresight (governance foresight, industry foresight or corporate foresight). However, many scholars highlight as the use of these methods bring to a better management of the innovation.

Rohrbeck and Gemünden (2008) distinguish the methods in market-oriented, technology-oriented and integrate ones and sustain that their applicability depends on context. Moreover, for the success of CF activities it is suggested a mix of quantitative and qualitative methods. The methods as scenario planning or roadmapping raise the integration capability and support the results visualization. To stimulate the motivation and the coordination, the communication-oriented methods are adapted for dynamic and turbulent contexts. As regards the time horizon, for example the scenario planning technique is used for the long-term analysis, while roadmapping is more appropriate for mid-time analysis (Lichtenthaler, 2005). According to Assakul (2003), the most commonly used methods in foresight exercises are panel of experts, pattern analysis and projections, and Delphi method.

In any way, according to Phaal *et al.* (2006:336), despite an abundant literature on CF techniques, there is a lack of information on how to choose the right technique relative to a specific problem.

3.4 CORPORATE FORESIGHT IMPLEMENTATION FRAMEWORK

Since, as already said, the literature on CF is quite young and emergent, there is a lack of information on CF implementation and it is needed a further research on the integrated management of Corporate Foresight.

In order to have a direction on which activities and practices to investigate, but to maintain flexibility and open possibilities to identify without barriers the activities presented already in the literature and also eventually new practices, we propose an open framework to analyse the CF implementation.

Based on the scanning of the Corporate Foresight literature, leaning also on other literatures as the ones related more specifically to strategy, innovation and R&D, the framework highlights two implementation levels, the orientations and the spheres, and inside these levels we identified further levels that we described above and we present in a unique figure in

Figure 3. The framework can be related to the famous framework of the rhetoric or journalism questions composed by the six famous WH-Q:

1. *what?*, the definition and orientations of CF;
2. *who?*, the CF foresight organization and actors;
3. *where?*, the fields and the context of action;
4. *when?*, the time it takes and to which it refers, so it is related to process;
5. *why?*, the scope and the aims;
6. *how?*, the way to do CF, so the organization and the soft-factors, the process and the techniques;

Thanks to the explorative case study, we will fill the boxes and add further details and levels to the framework. This framework has a double function: from one side to analyze the CF activities in companies where these practices have been already launched, from the other side to supply a set of points to act and lever on as regards the spheres to achieve an effective and efficient CF implementation.

			6 WH-Q FRAMEWORK	
CORPORATE FORESIGHT IMPLEMENTATION SPHERES	ORIENTATIONS	POLITICAL-ENVIRONMENT FORESIGHT	What? + Where?	
		COMPETITOR FORESIGHT	What? + Where?	
		TECHNOLOGICAL FORESIGHT	What? + Where?	
		CONSUMER FORESIGHT	What? + Where?	
	SPHERES	CULTURE	AIMS	Why?
			SOFT-FACTORS	How?
		ORGANIZATION	INTERNAL ORGANIZATION	Who? + How?
			EXTERNAL ORGANIZATION	Who? + How?
			ACTORS	Who?
		METHODOLOGY	PROCESS	How? + When?
TECHNIQUES	How?			

Figure 3 – Orientations-Spheres Corporate Foresight Implementation Framework

4. EUROTECH CASE STUDY

Eurotech is an Italian company located in Amaro (Udine, Italy) leader in two markets: the pervasive computation and the HPC (High Performance Computing) ones. Eurotech adopts the model of a “fables company” defining itself as the “ideas company”. As a matter of fact the production is outsourced³ to strongly focus the efforts on the value chain of Research & Development (40% of total investments): engineering, prototyping, quality control and supply chain management.

Founded in 1992 and quoted in the stock market in 2005, the company is a leading technology one, strongly innovative and being able to grow focusing its business model on innovation management through two main levers: the Corporate Foresight and the Merge & Acquisition strategy (Siagri, 2007).

On January 2008 the Eurotech group was employing 620 people, 40% of which in Research & Development. On the industrial side, Eurotech is present on United States with three facilities, in China with the Beijing commercial unit and with a R&D center in Chengdu and in Japan with a design-production and commercial unit; in Europe, beside Italian facilities, in France, United Kingdom and Finland.

In Eurotech group the CF is effectively implemented and its implementation can be described referring to the framework we proposed after literature review, and in particular through the three main spheres (see par. 3.3). For each of these spheres we will show the best practices and lesson learned in Eurotech. Since literature about CF is still emergent and only recently is starting to gain consideration by scholars (Liebl, 1996), and since implementation topics and cues are to be yet deeply explored, some explorative case studies are required to let outcrop relevant insights on CF.

As regards the orientations of the framework, it has to be said that the most important, if not the only one, foresight orientation as regards Eurotech is the Technology Foresight. As there are no strong contributors from the other types of foresight orientations, we will briefly describe the Technology Foresight orientation in the section related to the Eurotech vision.

The analysis, as described in the methodology section, has been led through different channels, in order to pick up and collect a huge amount of information and data to do the different sources triangulation.

Moreover, from the case study, emerge some quantitative results (in a scale from 1 to 5) about, for example, the uncertainty and complexity of the context. These marks have been chosen by a wide panel of experts (CEO, CTO, board members and company stakeholders) through a Delphi analysis.

4.1 OVERVIEW

4.1.1 Vision and markets

The foundation of the Eurotech vision is linked to the Mark Weiser⁴'s principle “The most important technologies are the ones that disappear. They wave themselves in the fabric of everyday life, until they are undistinguishable from it”⁵. This characteristic of invisibility is due to the progressive diffusion of technologies and of their integration in everyday life, namely the assimilation and embeddedness in the everyday objects.

The invisibility perspective/trajectory from a theoretical point of view leads to the ubiquitous computing revolution. The computers miniaturization and embeddedness will convey to the “smart dust” concept: the computers are more and more undersized since they get to be so little that they can be assumed to be as big as sand grains, in other words the trend is toward the so called “smart dust”. From a conceptual point of view instead we are going, in Eurotech understandings, to the human-machine interaction symbiotic era (Battistella and De Toni, 2008), that means that biology and technology spheres are progressively and mutually converging and interchanging their domains.

Eurotech claims that computers will disappear, augmenting their pervasiveness, and suggests that their differentiating characteristics will be:

- Connectivity to the internet broadband in every moment;
- On demand availability of computation capacity by the web;
- Miniaturized computers embedded in the environment, in our garments and in our body too;
- Augmented reality.

³ The only processes that are internally hold are the ones for which there is no economic convenience in outsourcing them, as, for example, prototype production and product tests.

⁴ The “father” of the ubiquitous (or pervasive) computing, who developed this theory during his work in Xerox Park.

⁵ Mark Weiser, “The Computer for the 21st Century”, Scientific American, vol. 265 no.9, pp. 66-75, 1991.

The Eurotech Research and Development is nurturing two opposite streams: one is the miniaturization, studying sensors and small computers for the information elaboration (pervasive, wearable computer), the other is represented by supercomputer, a system that has a control function and elaborates all the information gathered by the sensors network.

The main production field is the pervasive computation one, more specifically the «Pervasive computing GRID» that in a certain sense integrates all the two above explained streams, and it is in fact composed by high-performance computers, embedded computers, network computers, wearable computers, smart sensors. The «GRID», pervasive computational grid, is a new architecture in which computers of different dimensions (for example mobile computer, «wearable» computer and smart sensors embedded in everyday objects and environment) and high-performance computers (HPC) are interconnected through an infrastructure of scalable communication (PAN, LAN, WAN). In this context, Eurotech designs and sells Pervasive Computing Devices, in which the core components are the Embedded PCs.

The nano-PC markets are for instance represented by the Defence, Transportation, Health and Industry sectors, while HPC ones by University, Research and Computing Centers

4.1.2 Context

The ICT is a very dynamic and complex sector, continuously transforming itself due to the huge acceleration of the technological change (Kurzweil, 2006). The digital technologies exponential progress in terms of speed, miniaturization, and connection, contributes to let increase more and more the uncertainty and complexity of the competitive scenario. More specifically, to cope with this context, high-tech companies are now adopting new methodologies and organizational and managerial practices, coming from strategic and innovation management studies. Eurotech represents the case of a company succeeding in implementing CF and leader in the market.

The context where Eurotech is competing has been analyzed among two main variables, the environmental uncertainty and complexity.

More specifically, the environment uncertainty has been valued in terms of:

- Market growth;
- Clients and competitors behavior;
- Macro-economic forces and dynamics;
- Past events.

The competitors and clients behavior is hardly predictable, due to the already mentioned fast growth, progress and acceleration characterizing both pervasive computing market and HPC one. Instead the contractors' behavior is reasonably predictable, due of their membership to the same multinational group with an international imprinting but a strong integration.

Regarding the macro-economic forces, Eurotech is, since its quotation in the stock market, under the strong unstable influences of the financial market, as well of the world economy wealth. Moreover, the continuous changing business environment of the last 10 years is more and more heavily influenced by the change rate of digital technologies.

The environment complexity has been evaluated referring to (Duncan, 1972):

- Sector structure;
- Market structure;
- Links and dependences;
- Sector regulation and public visibility.

The Eurotech sector and market structures are highly complex and, due to the high number of clients and competitors and to the competition on a global scale, the actors' actions are highly unpredictable.

Regarding the dependences, Eurotech is linked and holds the control of some companies. More specifically, Eurotech is a group of companies created by a merge & acquisition strategy to gain strategic partnership on the Research side⁶. Merge & acquisition actions are vital to reach a competitive dimension, through the exploitation of capabilities, assets, know-how etc. already active and the exploration of focused technological areas and market niches into which to grow.

⁶ For example, Eurotech activated different collaborations with universities and research centres, both for Pervasive Computing (eg. Universities in Udine, Zaragoza, Paris, London, etc.) and HPC (eg. Italian National Institute for Nuclear Physics - INFN).

Finally, public regulations have a reasonable influence on the company (for example, considering the Tech Star quotation constraints and regulation).

Table 2 briefly summarized the context analysis about Eurotech. As reported before, the values (from 1 to 5) are been assigned by experts judgments and evaluations (company stakeholders, CEO, CTO, Board members) through a Delphi panel.

Table 2 –The CF Context analysis in Eurotech

	EVALUATION CRITERIA		LEVEL				
			1	2	3	4	5
CONTEXT ANALYSIS	UNCERTAINTY	Market growth				x	
		Clients and competitors behavior			x		
		Macro-economic forces and dynamics					x
		Past events				x	
CONTEXT ANALYSIS	COMPLEXITY	Sector structure				x	
		Market structure				x	
		Links and Dependences				x	
		Sector regulation and public visibility		x			

Hence, the Eurotech context analysis has shown the turbulent conditions and dynamics in which Eurotech is operating. According to the literature on CF, high environmental uncertainty and complexity are conditions that require CF, more specifically, a growing market, heavily impacting and startling past events, complex market and sector structures, numerous dependences and sector regulations.

4.1.3 Strategy

As above already highlighted, the Eurotech strategy is to configure itself as an “ideas company” and its business model basing on innovation management through two main levers: the Corporate Foresight and Merge & Acquisition strategy (Siagri, 2007).

According to this view, the Porter’s elements of strategy (1980) we analyzed are:

- Market strategy type;
- Differentiation criteria;
- Orientation.

More specifically, Eurotech adopts a niche strategy, focused on nano-PC and HPC industry-sectors. Moreover Eurotech adopts a global strategy, due to the International nature of the competition ground and due to its strategic partners international merge& acquisition.

Eurotech’s differentiation is on products segments: Eurotech wants to gain one of the first five places in the nanoPC’s production. The live-motive of Eurotech is the growth through the use of research, innovation and merge & acquisition. Many scholars claim that a company, that wants to grow and upgrades a strategy of market (global or niche), should enforce the Corporate Foresight. For this reason in our research we investigated the improvement made in the Corporate Foresight implementation by Eurotech.

4.2 EUROTECH IMPLEMENTATION OF CORPORATE FORESIGHT

For explanation clarity and synthesis we will now briefly present the main topics and results emerged by the Eurotech’s case study, subdividing them according to the three different spheres identified in the literature analysis: the culture, the organization and the methodology spheres.

4.2.1 Eurotech Corporate Foresight Culture Sphere

The foresight’s culture in Eurotech refers to the capacity of being and becoming sensitive to the trends and weak signals. This leads to greater attention, availability, willingness and readiness to listen to external sources and internal changes in the PEEST.

The analysis of the Eurotech's culture has highlighted three main issues, discussed more fully below.

Commitment & Leadership

The Eurotech senior management commitment on the spreading of CF culture is really high. This has been clearly evidenced both during field interviews, both by the triangulation with also the information acquired in the conferences, public statements, internal and public documents. The Eurotech CEO is very concerned and convinced of the potentiality of CF for innovation. As a matter of fact, the CEO himself devotes part of his daytime monitoring and researching new emerging and disruptive trends, even participating in many conferences and forums that talk about the future. This heavy commitment has the target from one side to increase the stock and the network of knowledge and from the other side to spread the concept of Eurotech as foresight and innovative business-oriented company. Thus the will to enhance the CF by the high direction is surely high, but to be honest, these incentives, and also sharing information on foresight⁷, occurs more often within the top and senior management levels, and not with a wider spread in all the company. This is in line with what emerged from the CF literature, which underlines the need for a strong commitment by top management to promote a high-rise and spread in the organization.

Communication & Climate

The communication activity on CF is continually and frequently carried out. We encountered two main channels, the formal and informal ones. Formal communication takes mainly place in committees, workgroups and conferences; informal communication in social and informal interactions and events as well as through informal networks.

As above remarked, the climate arranged in Eurotech is characterized by a deep and heavy acceptance and propelling commitment by the top management and by the foresight-oriented teams. Eurotech board is trying to make sense of strategic value conveyed by CF approaches to its stakeholders, favouring the interaction through environments where foresight actors are deployed in order to develop a potential of capabilities and sensibilities by which intercepting new trends and weak signals.

Peripheral Vision & Sensemaking

Eurotech shows a peculiar aptitude toward peripheral vision, disclosing readiness in sensing the new trends mainly in the technology level, by explorations and investigations conveyed by external sources.

Eurotech built strong foundations to enhance this sensemaking (Weick, 1979) aptitude adopting a networked organizational model characterized by core hubs in which information flows are conveyed together with new trends and proposals from peripheral units.

Moreover in Eurotech the foresight analysis is not only focused in the core business areas, but also in other areas to predict and to gain insights on unexpected events from different fields and to sense weak signals from neighbouring areas, the so called "white spaces" (Reger, 2006).

4.2.2 Eurotech Corporate Foresight Organization Sphere

In our opinion, looking through the lens of the CF to the Eurotech organization model, it is characterized by four main aspects:

1. Internal Configuration
2. Integration
3. Actors
4. Network

Internal Configuration

- The separation between the Research and Development;
- The foresight unit;
- The scientific committee.

⁷ Knowledge sharing is in this context limited only to foresight practices. Eurotech indeed has been recently investigated from a wider point of view represented by knowledge management studies. The results of this analysis have however shown that Eurotech share, deploy and manage knowledge fluxes among different and shared channels (Fornasier, 2008 - PhD Thesis).

The separation between Research and Development is one of the best practices established by Eurotech for its Foresight implementation, and on this the company built its organizational model.

Actually the Development is focused on the “market of today”. Thus it attends to develop products already existent with a more short-term focus, more oriented to tactics, that is at the direct income connected with what is desired by today clients (market-pull approach). The Research instead can be applied to the “market of tomorrow”, thus it receives inputs from the Foresight and has a more medium-long term focus, more oriented to the strategy, that is to imagine what the clients of tomorrow will desire and in which new and different scenario will take place the competition (technology push approach).

In Eurotech the separation between Research and Development is not only an organizational practice, but is also a physical one: indeed the Research is a separated unit, called ETH-Lab, directed by the CTO (Chief Technology Officer) and located in Trento, while the Development in Amaro (Udine).

Referring to the Christensen (1997)’s classification of innovation types, we might consider the Development more related to sustaining innovation, while the Research more related to disruptive and radical innovations.

In this organizational model (

Figure 4), the Foresight is placed at the beginning and provides inputs and insights for the research activities. The link between Foresight and Research is supported by the strategic planning and by relations and partnerships with universities and research centers.

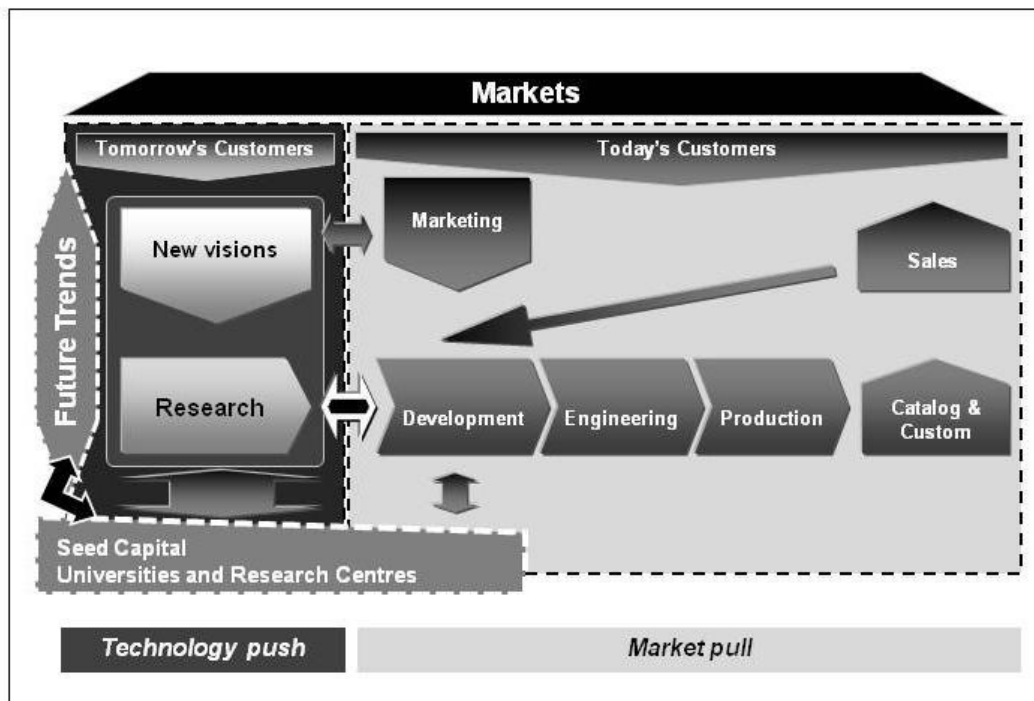


Figure 4 - A representation of the Eurotech organizational model

The Foresight internal organization in Eurotech is based on two main pillars: the Foresight Unit and the scientific committee.

The Foresight Unit is formed by three/four Eurotech top managers who try, through web-based research, database analysis, book readings, sector-related fairs attending, creative techniques, to make sense of new sector trends and of new possible technology development directions. This is the real “avant-garde” group in the company, directly directed and reporting to the CEO, and focusing a good part of its time, resources and efforts to scent and wind weak signals. Moreover the Foresight Unit activities are heavily interrelated with other functions, such as marketing, strategic and research ones.

The Eurotech scientific committee has the function to discuss these ideas through a multidisciplinary perspective.

It has been ideated as an open space collector of experts from different fields, in which they can imagine and shape joint futures derived from their own provenience disciplines and in which they can generate, discuss and refine through brainstorming insightful ideas coming from their scientific domains.

The well-known mechanisms are the *cross fertilization*, *cross pollination* (Lapierre and Giroux, 2003) and the accessibility at the *cognitive diversity* (Miller *et al.*, 1998), essential to enlarge and enrich perspectives and knowledge backgrounds.

Thus the scientific committee is composed to cover different areas, such as informatics, electronics, physics, biomedicine, etc. and the activities triggers are primarily Eurotech top managers, all of them experts on their respective fields.

Integration

The Eurotech Foresight activities do not remain only a future exercise, with no correlation to practice. The future researches are strongly interrelated first with the research directions and to the decisions as regards the research investments, then with marketing to investigate the possible future customers needs and the possible impacts on them, and finally with the strategy to support the decision-making and the direction of the vision and of the future strategies.

Actors

According to literature, Eurotech foresight activities are accomplished by actors coming from Research and Development, Strategy and Strategic marketing. More specifically, Eurotech's main actors are the CEO and the strategy executive officers, the CTO and other R&D technicians, and finally the scientific committee and external consultants.

Network

- The networking, that refers to the connections with the external environment through:
 - Collaborations between universities and research centres;
 - Strategic merge & acquisition to establish and nurture research partnership.

The foresight external organization matches with the networking activity.

A typical problem related to the research theme refers to the huge investments required in relation of an unknown commercial success rate. Moreover investing on Research does not imply any assurance of the fact that products will successful join the market. Eurotech pursues its solution to this problem creating, establishing and exploiting collaborative networks with universities and research centers. Thus, in the Eurotech organizational model these external knowledge networks cover a core strategic value.

More specifically, Eurotech cooperates with universities on a regional, national and international scale. A similar structure is applied for research centres. These partnerships match with multiple aspects, not only on a technological basis but also on a sociological one, in order to cover a wide range of perspectives and orientations, and to investigate also the impacts on an economic-managerial level on customers groups.

A second main pillar of the Eurotech networking activity is the partnership and collaboration with other companies. As remarked, Eurotech adopts a merge & acquisition strategy to establish this kind of strategic research-focused partnership (Siagri, 2007) in order to acquire complementary competencies or gain access to new external cognitive and knowledge diversity⁸.

In

Figure 5 the best practices about the CF organization now described are briefly summarized.

⁸ For example, the acquisition of Parvus inc. covered the lack of knowledge in the ruggedized mobile networking, display, and computer technologies.

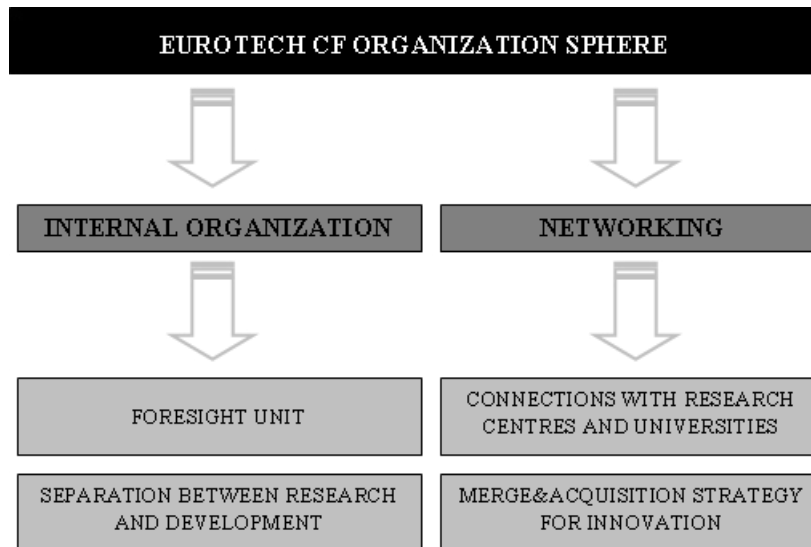


Figure 5 – Advices for implementing the organizational level of foresight

4.2.3 Eurotech Corporate Foresight Methodology Sphere

The methodology sphere of Eurotech Corporate Foresight is characterized by two main aspects: techniques and matching and process and application.

Techniques & Matching

On the methodological level, Eurotech declines the model suggested and proposed by Christensen (1997) as shown in

Figure 6 and adopts a set of foresight techniques with the aim to understand in advance which ones are the strategies to develop new disruptive or radical products.

More specifically, the CF in Eurotech is founded on mainly informal methods without an explicit and clear pattern and defined rules. Thus, the CF methodology is completely unstructured. Eurotech does not select a specific methodology for a specific context, but instead adopts the same methodology referring to its strategy of continuous innovation.

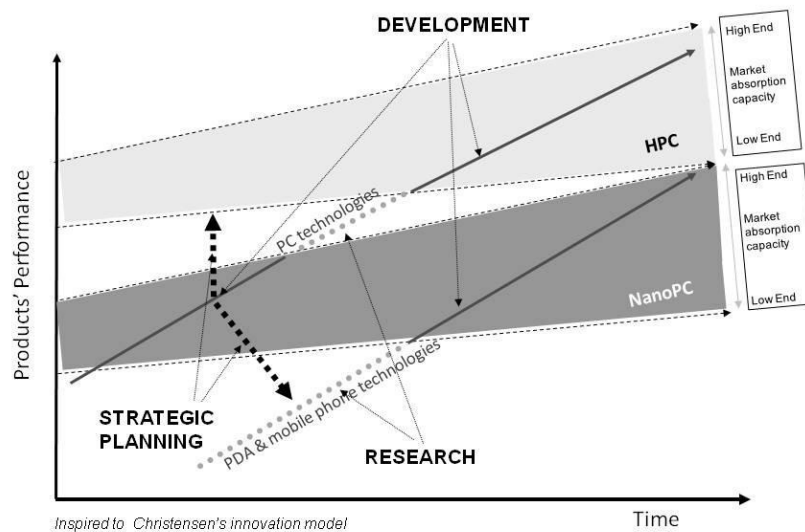


Figure 6 – Eurotech innovation model inspired to Christensen's model of disruptive innovation

Process & Application

The Eurotech CF process is completely unstructured, however we could notice and observe how the units focused on foresight activities (foresight unit and scientific committee) operate. The Foresight Unit is a continuous monitoring and supervising unit, while scientific committee meets two or four times a year. Thus the process, free of codified rules and norms, is more flexible to adapt and moulding itself to the company objectives and issues.

4.4 CASE STUDY DISCUSSION AND CONCLUSIONS

The case study has been analyzed referring to the three spheres we derived from the literature review:

1. Culture sphere
2. Organization sphere;
3. Methodology sphere.

Table 3 summarizes the emerging elements referring to the CF spheres that have been derived from the exploratory case-study.

In synthesis, the emerging elements characterizing the implementation of the foresight culture sphere are mainly three:

- *Commitment & Leadership*: the commitment and the will of supporting and propelling the CF by the top management;
- *Communication & Climate*: the top management and foresight actors' will to share multilevel and multidisciplinary information and knowledge;
- *Peripheral Vision & Sensemaking*: the will to open the organization towards external sources and actors to enhance readiness in sensemaking activities of speed and direction of sector changes in technologies, clients, competitors, environments, etc.

Moreover the emerging elements characterizing the implementation of the foresight organization sphere are mainly four:

- *Internal Configuration*: CF is nurtured by the key role played by the Foresight Unit and by the scientific committee, focused on sensing new trends and by the separation between Research and Development;
- *Integration*: integration of CF activities with other functions and processes, such as research, strategy and marketing, and the Merge & Acquisition strategy to foster innovation led by foresight;
- *Actors*: internal and external experts;
- *Network*: building of a supporting structure for foresight activities through the collaboration and partnership with universities, research centers and different companies.

Finally, referring to the methodological sphere, the elements to be considered from the Eurotech case study are:

- *Techniques & Matching*: matching with the context, that is the organization capability to select for that peculiar context the right technique or method, and march it with the foresight problem to be considered;
- *Process & Application*: time, level of analysis and structure.

Table 3 – The emerging elements characterizing the CF implementation in relation to the spheres

CF IMPLEMENTATION SPHERES	
CULTURE SPHERE	• Commitment & Leadership
	• Communication & Climate
	• Peripheral Vision & Sensemaking
ORGANIZATION SPHERE	• Internal Configuration
	• Integration
	• Actors
	• Network
METHODOLOGY SPHERE	• Techniques & Matching
	• Process & Application

5. CONCLUSIONS AND MANAGERIAL IMPLICATIONS

The advanced models for future projection use logics of anticipation, called foresight, based on the individuation of weak signals and emerging trends from external sources. Foresight, in fact, gives a vision to try to understand the complex forces that drive the change, including the emerging trends of convergence, the new technologies, the competitive dynamics, the potential dislocations and the alternative scenarios.

Corporate Foresight permits to adopt a process of strategic innovation that needs a continuous support from top management. It thus allows to a visionary company to activate systematic processes of exploration, of sensemaking and monitoring of the key trends that can potentially have an impact on business.

The present study has permitted to investigate the CF implementation modalities firstly through a literature pre-screening that allowed to build a first framework based on the four orientations and the three spheres of Corporate Foresight implementation. To fill the gaps in and to deeply investigate the levels of this framework, an explorative case study was needed; thus we explored the CF good practices in a very innovative company, whose deployment and strategy are deeply foresight-driven. The case permitted to propose a more complete framework that suggests and describes the key elements to implement CF.

The work presents implications in both academic and managerial fields. From an academic point of view, it represents a first tentative to build an integrated framework that helps in understanding the foresight activities in a company. From a practitioners' point of view, it is a basis for managers who would like to implement CF in their enterprises that can guide them thanks to the suggestions given by the orientations and spheres levels.

In our opinion, Corporate Foresight could have a deep strategic value in driving tomorrow innovations. But it needs not to be a set of techniques alone, instead to be integrated and supported building a structure of “soft” and “hard” factors. Finally, to quote Galsworthy's⁹ aphorism, “If you do not think about your future, you cannot have one”, the foresight is a powerful but still unexplored and neglected tool¹⁰ that could guide companies investigating and preparing for a complex and uncertain future.

Further work in this direction is surely needed: the research has to be extended first through a multiple case analysis in order to increase the research panel, to permit comparison and cross-analysis, and to further detail and complete the proposed framework and then through a survey research in order to investigate the causal relationship between the uncertainty and complexity of the context and the orientations and spheres and the potential correlations among culture, organization and methodology.

⁹ Galsworthy, John (1867–1933), playwright and British writer.

¹⁰ To paraphrase the Kotler's comment on strategic value of design.

REFERENCES

- Amabile, T. (1996) "Creativity in context" Boulder, CO, Westview Press.
- Andersen, P. D., et al. (2004) "Sensor foresight: Technology and market" Technovation, 24(4):311-320.
- Anderson, J. (1997) "Technology foresight for competitive advantage" Long Range Planning, 30(5):665-677.
- Andriopoulos, C.; Gotsi, M. (2006) "Probing the future: Mobilising foresight in multiple-product innovation firms" Futures, 38(1):50-66.
- Ansoff, H. I. (1976) "Managing surprise and discontinuity: Strategic response to weak signals" Zeitschrift für betriebswirtschaftliche Forschung, 28:129-152.
- Ansoff, H. I. (1987) "The emerging paradigm of strategic behaviour" Strategic Management Journal.
- Ashton, W. B.; Johnson, A. K.; Stacey, G. S. (1996) "Monitoring science and technology for competitive advantage" Competitive Intelligence Review, 7(1):115-126.
- Ashton, W. B.; Stacey, G. S. (1995) "Technical intelligence in business: Understanding technology threats and opportunities" International Journal of Technology Management, 10(1):79-104.
- Assakul, P. (2003) "Future Research Methods" http://www.cambridgeuniversityfutures.co.uk/Futures_Studies_Methodology.pdf
- Becker, P. (2002) "Corporate Foresight in Europe: A First Overview" Institution for Science and Technology Studies, Bielefeld.
- Bergeron, P.; Hiller, C. A. (2002) "Competitive intelligence" Annual Review of Information Science and Technology, 36:353-390.
- Blind, K.; Cuhls, K.; Grupp, H. (1999) "Current foresight activities in central Europe" Technological Forecasting and Social Change, 60(1):15-35.
- Brenner, M. S. (1996) "Technology Intelligence and Technology Scouting" Competitive Intelligence Review, 7(3):20-27.
- Brockhoff, K. (1991) "Competitor Technology Intelligence in German Companies" Industrial Marketing Management, 20(2):91-98.
- Brown, S. L.; Eisenhardt, K. M. (1997) "The art of continuous change: Linking complexity theory and time-paced evolution in relentlessly shifting organizations" Administrative Science Quarterly, 42(1):1-34.
- Brown, S. L.; Eisenhardt, K. M. (1995) "Product Development: Past Research, Present Findings, and Future-Directions" Academy of Management Review, 20(2):343-378.
- Burmeister, K. and Neef, A. (2005) "In the long run: Corporate Foresight und Langfristdenken in Unternehmen und Gesellschaft", Oekom Gesell. F. Oekolog.
- Bürgel, H. D.; Reger, G.; Ackel-Zakour, R. (2005) "Technologie-Früherkennung in multinationalen Unternehmen: Ergebnisse einer empirischen Untersuchung" in: M. G. Möhrle and R. Isenmann (2005): "Technologie-Roadmapping - Zukunftsstrategien für Technologieunternehmen"; Heidelberg, New York: Springer-Verlag; 27-53.
- Chatterji, D. (1996) "Accessing external sources of technology" Research Technology Management, 39(2):48-56.
- Christensen, C. (1997) "The innovator's dilemma: when new technologies cause great firms to fail" Harvard Business School Press.
- Coates, J. F. (1985) "Foresight in Federal Government Policy Making" Futures Research Quarterly, 1:29-53.
- Costanzo, L. A. (2004) "Strategic foresight in a high-speed environment" Futures, 36(2):219-235.
- Cuhls, K. (2003): "From forecasting to foresight processes: New participative foresight activities in Germany" Journal of Forecasting, 22(2-3):93-111.
- Daheim, C. and Uerz, G. (2008) "Corporate Foresight in Europe: from trend based logics to open foresight" Technology Analysis & Strategic Management, 20(3):321-336
- Day, G. S.; Schoemaker, P. J. H. (2005) "Scanning the periphery" Harvard Business Review, 83(11):135-148.
- De Toni, A. F.; Battistella, C. (2008) "Dal sapiens sapiens all' homo technologicus: la coevoluzione uomo-macchina", Multiverso.
- Dougherty, E. (1989) "Tech Scouts: R&D's Globetrotters" Research & Development, 31(10):44-50.
- Duncan, RB (1972) "Characteristics of organizational environments and perceived environmental uncertainty" Administrative Science Quarterly.
- Eisenhardt, KM (1989) "Building theories from case study research" Academy of management review.
- Gassmann, O.; Gaso, B. (2005) "Organisational frameworks for listening post activities" International Journal of Technology Intelligence and Planning, 1(3):241 - 265.
- Gregory, M. J. (1995) "Technology Management - a Process Approach" Proceedings of the Institution of Mechanical Engineers Part B-Journal of Engineering Manufacture, 209(5):347-356.
- Howell, J. M.; Shea, C. M. (2001) "Individual differences, environmental scanning, innovation framing, and champion behavior: Key predictors of project performance" The Journal of Product Innovation Management; 18(1):15-27.
- Ilmola, L.; Kuusi, O. (2006) "Filters of weak signals hinder foresight: Monitoring weak signals efficiently in corporate decision-making" Futures, 38(8):908-924.
- Kahn, H. (1967) "The Art of Conjecture" Basic Books, New York.
- Lackman, C. L.; Saban, K.; Lanasa, J. M. (2000) "Organizing the Competitive Intelligence Function: A Benchmarking Study" Competitive Intelligence Review, 11(1):17-27.
- Lapierre, Jozee and Giroux, Vincent-Pierre (2003) "Creativity and Work Environment in a High-Tech Context" Creativity and Innovation Management, 12:11-23.
- Lichtenthaler, E. (2005) "The choice of technology intelligence methods in multinationals: towards a contingency approach" International Journal of Technology Management, 32(3):388-407.
- Lichtenthaler, E. (2003) "Third generation management of technology intelligence processes" R&D Management, 33(3):361-375.
- Liebl, (1996) "Strategische Frühaufklärung: Trends-Issues-Stakeholders" Oldenbourg.
- Liebl, F. (2005) "Technologie-Frühaufklärung: Bestandsaufnahme und Perspektiven" in Handbuch Technologie-und Innovationsmanagement: Strategie- Umsetzung – Controlling, Wiesbaden 2005.
- Major, E.; Ash, D.; Cordey-Hayes, M. (2001) "Foresight as a core competence" Futures, 33(2):91-107.
- Martelli, A. (1992) "Analisi strategica mediante scenari. Dal macro al microambiente: teorie e metodi" Etas Libri.
- Martin, B. R. (1995) "Foresight in Science and Technology" Technology Analysis & Strategic Management, 7(2):139-168.
- McCutcheon, DM and Meredith, JR (1993) "Conducting case study research in operations management" Journal of Operations Management, Elsevier.
- Meredith, J. (1998) "Building operations management theory through case and field research" Journal of Operations Management.

- Meyer, J.A. (2002) "Knowledge and use of innovation methods in young SME's" International Journal of Entrepreneurship and Innovation Management, 2(2):246-267.
- Miller, C.; Burke, L.; Glick, W. (1998) "Cognitive Diversity Among Upper-Echelon Executives: Implications For Strategic Decision Processes" Strategic Management Journal, 19:39-58.
- Müller, C. (2006) "Strategic Foresight in Companies. An international survey on trends and futures research processes", in Müller PhD Thesis.
- Patton, K. M. (2005) "The role of scanning in open intelligence systems" Technological Forecasting & Social Change, 72(9):1082-1093.
- Phaal, R.; Farrukh, C. J. P.; Probert, D. R. (2006) "Technology management tools: concept, development and application" Technovation, 26(3):336-344.
- Pilkington, A.; Teichert, T. (2006) "Management of technology: themes, concepts and relationships" Technovation, 26:288-299.
- Porter, A. L. (2005) "QTIP: Quick technology intelligence processes" Technological Forecasting & Social Change, 72(9):1070-1081.
- Porter, A. L., et al. (2004) "Technology futures analysis: Toward integration of the field and new methods" Technological Forecasting and Social Change, 71(3):287-303.
- Ratcliffe, J. S. (2006) "Challenges for corporate foresight: towards strategic prospective through scenario thinking", Foresight.
- Reger, G. (2006): "Technologie-Früherkennung: Organisation und Prozess. Quantensprünge in der Entwicklung erfolgreich managen" in O. Gassmann and C. Kobe (2006) "Management von Innovation und Risiko", Springer, Berlin, 303-330.
- Reger, G. (2001) "Technology foresight in companies: From an indicator to a network and process perspective" Technology Analysis & Strategic Management, 13(4):533-553.
- Ringland, R. (2008) "Scenario Planning: Managing for the Future" Chichester, England.
- Rohrbeck, R. (2007) "Technology Scouting – a case study on the Deutsche Telekom Laboratories" ISPIM conference, New Delhi (Asia).
- Rohrbeck, R.; Arnold, H. M.; Heuer, J. (2007) "Strategic Foresight in multinational enterprises – a case study on the Deutsche Telekom Laboratories" ISPIM-Asia 2007, New Delhi.
- Rohrbeck, R.; Gemünden, H. G. (2008) "Strategic Foresight in Multinational Enterprises: Building a Best-Practice Framework from Case Studies" R&D Management Conference 2008 "Emerging methods in R&D management": 2008; Ottawa, Canada.
- Rosenthal, S. R.; Capper, M. (2006) "Ethnographies in the front end: Designing for enhanced customer experiences" Journal of Product Innovation Management, 23(3):215-237.
- Ruff, F. (2006): "Corporate foresight: integrating the future business environment into innovation and strategy" International Journal of Technology Management, 34(3):278-295.
- Schwartz, P. (1991) "The art of long view: planning for the Future in an Uncertain World" Wired.
- Schwarz, JO (2005) "Pitfalls implementing a strategic early warning system" Foresight, 7(4):22-30.
- Siagri, R. (2007) "Pervasive computers and the GRID: the birth of a computational exoskeleton for augmented reality" Proceedings of the the 6th joint meeting of the European software engineering conference and the ACM SIGSOFT symposium on The foundations of software engineering.
- Simonato, G. (2009) "Eurotech Visione esponenziale: da piccolo impresa a multinazionale tascabile" Guerini e Associati Italy.
- Slaughter, R. A. (1996) "Foresight beyond strategy: Social initiatives by business and government", Long Range Planning, 29(2):156-163.
- Slaughter, R. A. (1998) "Futures studies as an intellectual and applied discipline" American Behavioral Scientist, 42(3):372-385.
- Smiths, R.; Kuhlmann, S. (2004) "The rise of systemic instruments in innovation policy" International Journal of Foresight and Innovation Policy.
- Taylor, R. L. (1975) "Technological Gatekeeper" R & D Management, 5(3):239-242.
- Tsoukas, H.; Shepherd, J. (2004) "Coping with the future: developing organizational foresightfulness – Introduction" Futures, 36(2):137-144.
- Van Der Haijden, K. (2004) "Can internally generated futures accelerate organizational learning?" Foresight, 36(2):145-159.
- Van Wyk, R. J. (1997) "Strategic technology scanning" Technological Forecasting and Social Change, 55(1):21-38.
- Weick, K. E. (1979) "The social psychology of organizing" Random House USA Inc.
- Withehead, A. N. (1933) "Adventures of Ideas" New York: Macmillan.
- Wolff, M. F. (1992) "Scouting for Technology" Research Technology Management, 35(2):10-12.
- Yin, RK (2003) "Case study research design and methods" Applied Social Research Methods Series, Sage Newbury Park, Calif.