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From research & development  
to foresight & research.  
The announcement of a new wedding:  
the Eurotech case

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**From Research & Development to Foresight & Research:  
the announcement of a new wedding  
– The Eurotech case –**

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**Abstract**

*In the stream of works showing the evolution of the Research & Development organizational system, this paper presents a case study that reinforces the thesis of the R&D separation. After a detailed overview of how the separation can be implemented and the pinpointing of the activation of a Foresight unit, the authors surpass the failed wedding between Research & Development and originally propose a new couple: Foresight & Research.*

**Keywords:** Research and Development, Corporate Foresight, Research Outsourcing, Case Study

## INTRODUCTION

Due to the growing complexity and dynamicity of the market competition and the discontinuous conditions of the political-economical, socio-cultural and technological environment, recently new approaches to innovation (as for example: Open Innovation, Technology Brokering, Collective Innovation, etc.) are emerging as an anchor for companies. Company structure and dynamics are therefore changing in relation to this new landscape. Evidently, this evolution encompasses mainly the R&D organizational structure, which is the engine of innovation.

A rich stream of scholars (e.g. Leifer and Triscari, 1987; Chiesa, 1996) underlined how the play for speed and the R&D integration drove the company to concentrate on the D side, in other words on the market orientation and on traditional performances (costs, time, ...) and on the mission of developing the products, and did not press it to look also to the R side, in other words to the technology orientation, to new solutions and innovations and to the investigation of future possibilities of business. Hence they conclude proposing the separation of R&D. Moreover, an other stream of scholars (e.g. Reger, 2004; Rohrbeck and Gemunden, 2008) highlighted the importance of future studies and foresight activities in the company. In fact, the continuous innovation runs not only through the comprehension of and the research on the “market of today”, but also through the identification of the possible scenarios of the “markets of tomorrow”. In this line, it is important to manage and to organize the company to favour the anticipation and the comprehension of trends and consequently to be aware of the own future path of growth.

Taking off from these considerations, the present paper aims to contribute in enriching the research fields on R&D organization and on future studies. The R&D function has gained an even more pivotal role, but in our opinion it needs to be managed and organized in a special manner and to be supported by building a structure to sustain and to drive tomorrow innovations. Therefore, this paper would like to deeply investigate the structure and the organization of R&D through the “market of tomorrow” lenses. More specifically, the present work aims to:

- Propose a case study that reinforces the view of the failed wedding between R&D;
- Explain how a company can organize its R&D function with the aim to look deeper to future, pinpointing some suggestions on how to implement the R&D separation and on

how to organize and manage supporting processes and tools for a future-oriented R&D;

- Highlight the activation of a Foresight Unit, which has the main aims of driving the vision, orientating the decision making and nurturing the research activities;
- Announce a new wedding: Foresight and Research.

Consequently, the paper begins with an analysis of the existing literature contributions about R&D organization and Foresight, which leads to identify the theoretical foundations that permit to understand why it is important to investigate the R&D organization from a specific point of view. Afterwards, the paper points out the research design in terms of research questions, research methodology and empirical analysis. Then, the Eurotech case study is discussed in terms of its peculiar R&D organization, highlighting the role of the so called Foresight Unit. Finally, the paper draws conclusions and highlights the lessons learned and the recommendations for scholars and for practitioners.

## **THEORETICAL BACKGROUND**

Nurturing Research and Development (R&D) is a vital element to stimulate innovation. In fact, R&D is one of the preferred means by which organizations increase their stock of knowledge and use it in order to innovate (OECD Factbook, 2005).

The nature of R&D activity is peculiar for a number of reasons, as the degree of uncertainty, the fuzzy and not measurable output and the long-term ultimate result in the market (Chiesa and Masella, 1996). For these reasons, R&D has always been treated as an expense centre and R&D planning has been the result of a negotiation between R&D and corporate on the amount of resources to allocate in R&D. Anyhow, indeed its intrinsic level of uncertainty and complexity, R&D remains an important backbone of progress and of potential impacts to achieve a competitive edge in the marketplace. According to Whatmore (2002), organisations may see their R&D as at a crossroads: they can view it as a cost or as the engine of innovation, outsourcing it or deciding how to organize and manage it.

“Doing the R&D right” means also decide, define and manage the “right” organizational system. It can be linked with the type of innovation it produces (e.g. Thamhain, 2003; Argyres and Silverman, 2004), and it is one of the dimensions to define the R&D value (Chiesa and Masella, 1996). Moreover, R&D organizational structures reflect characteristic strategies of firms (Eto, 1991). Anyhow, literature on the organization of R&D function

completely agrees on the point that there is no such thing as the best organisational structure for R&D and innovation (Zander, 1999; Volberda, 1998). But literature also says that there is no one best way, because the R&D organization and management has to fit with the targeted and the importance of R&D activity type (von Zedwitz *et al.*, 2004) and with the nature of R&D process (Cavone *et al.*, 2000).

Furthermore, researches by Tidd *et al.* (1997) and Jacobs and Waalkens (2001) show that the choice for the best organisational form of R&D is based on four organisational dimensions (technology-push versus market-pull, centralisation versus decentralisation, concentration within a country or distributed internationally, internal versus external acquisition of knowledge).

In the stream of works showing the evolution of R&D (3 generations of Roussel *et al.*, 1991; 4 generations of Miller and Morris, 1998; 4 phases of Niosi, 1999; 5 generations of Rothwell, 1994 and Rogers, 1996; Chiesa, 2001), Nobelius (2004), evidencing how the complexity has continually expanded throughout the generations, proposed an evolutionary view of R&D function based on six R&D generations:

1. R&D as ivory tower: technology-push oriented and focus on scientific breakthroughs, little interaction with the rest of the company;
2. R&D as business: market-pull oriented, strategy driven, project management importance, internal customer concept;
3. R&D as portfolio: linkages with business and corporate strategies, methods as risk-reward to guide overall investments;
4. R&D as integrative activity: customer involvement, total concept focus and parallelization of activities;
5. R&D as network: collaboration with competitors, suppliers, distributors, control product development speed, separating R and D;
6. R&D as arena: it is characterized by a re-focus of the research part, a multi-technology base and a more distributed technology-sourcing structure, an enlargement and enhancement of the capabilities by connecting to loosely tied multi-technology research networks and by niche-based alliances, conducted with the aim of recognizing the future breakthroughs affecting the industry segments.

Even if the last two generations are the most innovative ones, the data (OECD, 2005) show that the 90% circa of the companies are still in one of the first four generations, and in

particular they still have the R&D in the same function. Going somewhat contrary to this commonly accepted notion that R and D are “married”, a flow of scholars<sup>1</sup> showed the differences between R&D and hypothesised there is a trend of the separation of the Research from the Development. As regards the fifth generation, in fact, two major works concentrate on the investigation of R and D separation. The results of a field study (Leifer and Triscari, 1987) highlighted the differences between R and D, indicating that D units were characterized as having more routine jobs, more inter-unit dependence and coordination and more communication outside the work unit but less within the larger organization, and were less tightly structured than R units. The works of Chiesa (1996, 2001) confirmed these differences and highlight the separation advantages in terms of culture, organization and people and the main disadvantage as regards integration and communication issues between R and D.

Other authors, talking about other issues, only give a hint to the topic. For example, Cagliano *et al.* (2000) explored the characteristics of technological collaborations in the different phases of the innovation process (research, development and manufacturing), highlighting how they differ in terms of content, motivations, partners involved and organizational forms of collaboration (in terms of number of partners, contractual formalization, structure of control, time horizon and density of relationships). Through interviews to R&D managers, Whatmore (2002) showed how a number of companies have “de-coupled” their R&D, shifting research activities to universities and development ones to product divisions or pushing R&D to become spin-offs. For Jain and Rivers (2000), the R&D difference can be highlighted in terms of basic or applied R&D activity (the R&D at the university is more focused on R and the industrial R&D is more D), and they finally underline how, due to a more deep understanding of the process from idea to marketplace, the emphasis on R or D has become a moving target depending upon the need. From the point of view of the globalization of R&D, the work called “global R&D management agenda” (von Zedtwitz *et al.*, 2004) identified the major challenges of R&D among 18 multinationals. One of the ten challenges for managing global innovation they identified is “managing interfaces in R&D”, where the separators between international research and development are: geographical distance, differences in reporting structures, controlling, time horizons, knowledge background and cultural gaps.

The separation clearly lets outcrop some difficulties, the main one can be found surely in the integration mechanisms. For example, Paraponaries (2003) talks about the difficulties of co-

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<sup>1</sup> Other scholars stated different articulations of R&D, as for example the investment and harvesting modes (Coombs, 1996) and exploration and exploitation (Kodama, 1992).

operation due to the R&D separation, referring in particular to the knowledge management and concluding the necessity to absorb and diffuse knowledge within the various departments of R&D (Kogut and Zander, 1993).

Anyhow, the integration/separation of R&D is still an evident dilemma as a contemporary management issue, in particular referring to the different countries cultures, approaches and policies (Whatmore, 2002), the globalization and the internationalization<sup>2</sup> (e.g. Gassmann and von Zedtwitz, 1999; Chiesa, 2000; von Zedtwitz and Gassmann, 2002; van Ark *et al.*, 2008) and the integration with other functions as strategy, as manufacturing (e.g. Cagliano *et al.*, 2000; Mariani, 2002) or as marketing (e.g. Griffin and Hauser, 1996; Becker and Lillemark, 2006), so much that the different performance measurement system for R and for D has been underlined and studied too (Chiesa and Frattini, 2007).

Thus far, the discussion has drawn a first look inside the concept of R&D separation. Anyhow, literature (Nobelius, 2004) claims the need of further research underlining how there has been limited research on the interaction between Research and Development. Actually, literature still evidences some strong limitations:

- it is not fully yet explained how it is really possible to implement the R&D separation, in other words how the process can be deployed;
- scholars have not yet focused the main supporting managerial and organizational activities.

As criteria such as relevance and actionability are often put forward as important for the quality of research results (Adler *et al.*, 2003; Shani *et al.*, 2007), we would like to deep our research on finding how to implement and how to support the R&D separation.

Furthermore, as confirmed by literature, research is also and especially needed under the prerequisites of today, as the R&D organization depends on context because its processes adapt themselves to the surrounding environment and prerequisites. Considering that the sixth generation of R&D (Nobelius, 2004) is characterized by the aim to identify the future breakthroughs of the specific industry, in our opinion a promising direction is the one of the foresight point of view.

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<sup>2</sup> The drivers of internationalisation differ substantially between research, on the one hand, and development, on the other. Research activities are usually concentrated in a single location, mostly near the firm headquarters, to exploit ties with universities and maximise cooperation across activities. Development is generally tied to individual business units and is more likely to be positioned in proximity to production locations.

Indeed, some studies showed that half of present industrial problems require long-term research and a strong attention to the context changes and that there is a relationship between long-term profitability and investments in R&D (Fagerberg, 1987) and the ability to identify and cultivate core capabilities and competences of the corporation (Prahalad and Hamel, 1990). In other words, the present competitive environment, in which competition increases and the pace of change accelerates, stresses even more the need for deploying R&D investments more efficiently and more effectively.

In this age of rapid technological innovation and social change, firms that do not stay abreast of the latest advancements in science and technology (S&T) and of the sociological trends stand a greater chance of missing opportunities than firms that maintain vigilance over the ever-changing PEEST (Political, Economical, Environmental, Sociological and Technological) environment. Nevertheless, literature on innovation management points out a frequent lack in catching the business opportunities, underlining the importance of weak signals (Ansoff, 1976 and 1987) and of discontinuities for disruptive innovation (Christensen, 1997). The study of weak signals and emerging markets for new technologies, innovation and product development is called “Corporate Foresight” (CF) (e.g. Becker, 2002): it is in fact focused on the study of how the organizations can identify weak signals and information from the periphery, anticipate emerging markets and trends and manage innovation to prepare for an uncertain future.

Foresight helps companies to be given a vision to try to understand the complex forces that drive the change, to accordingly support the decision-making process and manage strategy and R&D. As a matter of fact, many companies consider foresight as such a core competence that have built a CF function dedicated only to study advanced models for future projection using logics of anticipation, to individuate weak signals from external sources and understand emerging trends in all the PEEST environment. This function has usually been named in large companies (e.g. Nokia, Siemens, Deutsche Telekom, Shell, Telecom Italia, etc.) as “Foresight unit”, “Future Centre”, “Future Lab”. Moreover, some recent works have investigated new forms of R&D organization and laboratories, for example, Dell’Era and Verganti (2009), underlining the importance of technological but also sociological trends, talk about the Design Driven Laboratories, which study not only the technological but also the semantic dimension of the products.

Anyhow, literature on foresight is still in its infancy and it therefore has many interesting points to raise and research on. For our purposes, the main gaps that can be highlighted are:



- the lack of a description of the functioning of the Foresight Unit and of how to implement it;
- the lack of a clear representation of its objectives and links with the other company functions.

As the dilemma of R&D integration/separation will never end because, as already evidenced, it strongly depends on circumstance, further research is needed with a particular focus on a specific context. Therefore we would look at the problem through the lenses of Corporate Foresight, in other words we would like to investigate the R&D configuration in a context of higher speed and efficiency need, but of attention to future trends and innovation as well. This point of view is useful in our aim to fill the literature gaps as regards the implementation and the supporting activities for R&D separation.

## **RESEARCH DESIGN**

### *Research questions*

The configuration and the management of the R and D are strategically important and can have a deep value in driving today and tomorrow innovations. Companies find themselves propelled by speed and efficiency priorities, and have difficulties on giving importance to the R side, because of its mid-long term objectives. Moreover, as discussed above, also the Foresight Unit is increasing its importance for propelling the company's innovation engine.

The present work would like to contribute to wider the knowledge basis on R&D organization and to propose a solution of the dilemma of R&D separation, through the following research questions:

- **Can the R&D separation be the right answer for companies to innovate, investigate and be ready for the market of tomorrow?**
- **How can the “innovation engine” then be configured, supported and managed?**

### *Research methodology*

The gaps identified and the insights gained from the literature analysis led to a detailed study of R and D separation and of foresight practices. As there has been limited previous research on these topics, since implementation topics and cues are to be yet deeply explored, and in order to consider the complex system of variables that characterize the observed phenomenon, explorations are required to let outcrop relevant insights on R&D and CF.

The present study was exploratory in nature and one in-depth case study was selected for the following reasons:

- the case-study is especially proper for new investigations (Eisenhardt, 1989) and for exploratory research on complex social phenomena in real-life context (Yin, 2003; McCutcheon and Meredith, 1993);
- it allows researchers to do a holistic and contextualized analysis, to observe the phenomenon in its complexity, to collect a wide array of data (Hartley, 1994) and to identify the crucial variables (Yin, 2003);
- it matches the study's goal of studying a phenomenon with a dynamic and process nature and in which unfolding events play an important role in building explanations (Pettigrew, 1992);
- R&D managers have been found to be positively inclined to case-study research (Gassmann, 1999).

#### *Case Study Selection, Sample And Unit Of Analysis*

After two phases of literature review (a first one on R&D organization, focusing on the separation/integration dilemma, and a second one on Corporate Foresight organization), we have used the explorative case study research design, as defined by Yin (2003), selecting a success case, that evidences practices that are not yet clearly stated or yet investigated by literature, for an in-depth research.

This article is therefore focused on the study of a company operating in the ICT industry: Eurotech holding. The motivations for the choice of this case are many and different:

- Eurotech is characterized by a strong importance of R&D. It, in fact, defines itself as an “idea factory”: the production is outsourced to concentrate the efforts on Research and Development (40% of the investments) and the 31% of the employees are working in R (1,6%) & D (29,4%) (see Table 1 for a detailed overview);
- it was selected among the companies that have a very high innovative character and that have a future-oriented organization. In fact, it has, as it is widely recognized, a peculiar organizational model for innovation and a foresight-driven perspective for its R&D and strategy;

- its strategy is foresight-driven, in other words it is strongly oriented to the future trends. In fact, it has been able to grow<sup>3</sup> through acquisitions and targeting its business model on innovation;
- its CEO, Roberto Siagri, and the senior management's commitment on the spreading of innovation and CF culture is really high.

The units of analysis have been the entire Eurotech organization and especially the areas of R&D and Foresight, and their links with Strategy and Marketing.

### *Data Sources*

The study has an exploratory character, is retrospective and single in nature. It was carefully designed to ensure high quality and sufficient rigor. To maximize its validity and reliability (Dane, 1990; Yin, 2003), multiple sources of data were used, in order to collect a huge amount of information and data and have more and different information sources, with the double aim to increase the information basis and to diversify it, implementing an information triangulation. In particular, the channels for data were documents, interviews, Delphi panels, observation. Moreover, the collection of data required 20 circa non-consecutive days of on-site visits and the time-frame of the analysis was from 2006 to 2007.

Company documents. Copies of company documents on R&D organization and strategy, websites and other official documents were investigated. Also the company press review was considered. They were coded according to the areas of the analytic protocol proposed below.

Interviews. The case study was conducted in twelve face-to-face interviews with key informants: they were direct interviews with four key foresight actors of the company (CEO, CTO (and responsible of R), a strategy manager and a scientific committee member), in order to gain multiple perspectives and to investigate the whole organizational network and foresight system. As convergence of opinions from multiple researchers enhances precision in findings and different insights add richness to data (Eisenhardt, 1989), each of the two investigators were present in every interview.

To assure the coherence and the consistency, a standard interview protocol was developed to be checked and to guide the interviews, it was constituted of three main sections:

- (1) description of the business model and of the innovation strategy;

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<sup>3</sup> A story of acceleration with the phases of incubation (1992-2000), of private equity and acquisitions (2000-2005) and of public listed company and acquisitions (2005-now), the last two when the revenues strongly increase: 3,9 mln (2000), 6,4 (2001), 8,3 (2002), 11,7 (2003), 18,8 (2004), 29,8 (2005), 50,7 (2006), 75 (2007), 91,7 (2008).

- (2) description of the R&D organization (i.e. R and D separation; their characteristics, organizational models, etc.), in particular internal configuration, network, actors, integration mechanisms;
- (3) description of the managerial and organizational supporting activities (i.e. foresight activities).

Moreover, also other interviews released by company stakeholders (CEO, CTO, CFO, board members, etc.) on adjacent themes (innovation, strategy, etc.) were considered.

Panel Delphi. From the case study, some quantitative results emerge (in a scale from 1 to 5) about, for example, the uncertainty and complexity of the context or the alignment of the vision and of the strategy with future trends<sup>4</sup>. These marks have been chosen by a wide panel of experts (CEO, CTO, board members and company stakeholders) through a Delphi analysis.

Observation. The researchers had the possibility to directly observe the foresight activities, the R&D organization and to participate to the scientific committee as observer.

#### *Data Analysis*

Case analysis were conducted following the recommendations of Eisenhardt (1989), McCutcheon and Meredith (1993), Miles and Huberman (1994) and Yin (2003).

Moreover, given the qualitative nature of the study, to perform it in a rigorous way, the two researchers autonomously (basing on documents, interviews and observation) evaluate the case and wrote their comments, and subsequently they shared their opinions to obtain a convergent assessment. Gaps and conflicts were resolved by further reviewing the transcripts and by consultation with the interviewees. Finally, informants reviewed and confirmed the case results to ensure the investigators' comprehension is correct. Such feedbacks from informants are essential to prevent observer bias (Lincoln and Guba, 1985) and in establishing the credibility of an interpretation (Wallendorf and Belk, 1989).

In the following section, we will deeply describe the data gathering and analysis (company profile, analysis focus, analyzed dimensions, and analysis steps) and the results of the case studies.

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<sup>4</sup> These results have been published in other works (Battistella and De Toni, 2009 and Battistella *et al.*, 2009).

## EUROTECH CASE STUDY

### *Overview*

#### Company profile

Eurotech is an Italian company located in Amaro (Udine, Italy). 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. Its CEO, Roberto Siagri, in 2007 declared that this growth has been due in his opinion to two main levers: the innovation and foresight culture and the acquisition strategy. In 2008 the revenues were of 91,7 millions, +19,9% from 2007.

Eurotech is a leader in the pervasive computing market, and its R&D focus can be divided into two major streams:

- the nanoPC, in other words the miniaturization, studying sensors and small computers for the information elaboration (pervasive, wearable computer);
- the HPC (High Performance Computing), in other words the 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. The “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. Moreover, Eurotech produces also many innovative products, as for example the Zypad (a wearable computer), the Clù (a personal super-computer), etc.

In our aim of describing the implementation of the R&D separation and of the supporting activities based on foresight, we chose a case of success. Eurotech can be surely defined as an innovative and visionary company, for a number of reasons:

- the many awards for innovation of its products. Only for example, in 2006 the Zypad, a wearable computer developed by Eurotech through CF practices, won the award 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.

- its innovative entrepreneur. 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”.
- the adoption of its products by relevant or innovative industries or embedded in other innovative products. For example the Zypad has been adopted in the Defence from the American Army (Airforce). An other example is the product Vista, a Lab-On-Chip with a miniaturized “electronic eye” that is used in the completely automatic cars.
- its “aggressive” strategy in relation to its competitors. 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. While its competitors are still producing embedded computers, Eurotech considers them only as a basis to gain a sure revenue, but it continuously try to offer to the market new radically innovative products. For Siagri, the right balance between innovation and steadiness is the famous Pareto’s law, 20/80.

A basilar and important brick of Eurotech innovation is the R&D. As a matter of fact, Eurotech adopts the model of a “fabless company” defining itself as the “ideas company”. This means that the production is outsourced (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) to strongly focus the efforts on the value chain of Research & Development (40% of total investments): engineering, prototyping, quality control and supply chain management. Moreover, on June 2009 the Eurotech group was employing 564 people, 32% ca of which in the “innovation engine”.

**Table 1- Eurotech employees' breakdown**

	Headcount	%
Foresight*	4	0,7%
Research	9	1,6%
Development	166	29,4%
Strategy	15	2,7%
Marketing	18	3,2%
Other**	352	62,4%
<b>TOTAL</b>	<b>564</b>	<b>100,0%</b>

\* Employees who come from research (1), strategy (2) and marketing (1) and who do both activities (foresight and research, foresight and strategy and foresight and marketing). The scientific committee is not employed, but it's by token.

\*\* Industrial Operations, Sales, General & Administration

The following discussion will follow the protocol of analysis (the innovation strategy, the R&D organization and the managerial and organizational supporting activities).

*Vision, mission and strategy*

The Eurotech vision strongly derives from foresight practices, connected to visionary trends for the future of man and machine. The foundation of the Eurotech vision is, in fact, linked to the Mark Weiser<sup>5</sup>'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". 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 practical 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 theoretical 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.

<sup>5</sup> The "father" of the ubiquitous (or pervasive) computing, who developed this theory during his work in Xerox Park.

Eurotech's mission is therefore to be innovative, technically excellent and reliable with the final aim to integrate computation and communication technologies into miniaturized and user-friendly solutions in order to make everyday life better, safer and more comfortable.

As above already highlighted, the Eurotech strategy is to configure itself as an “idea company” and it bases its business model on technological anticipation. According to this view, and following an analysis based on the Porter's elements of strategy (1980) of market strategy type, differentiation criteria and orientation, Eurotech characterized itself as follows:

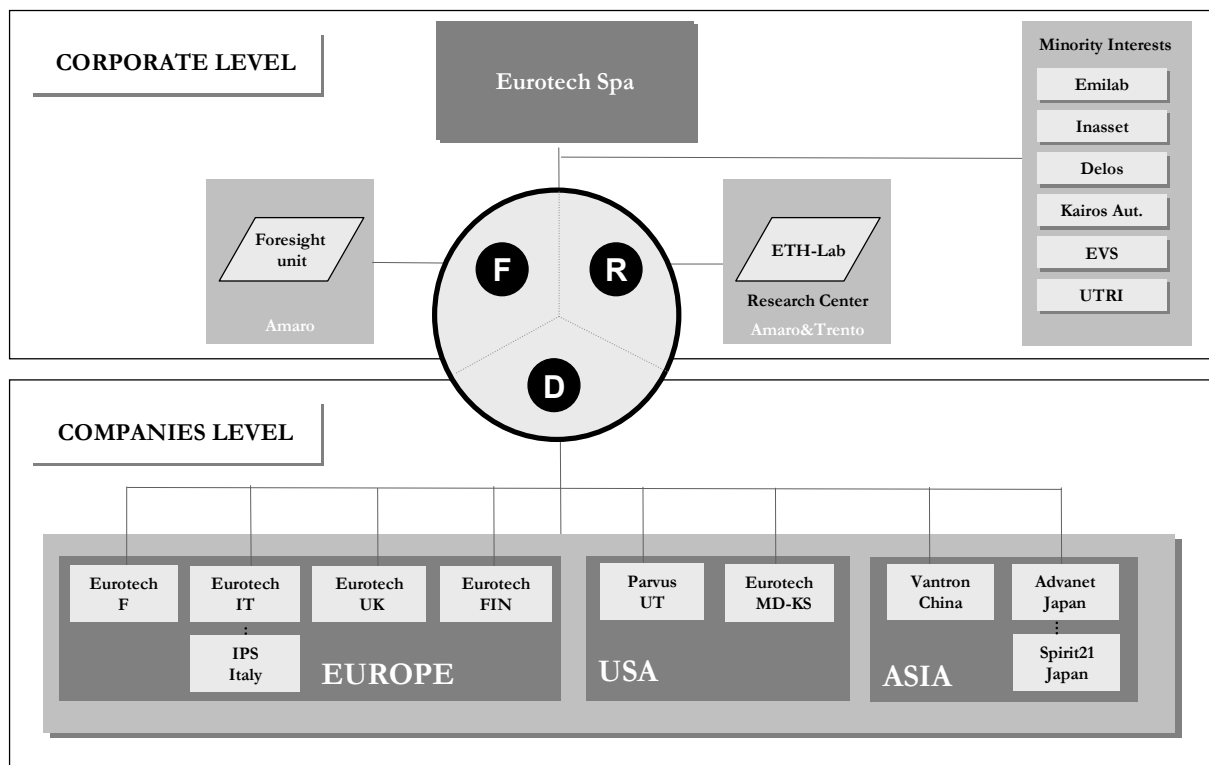
- it adopts a niche strategy, focused on nano-PC and HPC industry-sectors, but in the meantime a global strategy, due to the international nature of the competition ground;
- Eurotech differentiates itself on products segments: it wants to gain one of the first five places in the nanoPC's production, and it produces not only embedded PCs, but also innovative products to be distinct from competitors;
- the Eurotech's live-motive is the growth through the use of research, innovation and acquisition. Specifically, its international acquisition strategy has the double scope to acquire innovative companies in fields where it is low competent and/or to expand in new countries (e.g. USA and Japan) and in new markets (e.g. the defence one).

#### *Eurotech organization for innovation*

The Eurotech system for innovation can be recognized in the two levels of corporate and company. In the corporate level, Eurotech Spa is connected to the Research centre and the Foresight Unit, while Development is decentralized in the company level.

Figure 1 shows how in the Eurotech group structure there can be recognized the structure of the innovation engine based on the separation of R&D and the wedding between F&R.





**Figure 1 – Eurotech group structure**

The innovation engine can be more in details appreciated in Figure 2: it is the core system of the Eurotech’s system for innovation, which is in fact based on a core and a support system. The core is composed by the separation of R&D and the foresight unit as a supporting tool for R, while the support system by network, practices and activities and soft factors, that will be deeply described next.

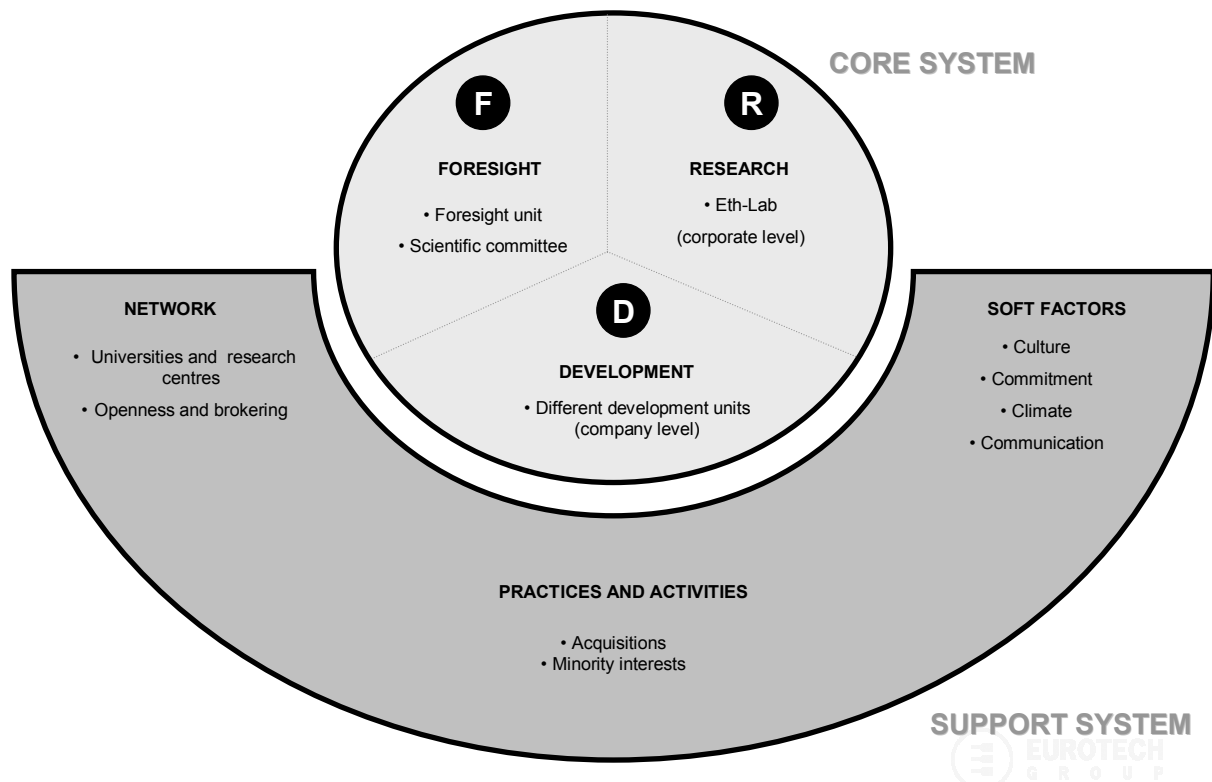


Figure 2 – Eurotech’s system for innovation

### The core system

#### Research and Development separation

The separation between Research and Development is one of the best practices established by Eurotech, on which 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 Unit 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 the competition will take place (technology-push approach). Moreover, while the Development is connected to the Marketing Unit, the Research is more related to the Strategy and the Foresight Unit.

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 both in Amaro (Udine) and Trento, while the Development is in all the single companies in Europe, USA and Asia. Referring to the Christensen (1997)’s classification of innovation types, Eurotech considers

the Development more related to sustaining innovation, while the Research more related to disruptive and radical innovations. In this organizational model (Figure 3), 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, by relations and partnerships with universities and research centers and by seed capitals.

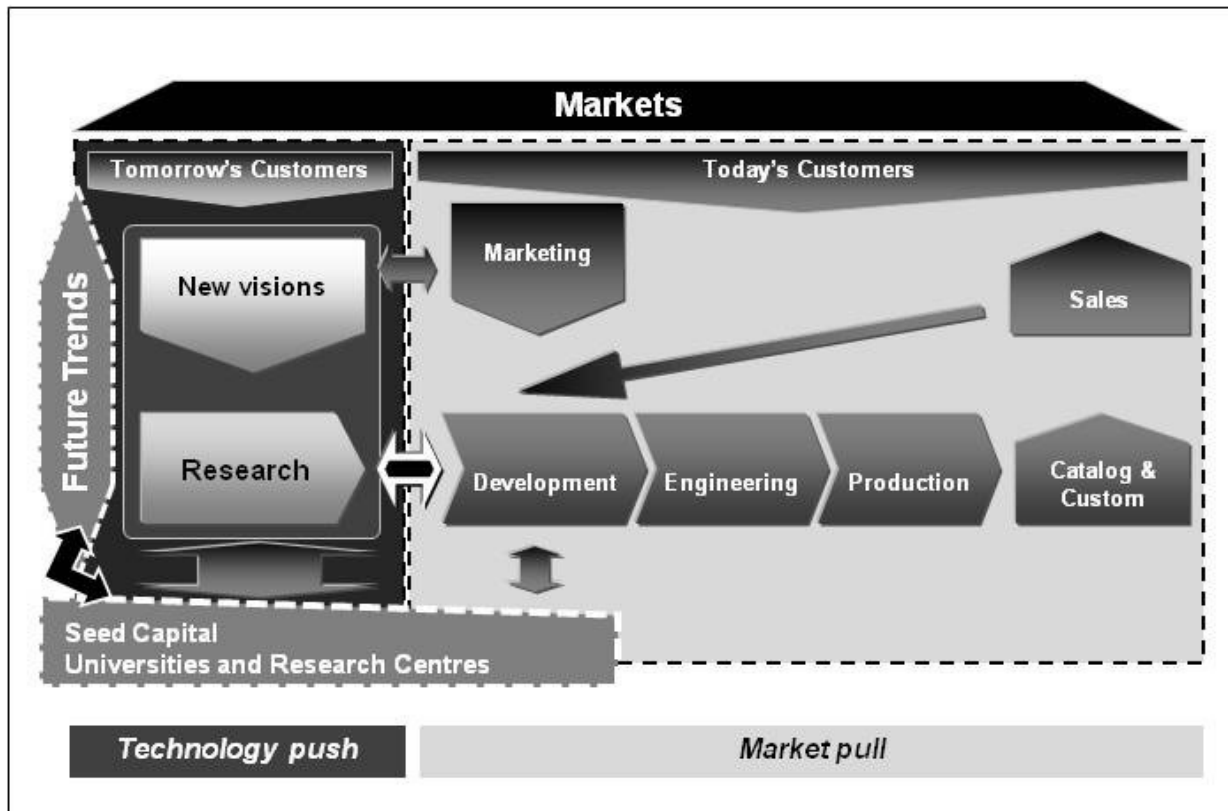


Figure 3 - A representation of the Eurotech organizational model [source: Eurotech internal documents]

### Foresight

The foresight activities are conducted in Eurotech through two main teams:

- the Foresight Unit to investigate the future trends, related to the PEEST context;
- the scientific committee.

The *Foresight Unit* is formed by 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. 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.

Moreover, 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. Anyhow, the Eurotech Foresight activities do not remain only a future exercise, with no correlation to practice, but there is a strong integration. 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.

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/three 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. 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, 2004).

Moreover, Eurotech supports its peculiar aptitude toward peripheral vision, disclosing readiness in sensing the new trends mainly in the technology level, by explorations and investigations conveyed by different sources. For this purpose, Eurotech has a *scientific committee*, in other words a team of experts who 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 and 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.

The Foresight Unit is really peculiar and evidences strong links with the Research function, as much that in our opinion we can talk of a wedding between them. F in fact has the main aim to nurture the R and to orient it basing on trends, while the R gives feedbacks to F suggesting the possibilities of investigations and the real practionability.

### The support system

The R&D separation and the F&R wedding in Eurotech are supported internally and externally by three main pillars:

- network: links and collaborations with universities and research centres and openness and brokering activities;
- practices and activities, as acquisitions and minority interests for innovation;
- soft factors.

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. Finally, both the R and the F are prompted to *openness and brokering* (mainly of technology), where R with other units while F with people who are experts in one of the PEEST areas and watch over the future.

A second main pillar of the Eurotech supporting activity for innovation is the partnership and collaboration with other companies. As remarked, Eurotech adopts an *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

diversity. For example, the acquisition of Parvus Inc. covered the lack of knowledge in the ruggedized mobile networking, display, and computer technologies. Moreover, it has *minority interests* in other companies, which Eurotech defines as probable seeds of innovation and on which it bets for the future.

Finally, it has to be said that also “soft” elements, as:

- *culture*, deployed in peripheral vision and sensemaking;
- top management *commitment* (and CEO leadership);
- *climate*;
- *communication*;

are important to support the Eurotech organization for innovation.

**DISCUSSION & IMPLICATIONS**

The study highlights how the attention to innovation and to the market of tomorrow needs that the company adopts a special R&D organization and strategy configuration and supports processes as foresight. As a matter of fact, the literature review and the case analysis permitted us to draw a matrix aims/temporal horizon showing schematically the perspectives of Foresight, Research and Development (Figure 4): while Development has a short temporal horizon and the aim to develop and design new products, the Research has a longer time and it aims to research new solutions, finally Foresight has the longest temporal horizon and aims to anticipate PEEST trends.

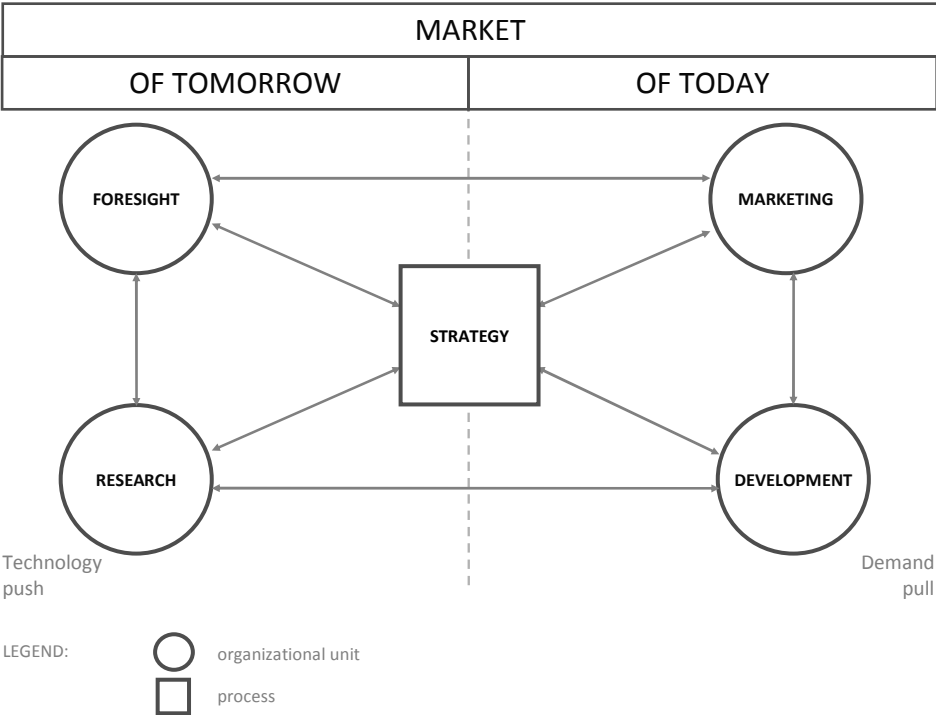
		TEMPORAL HORIZON		
		Short	Mid	Long
AIMS	Anticipating political economical environmental sociological and technological trends			<b>FORESIGHT</b>
	Researching new solutions		<b>RESEARCH</b>	
	Designing new products	<b>DEVELOPMENT</b>		

**Figure 4 – Foresight versus Research and Development**

Basing on the case study, we propose a first framework that suggests the R and D separation and describes the key links among CF unit and the other functions, in particularly R and D, distinguishing them from the market of today and market of tomorrow perspectives. In the stream of scholars underlining the R&D separation, the present work would like to propose a new couple for wedding: Foresight and Research.

Figure 5 shows schematically the main interactions among CF unit and other functions: while the strategy can be found in the middle between the market of today and the market of tomorrow perspectives, R&D can be linked to strategy; but then, as we have discussed above, R is much more on the tomorrow perspective and D vice versa, so we can theoretically divide them (and as we saw in the case study, some companies practice the R&D separation); the marketing function can be more be found in the right part of the scheme, because it is more connected to the investigation of the present and future “customers of today” ’s needs. Finally, the Foresight Unit finds itself linked to research, to feed it, to strategy, for the decision-making about the directions aligned to trends, and to marketing, to investigate also the customers of tomorrow’s needs.

These strong links enhance the 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.



**Figure 5 – Interactions among Foresight unit with other functions**

Furthermore, thanks to literature and the empirical study, it has been possible to complete Table 2, which highlights the main differences among D, R and F along the two spheres of general characteristics and organization (internal and external).

**Table 2 – Main differences among Foresight, Research and Development**

		Organizational units		
		DEVELOPMENT	RESEARCH	FORESIGHT
<b>1</b>	<b>GENERAL CHARACTERISTICS</b>			
	MISSION	Development	Discovery	Anticipation
	FOCUS	Products	Technology applications	Trends
	DRIVER	Market evolution	Technology evolution	Politics, economics, society and technology evolution
	TEMPORAL HORIZON	Short term	Mid term	Long term
	PERFORMANCES	Efficiency and speed: bring a new product into the market efficiently and speedily	Effectiveness: discover something new	Effectiveness: investigate and understand trends
END RESULTS	Plannable	Unpredictable	Unpredictable	
<b>2</b>	<b>ORGANIZATION</b>			
	ACTORS	Developers	Scientists (specialists in a certain area) and technologists	Scientists, technologists, sociologists, scientists in politics and economics... (experts in one of the PEEST)
	ACTIVITY FORMALIZATION	High	Low	Very low
	INTERNAL LINKS WITH OTHER FUNCTIONS	Strong integration with marketing, links with research, production and strategy	Strong integration with foresight, links with strategy and development	Strong integration with research and strategy, links with marketing
EXTERNAL LINKS AND COOPERATION	Potential external links with external development centres	Links with external technical centres of excellence, with research centres and universities	Many links with technology intelligence centres, sociological scanning centres, with research centres and universities	



Finally, the research drives other important results as regards the organizational structure of the engine of innovation and the splitting-up of Research and Development. From an organization viewpoint, the case study suggests to characterise and support it by building a dedicated unit strongly connected to Research (Foresight Unit), by favouring internal relationships (e.g. scientific committee) and external networks (e.g. collaborations with universities and research-centres and R&D partnerships) and by using the Merge & Acquisition strategy to buy high-competence companies covering own low know-how fields. From a methodological viewpoint, it is described by the Eurotech case how the foresight techniques can be applied with the aim of comprehending in advance the strategies to continuously innovate and develop new products. This capacity of being and becoming sensitive to the trends and weak signals leads to greater attention, availability, willingness and readiness to listen and to react strategically and innovatively to internal and external changes in the PEEST.

The findings have implications in both academic and managerial fields. From an academic point of view, the work represents a value for a number of reasons:

- R&D integration/separation answer – it is an answer to the R and D separation dilemma;
- actionability of the R&D separation – it lets understand how to put into practice and to operate the separation of R&D, with a description of its implementation and of the most advanced practices to support it, in order to achieve an organization for innovation;
- R&D and Foresight – it is a first tentative to build an integrated framework that helps understanding how the foresight activities can be a support for Research and can be implemented and organized in a company.

From a practitioners' point of view, it is a basis for managers who would like:

- to understand how to structure the “innovation engine” in order to give attention to the market of tomorrow;
- to understand how to implement CF in their enterprises;

and:

- it suggests good practices to support R&D separation;
- it can guide them in this process thanks to the suggestions given by the two levels of engine for innovation organizational structure identified.

## **CONCLUSIONS, LIMITS, SUGGESTIONS FOR FURTHER RESEARCH**

In many cases, as the Eurotech one, it is opportune to separate Research and Development in order to concentrate not only on the market of today and to foster foresight activities. There are in fact some contexts where the divergence of R and D, as regards different focuses (market and technology respectively) and temporal orientations (market of today and market of tomorrow), is even stronger, e.g. high-tech or pharmaceutical industries.

Moreover, CF could have a deep strategic value in driving tomorrow innovations. In particular, it can be seen as a function of support of the Research one: foresight can be focused on a long temporal horizon, and can feed the research by anticipating trends and giving new ideas of business. In fact, CF allows 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 work, following the flow of research on R&D organization and separation, underlined the potentiality of the logics of anticipation of weak signals and trends from external sources. 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. Then a survey research is needed in order to investigate the causal relationship between the uncertainty and complexity of the context and the R&D organization and the potential correlations among the four CF organization levels.

In our opinion, decoupling the R&D, adding features of foresight to the organization, even building an organizational system to support these strategic decisions, could have a deep strategic value in driving tomorrow innovations and in guiding companies investigating and preparing for a complex and uncertain future. In fact, Research, having failed its wedding with Development, can find a new strategic partner in Foresight.

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