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"Intentional" and "Unintentional" Marketing in High-Technology Contexts: a Multiple Case Study in the Province of Pisa

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To myself,
for the courage of not giving up

Acknowledgments

When I wrote my undergraduate thesis I promised myself: "Never a thesis again!". Well, this is my *third* thesis after having written my Master dissertation as well. Being the conclusion of almost five years of a Ph.D. program, it has been more challenging, but also more demanding than the previous works and has covered a very difficult period of my life: I apologise, therefore, if these long acknowledgements may sound a little bit sad. Even though the pages that follow are only my responsibility, there are many people who have helped me in developing this thesis, both from an academic and from a personal point of view.

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[1] **Mohr, J.** (2001), Marketing of High-Technology Products and Innovations. Prentice Hall.

so genuinely ... "Milanese" and irremediably Inter supporter. Last but not least, even though she is not from Bocconi Univesrity, I also want to remember Dina who shared with me not only most of the good and bad days, but also the nights, me being her room-mate.

The empirical part of the thesis was developed in the Province of Pisa and is a part of a larger project (*Osservatorio sulle Imprese High-Tech della Provincia di Pisa*[2]) of the In-Sat Laboratory of the Scuola Superiore Sant'Anna in Pisa where I moved three years ago to join my current research group. I would like to thank Professor Andrea Piccaluga and Alessandra Patrono who gave me invaluable advice and background information on the firms of the *Osservatorio*, helping me to choose those that have become part of the empirical research.

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[2] Observatory on the High-Tech Firms in the Province of Pisa.

tireless worker, always available to help you in solving even the most elementary problem. Since my arrival at the Laboratory our relationship has been very friendly, but in the last period she has demonstrated for me a special care and a deep understanding. Thank you for your work: the Laboratory would not be the same without you; thank you for your friendship: I would not be this way today without you help too.

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had to study instead of playing with them. Maybe one day they will be proud of having an aunt with so many degrees and will discover that this is a job like the one their parents have.

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Introduction and layout of the thesis

RELEVANCE AND RESEARCH QUESTION

> "Technology has been the principal driver of the astounding increases in productivity and well-being of societies achieved since the Industrial Revolution. Furthermore, these trends show no sign of abating. To the contrary, the effects and influence of technology are expected to accelerate" (John et al., 1999, p. 78).

This sentence alone could explain the reason for and the relevance of a study on high-technology. Moreover it is often observed that technology-based firms show a high rate of growth, especially smaller ones which are often created in response to the emergence of a technological opportunity. These firms try to establish a position in a new market when no large capital investments are required and they often tend to show high rates of growth which are likely to benefit the local economy (Shanklin and Ryans, 1985). Even though this view is now less widely accepted, the role of small high-technology firms still remains a central concern for policy makers in advanced economies.

The research question this research is built around is essentially the following:

"How do small high-technology firms perform marketing activities?"

In the attempt to answer this question, case studies of small firms operating in the area of Pisa have been carried out. This approach rises at least three more questions.

The first is: why concentrate on *marketing* in high-technology contexts? The easiest way to answer this question is with the words of Woods and Remondi: "the best technology will not necessarily win market predominance" (1996, p. 8). Many firms (especially smaller ones) which have good technical capabilities and promising products, fail exactly because of the inadequacy of their marketing and, more generally, managerial capabilities (Mohr, 2001). As Shanklin and Ryans put it: "the technology company's success depends not only on its continued ability to develop new products and processes (its R&D component), but also on its ability to make its target markets aware of their availability

and quality" (1985; p. 121). Therefore, successful high-technology companies not always have the best product or technology, but have developed the best marketing strategy (Viardot, 1998).

The second question is: why *small firms*? The reason for choosing small firms has been indirectly described above: they are particularly sensitive to the problem of being almost exclusively technically oriented and lack proper managerial and marketing capabilities. Indeed, their managerial limits and their unarticulated organizational structure translate into a situation in which the boundaries between functions becomes blurred: marketing, as a consequence, is performed in an unstructured way and is often subordinated to other functions. Moreover, their role for the local economy in which they operate, if not unequivocally stated, still remains important. Apart from the fact that in the Italian industrial scenario small companies represent far most the majority of firms, they are organizations in the first phases of development that need specific attention and specific tools to be nurtured and sustained.

The third question is: why *Pisa*? The reason for choosing Pisa is linked to the fact that in this area more traditional manufacturing sectors (furniture, footwear, leather and textiles) are experiencing a slow but constant decline. They are still important for the local economy but are undergoing a process of consolidation and restructuring. From this industrial history has originated an advanced context in which a well-developed public research system is able to attract, form and retain city relevant human resources in the, to generate high-technology start-ups and to attract external companies to the area. These firms do not operate in isolation, both in the sense that there are so many high-technology businesses that the area of Pisa is often described as a high-technology cluster, and in terms of an industrial culture that creates a favourable environment for these firms to operate. If the University of Pisa is the birthplace of Information Technology in Italy (in 1955 a team of professors built the first Italian computer, CEP – Pisa Electronic Calculator), high-technology in the area is now much more diversified, given the presence of microelectronics firms, the pharmaceutical industry and telecommunication companies (Di Minin et al., 2003). Moreover, the Pisa Model, as Cooke (2004) defines it, is of particular interest because it has been able to overcome the risk typical of similar clusters of traditional Italian industries of not being able to link *explorative* knowledge, represented by research, to *exploitation* knowledge which allows the former to be transformed in products or services with a market value. To make this transition a

boundary-crossing agent is needed and, in the case of Pisa, this role has been played by the Scuola Superiore Sant'Anna, one of the three Universities of the town. Its role has been that of creating interdisciplinary networks able to transmit, inwards and outwards, knowledge to and from international networks (Cooke, 2004).

LITERATURE REVIEW

Defining high-Technology

We live in the knowledge era and this knowledge is often embodied in complex products performing multiple tasks which we define as "high-technology". Notwithstanding the generic use of the terms technology and high-technology, both in everyday life and in academic literature, it is rather difficult to find a definition able to encompass the different meanings attributed to these words. For this reason, the **first chapter** of this study is dedicated to the problem of defining the concept at its basis.

For the purpose of this research, the term *technology* is linked to artificial things whose design, production and functioning requires engineering knowledge and which are able to perform a large amount of operations (Mick and Fournier, 1998).

Defining *high-technology* is a more challenging task. There can be agreement on the fact that high-technology is linked to innovation, scientific discoveries and leading edge or state-of-the-art knowledge (Mohr, 2001). However, there is sometimes some degree of confusion because other terms are used as synonymies or with a similar meaning to high-technology regarding products or industries like: research intensity, science-based, technology intensity, knowledge-based (Godin, 2004). The adjective "high" implies a scale against which to measure technologies: what is high- and what is low-technology? In trying to answer this question, a first important distinction is made between the different approaches to define high-technology used by governmental bodies and by academics.

The aim of government bodies is to find a definition of high-technology which allows a neat distinction between high- and low-technology industries and firms in order to identify those to which a specific (usually supporting) policy can be applied. The basic assumption is that there exists a continuum between "low" and "high" technology on which products, industries and markets can be located: along this continuum they are

considered highly technological if they are above a given threshold for some given factors (Gardner et al., 2000). The most common governmental indicators are: *input-based indicators*, defining high-technology on the basis of human or capital inputs employed in the production process (investments in R&D and R&D employment), and *output-based indicators*, which take into account the productive value-added of firms (usually in terms of number of patents granted) (Chabot, 1995).

The academic approach to the problem of defining high-technology is based on identifying common characteristics typical of high-technology settings. The specific aspects used in the literature to characterise the concept are quite diverse and the classification and organisation of the various contributions is made difficult by the fact that their reference point is often not only diverse but also not always clearly stated. For these reasons, the term "setting" is used in this work to refer to the three levels of analysis that emerge from the literature under consideration: the product, the industry and the market. These levels are always interrelated: high-technology firms deal with high-technology products which are launched in high-technology markets.

As regards high-technology *products*, the main characteristics are:

- high complexity, linked to the scientific and technical knowledge embodied (Möller and Rajala,1999);
- innovativeness, confronting customers with devices they are not familiar with (Viardot, 1998);
- rapid obsolescence, linked to the short life cycle of a technology and its fast replacement by new ones (e.g., Mohr, 2001);
- unit-one costs, which refer to a situation in which the cost of developing the first unit of a product is much higher than the costs of reproduction (John et al., 1999);
- network externalities, which exist when the value of a product is a direct function of the number of individuals using it[1] (Mohr, 2001).

A second level of analysis regards the *industry* and the characteristics of firms and *competition*. These characteristics are:

- high investments in R&D which are needed to master the knowledge embodied in the high-technology products manufactured (e.g., Beard and Easingwood, 1992);

[1] It is worth noting that the last two characteristics are not an essential characteristic of high-technology products and, indeed, are usually found in consumer, mass-produced goods.

- knowledge spillovers, linked to the risk of imitation which occurs when knowledge flows across the boundaries of firms (Mohr, 2001; Arora et al., 2002);
- competitive volatility, that is, the uncertainty linked to the question who will be the future competitors, how competition will be played and on which basis (Mohr, 2001);
- difficulties in forecasting the impact of a technology, linked, among others, to the unexpected use of a technology and to the need of complementary technologies (Viardot, 1998);
- rapid growth, a characteristic mainly linked to small high-technology firms (Temporal and Lee, 2001; Oakey 1995);
- tendency to cluster, which refers to the concentration of high-technology firms in the same area (Breschi and Malerba, 2001).

The last level of analysis looks at the *market*, that is, the customer and his/her relationships with the firm. Firms experience high *market uncertainty*, which is related to factors like: the customers' fear of technology, the rapid change of customers' needs, the inability to forecast the size of demand and the "inexistence" of the marketplace (Shanklin and Ryans, 1985; Moriarty and Kosnik, 1989; Mohr, 2001). Customers, on the other hand, face high *technological uncertainty* which derives from concerns about the functioning and possible side effects of technology, from the doubts about the capacity of the provider to respect the timing and to provide the necessary collateral services, and from the uncertainty about the speed of development of the technology (John et al. 1999; Mohr, 2001). A last aspect of the market of high-technology products is the relevance of tradability problems which result from the difficulty to attribute a value to the knowledge embodied in technological devices (John et al., 1999; cfr. Arora et al., 2002).

The conclusion drawn from this review of definitions of high-technology is that it is not possible, and maybe not even useful, to find a single definition of this concept. It is indeed more realistic to define high-technology in a way which is functional to the purposes for which it is created.

Marketing in high-technology contexts

Researchers dealing with the management of high-technology products have raised the question whether marketing activities in high-technology settings can be considered different from those typical of more traditional environments. Some claim that high-technology marketing is simply a sub-set of traditional marketing (e.g., Viardot, 1998),

whereas others maintain that different marketing strategies are needed when dealing with high-technology (e.g., Gardner et al., 2000). There seems to be, however, general agreement on the fact that some kind of adaptation is necessary when applying marketing principles to high-technology industries (e.g., Mohr, 2001).

From the wide literature on marketing, three interconnected conceptual areas will be taken into consideration in the **second chapter** of this research:

- the concept of market orientation;
- the principles of industrial marketing ;
- the paradigm of relationship marketing.

The reason why these approaches have been selected has to do with the characterisation of high-technology settings developed in the chapter 1. The most important factors pointing to the relevance of a *market orientation* philosophy are: R&D intensity, competitive volatility and market uncertainty. Developing a market orientation is essential for high-technology and research-intensive firms which tend to be too much concerned with technical aspects which could lead to the loss of contact with their clients. Moreover, the factors grouped under the label "market uncertainty" (e.g., rapid change of customers' needs, inability to estimate the size of the demand) may be better kept under control by putting the client and his/her needs at the centre of the business.

The development of a *relational approach*[2] to managing the interaction with clients finds its origins in other important characteristics of high-technology products, industries and markets. First of all the complexity and innovativeness of the product can create fears in the user that may be strongly reduced if the firm interacts on a more stable basis. These interactions may also reduce *technological uncertainty* and may foster a level of loyalty in clients which is able to avoid or decrease the problems associated with the rapid obsolescence of products and the risk of knowledge leakages. In both cases the creation of relationships based on trust with clients might persuade them to stay loyal to the firm in the face of the presence of new products/technologies or suppliers. Finally, tradability problems and the related information asymmetry may be reduced through the creation of stable relations with clients.

[2] Even though the literature on relationship marketing considers not only the relationships with customers but also with other actors (suppliers, competitors, public and private institutions), in this work the focus is almost exclusively on the first type of interactions.

The importance of literature on *industrial marketing* is less direct than in the case of the two strands of literature considered above. The characteristics of a high-technology products (complexity, innovativeness and rapid obsolescence) make the related purchasing process a long, complex and risky undertaking. As a consequence more people are involved in the buying decision, each with different roles, knowledge and impact on the same decision. All these aspects are typical of business-to-business markets. Moreover, high-technology producers (and not simply sellers) mainly deal with industrial clients and their analysis of the final customer is only in terms of derived demand.

A last strand of literature considered in chapter 2 deals with the *locational choices* of firms. As already mentioned before, a general tendency of high-technology companies to locate in delimited geographical areas has been observed (e.g., Silicon Valley) which have been labelled in different ways: innovative milieux, industrial districts, localized production systems, new industrial spaces, regional innovation systems, learning regions[3]. For the purposes of this research, however, I will employ the terms cluster or district[4] to refer to the territorial dimension of the subject under study.

It is worth noting that not all the spatial concentrations of firms in a given area can be considered clusters: the sharing of a common vision and the development of deep relationships is essential. It is the perception, common to all actors, of being part of a system based on reciprocity and trust that "makes the difference", otherwise it is possible to speak simply of *agglomerations*, in which firms passively exploit some local endowments without aiming at the development of a degree of embeddedness which facilitates interactive learning and innovation (Bresnahan et al., 2001; Cooke, 2001).

When the analysis of high-technology industries calls for the consideration of the geographical dimension, a *political dimension* emerges as well. Clusters tend to assume a significant importance in the economic life of places where they operate, be they cities, provinces, regions or wider territorial areas: it is therefore normal and advisable for the political bodies governing these areas (usually regions) to develop policies able to address the related issues. Paradoxically, therefore, in the era of globalisation of science, technology and knowledge, the importance of regions has increased (DeBresson and

[3] For a review and an analysis of these different concepts see Mouleart and Sekia (2003).
[4] These two terms are not always used interchangeably and different authors propose different definitions. In this work, however, I will use them as synonymous.

Amesse, 1991; Bresnahan et al., 2001). Indeed, as Cooke, observes: "... microcosms enable macrocosms to function" (2005, p. 1147), in the sense that large companies (starting with those in the biotechnology sector) are trying to overcome knowledge asymmetries by embedding themselves in regional and local clusters in oder to exploit regional knowledge capabilities and systematic innovation strengths.

The analysis of these areas of study presented in chapter 2 aims at understanding which of them, or which part of them, can be useful in determining how marketing activities can be profitably organised and performed in contexts characterised by high technology intensity and which external factors (location and policies) may influence firms performance. In relation to the research question at the basis of this work, the interesting point becomes whether firms actually behave according to literature prescriptions. If not, how do they actually behave and why?

METHODOLOGY AND EMPIRICAL PART

The empirical approach adopted for this research is based on the method of case studies. By exploring how some small high-technology firms perform their marketing activities, the analysis attempts to confront the actual behaviour of these firms with the literature "prescriptions" with the aim of improving and adding new perspectives to this literature.

Seven case studies have been conducted involving small firms operating in different high-technology sectors and located in the Province of Pisa[5]. The aim of an approach based on case studies is to make inferences not towards wider populations from which cases have been drawn, but towards confirming, rejecting or filling-in the gaps in existing bodies of knowledge. This means that case studies try to reach an *analytical* and not a *statistical* inference, that is they do not aim at enumerating frequencies but at describing complex concrete events (Remenyi et al., 1998). The objective, therefore, is not that of generalisation, but of particularisation. It may be possible, however, that formal generalisation is overrated as the main source of scientific knowledge in the sense that it is only one of the ways in which knowledge is created and accumulated (Flyvbjerg, 2004). Indeed, what derives from focusing on uniqueness is either the identification of discontinuities in established theories and theoretical assumptions, or the recognition of

[5] The reasons for choosing this geographical area and small firms have already been explained in the first part of this introduction.

new trends of development that only particular cases at the forefront may allow researchers to sense. With this spirit the empirical part of this work has been developed.

This work is part of a wider research conducted at the In-Sat Laboratory of the Scuola Superiore Sant'Anna in Pisa: the *Osservatorio sulle imprese High-tech della Provincia di Pisa* (the Observatory on the High-Technology Firms of the Province of Pisa). The aim of conducting these case studies has been to describe what marketing means to these firms and how they actually commercialise their products. Moreover, their concentration in the area of Pisa allows for an analysis of the effects of co-location of firms in a limited geographical area and an exploration of the possible policies that are required most by high-technology small firms. **Chapter 3** consists of the description of the methodology used, the explanation of the criteria used to select the firms to be interviewed and a general presentation of these firms.

Chapter 4 is devoted to the presentation of cases. The layout of the various paragraphs strictly follows the structure of the underlying interview which has been developed around the following topics:

- the firm: history, activities, organisation, products etc.;
- the marketing activities: organisation, activities, challenges etc.;
- the relationships with clients and other firms;
- localisation and policy issues.

RESULTS AND CONCLUSIONS

The **final chapter** concludes this research. The process of drawing conclusions has been subdivided in four parts. In the first, the general overview on the cases is provided, and attention is particularly paid to unexpected elements emerging from the field experience. The second step, consists of a more detailed cross-case analysis which will lead, in the following step, to a reappraisal of the literature described in chapter 2. The last step, building on the revision of the literature, provides a model to be tested in future research.

The main conclusion that can be drawn is that marketing in small high-technology firms, as also results from the review of the literature, is underdeveloped. Rarely these firms have a marketing or even a commercial function and even if there is a division dedicated to marketing, the activities they perform are rather limited and are mainly linked to the

commercialisation and advertising of products. However, some of the firms interviewed in the empirical part have developed rather elaborated ideas about marketing, in the sense that marketing is considered a strategic function which cannot be simply reduced to a set of operational tools to be used in the last phases of the development and production process to convince the client to buy. Companies do, however, experience difficulties in implementing this marketing approach for reasons mainly linked to the lack of financial and human resources.

These considerations, led to the identification of two groups of companies: those for which the development of a more structured approach to marketing is a priority and those for whom this is not. Reconsidering the literature on market orientation, two phases have been identified: during the first, firms do not engage in the generation of, dissemination of and responsiveness to market intelligence (the essence of a market orientation) even though one cannot say that they do not perform marketing at all: for this reason during this phase marketing has been labelled "*unintentional*". At a certain point, firms will notice the limits of their marketing activities and will decide to move towards an "*intentional*" form of marketing in which all the actions linked to a market orientation approach are systematically performed.

The model which derives from the outcomes of the empirical case study research concludes this research and is devoted to the identification of the factors that trigger small high-technology firms to move from unintentional to intentional marketing.

Chapter 1
Defining high-technology

1. Introduction

Research dealing with technology and high-technology should start with some kind of definition of these concepts. However, it is not possible to find in the literature a conceptualisation which all researchers agree on (Gardner et al., 2000). This chapter attempts a systematisation of the different approaches that can be found in studies related to high-technology. It is worth noting that the phenomenon under study is being observed through the lenses of a marketing perspective, in the sense that the literature considered in this chapter is mainly drawn from those studies that analyse high-technology in terms of the consequent specific features of the marketing function.

The first paragraph is devoted to a review of the definitions given to the term technology. The second section focuses more specifically on the concept of high-technology. After a presentation of the criteria generally used in classifying products and industries as high- or low-tech, I will classify the various contributions available in the literature according to three different levels of analysis: the product, the industry and the market. The objective is to obtain a workable definition of high-technology, that is a conceptualisation useful for developing research on this topic.

2. The concept of *technology*

The word "technology" refers to "a set of crafts, techniques, or a collection of methods that can be used for building, manufacturing, or producing" (Mohr, 2001, p. 4). More specifically, this term refers to that know-how or stock of knowledge required to create and sell products or services. As such, technology differs from general knowledge and is intended as the part of knowledge which is more directly used for practical ends (Capon and Glazer, 1987). But also, according to these and similar definitions that characterise technology as a capability (Jolly, 1997), technology does not necessarily coincide with

the product that embodies it (Arora et al. 2002). This point deserves to be analysed further. From many points of view, technologies can be distinguished from products. Technologies usually are applied in different fields and, therefore, can be embodied in different products. This has important implications for the type of competition faced by technologies and products: while goods compete against other goods fulfilling the same need, technologies compete with specific products for a given function and with other technologies for a different and wider set of functions to be performed. Moreover, the life cycle of a technology can be significantly different from that of the products in which it is embodied: usually technology exists longer than the product, but it is also true that products persist over time even though the constituent technologies change dramatically. One example on this respect could be the telephone. Moving from analogical to digital technologies the telephone has improved its performance and extended its applications (e.g., mobile communication), but the basic product function has remained the same. Finally, technology itself can be sold and acquired without being supported by a physical device. If we think of product development as consisting of different stages, a firm can decide up to which point (stage) to develop the technology (Arora et al., 2002). As Jolly (1997) puts it: "The inventor of a new technology, in other words, does not have to be the one to close the circle of commercialisation" (p. 28) The alternatives can be (Mohr, 2001):

- selling or licensing know-how;
- selling prototypes;
- selling ready-to-use components;
- selling products ready to be used by consumers;
- selling a complete, end-to-end solution.

Although these are relevant aspects to be taken into consideration when dealing with technology, it is also true that the value of a technology and its future is strictly connected to that of the products incorporating it, their acceptance by users and their performance in the market (Jolly, 1997). For this reason this study focuses on those technologies embodied in products and, specifically, on the interrelation between the market in which these products will be launched and the development process of the producer.

This reasoning leads to a related important distinction: that between product, process, and management technologies. The focus of the previous discussion (and of this study) is on *product* technologies, that is, ideas and components embodied in a product. *Process*

technologies encompass the methods involved in manufacturing products or in providing service. *Management* technology refers to the set of procedures and knowledge useful in the organisation of business activities and in the development of marketing strategies (Capon and Glazer, 1987; Moriarty and Kosnik, 1989). Besides the fact that, according to this classification, almost everything can be considered technology, what can be derived from this distinction is the "dual existence" (Oakey et al., 1988) that characterises many manufacturing technologies. This dual existence consists in the fact that many technologies are the product of the firm that manufactures it, and at the same time are employed in the production process of other firms. Therefore, especially when undertaking the task of distinguishing between (high-) technology and non-(high-) technology sectors and firms, a question emerges: should the distinction be based on the characteristics of products manufactured and sold or according to the type of tools and devices employed in the production process (Oakey et al., 1988)? There is not simple answer to this question. Even though it is possible to agree with Oakey and colleagues, who point out that basing a classification on output products only provides a limited picture of the phenomenon of high-technology (Oakey et al., 1988), for the purposes of this work this will be the perspective employed. Indeed, marketing considerations emerge when a firm has to manage the development process which results in a device that has to be sold to a final or industrial user and not when it employs a set of technology instruments to perform internal activities.

As a result of the foregoing discussion, the conceptualisation of the term technology which forms the basis of this work is linked to the idea of artificial things the design, production and functioning of which require engineering knowledge and which are able to perform a large amount of operations (Mick and Fournier, 1998).

3. Defining high-technology

Notwithstanding the difficulties identified in the previous section and the choices needed to restrict the area of interest, it seems possible to find a certain agreement on the meaning of the word "technology". A more challenging task is that of providing a neat definition of "high-technology". To some observers, this term is used to refer to innovative sectors producing new products and processes. In other cases, the term is associated with the use of advanced technologies that incorporate complex scientific and

engineering knowledge. To some others, the fundamental feature of high-technology industries is the use of high levels of skills in the production process (Baldwin and Gellatly, 1999). Another distinguishing feature is that high-technology products, compared to low technology ones, embody more turbulent technologies and require significant changes in consumers' usage patterns (Gardner et al. 2000)

Gardner and colleagues (2000) report some other definitions of high-technology found in the literature, for example:

- "... the segment of technology considered to be nearer to the leading edge or the state of the art of a particular field. It is that technology inherent in emerging from the laboratory into practical application" (Rexroad, 1983, p. 3)[1]
- "... a group of industries [that] stretches beyond electronic computers to a variety of research industries such as biotechnology, pharmaceutical, chemical and aerospace" (Samili and Wills, 1986, p. 23)[2]
- "Those devices, procedures, processes, techniques, or sciences that are characterized by state-of-the-art development and have typically short and volatile lives" (Grunenwald and Vernon, 1988, p. 10)[3]

In a recent article, Godin (2004) traces the evolution of the term "high-technology" and its related indicators. According to his reconstruction, the first definition introduced was that of *research intensity*, coined by Hoffmeyer in 1958[4] and used in many OECD studies (e.g., *Science, Economic Growth and Government Policy*; OECD, 1963, Paris). The objective of such studies was that of convincing governments to develop science and technology policies based on some relevant characteristics of these industries: their fast pace of growth, the increase in their share of world trade and their positive balance of payments in international trade. A succeeding notion was *science-based industries*, introduced by the OCED in the 1970[5], immediately followed by that of *technology intensity*. This last term was associated with other concepts like critical technologies, core technologies, basic technologies, advanced technologies, new technologies, strategic technologies and emerging technologies. The term *high-technology* was first introducedin

[1] Rexroad, R. A. (1983), *High Technology Marketing Management*, Ronald Press, New York.
[2] Samili, A. C. and Wills, J. (1986), "Strategies for marketing computers and related products", *Industrial Marketing Mangement*, Vol. 15, February, pp. 23-32.
[3] Grunenwald, J. and Vernon, T. T. (1988),"Pricing decision making for high-technology products and services", *Journal of Business and Industrial Marketing*, Vol. 3, Winter, pp. 61-70.
[4] Hoffmeyer, E. (1958), *Dollar Shortage and the Structure of US Foreign Trade*. North-Holland, Amsterdam
[5] OECD (1970), *Gaps in Technology: Comparison between member countries in education, R&D, Technological Innovation, International economic exchange*, OECD; Paris.

the mid-1980s: according to Godin, however, there was nothing really new about the concept, "but a valued and prestigious label (high) was now assigned to it." (Godin, 2004, p. 1222). Godin also claims that the emerging idea of *knowledge-based industries* is only a variation on the theme of high-technology.

Given the various characterisation of the concept and the different labels used to express the same idea, the problem is to find a definition of high-technology which corresponds with the general meaning attributed to it in everyday life, which is useful in empirical investigations and which is functional to policy purposes (Gardner et al., 2000). Clearly, it is very difficult to find a definition able to satisfy these requirements and one should question the usefulness of such a definition: it is indeed more realistic to define the term high-technology in a way that is functional to the purposes for which it is created.

And this is what usually happens. Even though many agree that high-technology is related to innovation and that it refers to artefacts, processes and ideas which result from the latest scientific discoveries (Mohr, 2001), it is possible to distinguish between two main approaches when defining high-technology. The first is used by government bodies whose aim is to neatly distinguish between high- an low-technology industries and firms in order to identify those to which a specific policy can be applied. The basic assumption is that there exists a continuum between "low" and "high" technology on which products, industries and markets can be located: along this continuum they are characterised as being highly technological if they are above a given threshold for some given factors (Gardner et al., 2000).

The second approach is mostly found in academic literature and is based on the identification of those common underlying elements that can be associated with high-technology (Mohr, 2001). The advantage of this approach is that the main aspects and dimensions of the subject under study are identified and that it allows researchers to detect the peculiar problems and challenges that these characteristics generate in the management of high-technology products. The main problem has to do with the variety of perspectives from which the same concept can be observed and, hence, analysed: these perspectives are often mixed-up in the literature and, therefore, it is rather difficult to systematise them in order to obtain a clear and consistent view on the matter.

In both cases there is the problem that the identification of the high-technology phenomenon implies a certain degree of subjectivity. The first approach provides an objective means for distinguishing between high- and low-technology, but this is linked to the more or less subjective identification of the relevant threshold. In the second case, while there can be agreement on the characteristics relevant to high-technology (e.g., complexity, rapid obsolescence), it is often difficult to establish when they occur in practice and to what extent they should occur so that it is possible to speak about high-technology. Both approaches, therefore, suffer from the same problem: they may be able to define the obvious but fail to shed light on the grey areas of the subject under concern (Oakey et al., 1988).

In what follows both perspectives are presented. For the purposes of this research a particular attention is paid to the second one and the aim is to somehow provide a systematisation of the contributions on this topic by distinguishing three different but interrelated levels of analysis: the product, the industry and the market.

3.1 Government definitions of high-technology

High-technology is one of the principal drivers of productivity increases and competitiveness in modern economies and a source of well-being for entire societies. Furthermore, the influence of technology is expected to increase in the future (John et al., 1999; Cooke, 2004). The U.S. National Science Foundation cites the following as "reasons why high-technology industries are important to nations:

- High-technology firms are associated with innovation. Firms that innovate tend to gain market share, create new product markets, and/or use resources more productively.
- High-technology firms are associated with high value added production and success in foreign markets which helps to support higher compensation to the workers they employ.
- Industrial R&D performed by high-technology industries has other spillover effects. These effects benefit other commercial sectors by generating new products and processes that can often lead to productivity gains, business expansions, and the creation of high-wage jobs." (NSF, 2000, p. 7-5)

As a consequence, when dealing with high-technology, governments' main concern has been with the identification of high-technology industries in order to assess their impact

on industrial performance and to address public policies which aim at stimulating their development. It is maybe for this reason that the classification schemes available are usually sector-based, that is they aim at the identification of whole industries that can be considered highly technological. It is quite possible, however, that sectors labelled "high-tech" include low- (ore lower-) technology firms and that high-technology firms operate in sectors classified as low-tech (Baldwin and Gellatly, 1999).

The most common governmental indicators are: *input-based indicators*, defining high-technology on the basis of human or capital inputs employed in the production process, and *output-based indicators*, that take into account the productive value-added of firms (Chabot, 1995). The main problems and limits of such measures are considered below.

INPUT-BASED INDICATORS

The basic assumption of this first group of indicators is that inputs to the production process can be considered as proxies of the technological intensity of an industry.

R&D intensity

Technological innovations are often the result of huge research efforts within firms. One of the indicators most widely used to distinguish between high- and low-tech industries considers the expenditures in such an activity in a given sector as a proportion of total sales. By comparing this value with the average expenditures in all industries, a sector is classified as high-tech if the ratio is above average or above a given threshold. This indicator dates back to the 1930s when the purpose was both to provide firms with data to compare their performance, and to stimulate and influence policies supporting R&D, particularly in big firms (Godin, 2004).

As pointed out in the previous discussion, the concept of R&D intensity evolved to encompass terms like science-based industries, technology intensive sectors and high-technology. The statistics used to measure all these concepts was always the ratio between R&D expenditures and sales, and this is the indicator most generally used to identify high-technology industries, even though other measures are sometimes added, the most common being the level of R&D employment (see later in this sub-section) (Godin, 2004).

The following table presents an application by the OECD of the measure just described. Four classes of industries were identified (high-, medium-high-, medium-low- and low-

technology) depending on the level of the ratio between R&D expenditures and sales as compared to the average of all industries. (Table 1.1) (Hatzichronoglou, 1997).

Table 1.1 – Manufacturing industries classified according to global technological intensity

Category	Industry
High-technology	1. Aerospace 2. Computers, office machinery 3. Electronics-communications 4. Pharmaceuticals
Medium-high-technology	5. Scientific instruments 6. Motor vehicles 7. Electrical machinery 8. Chemicals 9. Other transport equipment 10. Non-electrical machinery
Medium-low-technology	11. Rubber and plastic products 12. Shipbuilding 13. Other manufacturing 14. Non-ferrous metals 15. Non-metallic mineral products 16. Fabricated metal products 17. Petroleum refining 18. Ferrous metals
Low-technology	19. Paper printing 20. Textile and clothing 21. Food, beverages, and tobacco 22. Wood and furniture

Source: adapted from Hatzichronoglou, 1997, p. 6

This approach has many deficiencies. Apart from the fact that, as noted earlier, the identification of the relevant threshold can be a very subjective undertaking with significant consequences for the overall classification process, this measure takes into account only one input of the production process. Additionally, it is more likely that R&D expenditures are associated with product innovations and technologies rather than with process technologies: this leads to a restriction of the phenomenon that can be criticised from a public policy point of view. In the specific case of the OECD indicator, another disadvantage is that only manufacturing activities are considered with the consequent underestimation of the service sector. Moreover, it is possible that technology innovations are not the result of formal R&D activities and expenditures, but of more informal and discontinuous efforts. This is particularly true for smaller firms which cannot afford to devote the relevant capital that research activities in high-technology often requires. The role of this set of firms would be, therefore, underestimated (Baldwin and Gellatly, 1999).

Finally, the underlying assumption that a more or less direct link exists between the amount of investments in R&D and innovative and highly technological output, can be criticised, even more if we also take into consideration the final economic success of the output. What if R&D efforts do not lead to innovative products? And, what if a given output does not translate into a market success? If the aim of policy-makers is to identify the phenomenon of high-technology because of its capacity to significantly impact on economic development, these questions are of paramount importance (Oakey et al., 1988).

R&D employment

Another, and related, input-based indicator is that adopted by the U.S. Bureau of Labor Statistics. The relevant dimension in this case is the percentage of employees engaged in R&D activities. These employees are defined as those that devote the majority of their time to R&D activities, as stated by their employer. According to this approach, sectors are classified as high-technology if they present a proportion of R&D employment equal or greater than the average proportion of all industries. The industries meeting this criterion are then divided into two groups: the first encompasses those industries with a percentage of R&D employment that is at least 50% higher than the average (Level I: R&D-intensive industries). The second is a residual group that constitutes the Level II or R&D-moderate industries (Hadlock et al., 1991).

Compared to the method used by the OECD, this one has the advantage of explicitly considering not only manufacturing firms, but also a set of "selected nonmanufacturing industries" (Hadlock et al., 1991, p. 26). It is, however, prone to many of the critiques moved against the R&D intensity indicator: the problem of identifying the relevant threshold, the limits of focusing on only one input, the arguable (tacit) assumption that innovation can only be the result of formal R&D activities with the consequent implicit identification of high-technology with R&D intensity, the failure to link the results of R&D employees' work with economic and market success. Moreover, it is possible that a great effort in research activities is not associated with a high level of R&D employment, at least compared to total employment in the industry concerned. Therefore, notwithstanding the fact that R&D inputs as a whole can be quite significant, basing classification on the number of employees can lead to an underestimation of the high-technology significance of an industry (Mohr, 2001; Oakey et al., 1988).

OUTPUT-BASED INDICATORS

An alternative way to establish the level of technological intensity of a firm and, therefore, of an industry considers the output of a technological process. *Innovations* are the proxy most widely used to evaluate the technological prowess of a business. Translating this principle into practice, however, presents some problems. How can innovations be identified? That is, what innovation can be considered to imply and presuppose the technological aptitude of a firm? How can a cut off point be established in order to distinguish between an innovation and a series of improvements to existing products or processes? Answers to these questions can be based on experts' judgment or even by asking firms to classify the results of their activities as more or less radically innovative (Baldwin and Gellatly, 1999). Both these solutions, however, imply a significant amount of subjectivity. A more objective indicator of the innovative outputs of companies is based on their *patenting activity*. This method has many problems when is applied in practice which have been largely analysed in the literature. The main drawback of using patent counts to identify high-technology firms and industries is that many patents refer to innovations that fail to be incorporated in successful products or processes. More than the number of patents, therefore, it seems to be more useful to take into consideration the value of the underlying innovation, which, however, raises another question: should firms and industries be classified according to the technical value of their innovations (that is their contribution to general knowledge *per se*) or should their economic value be considered as well (Oakey et al., 1988)?

From the foregoing discussion it is possible to draw a first elementary but also essential conclusion: any attempt to identify high-technology firms and industries needs to assume a composite perspective, that is, it cannot be based on only one element, being an input or an output, of the business activity. A second consideration suggests that the indicators generally used in governmental classifications should be improved by taking into account the value and not only the intensity of the innovative efforts of firms and industries. This is particularly important when the aim of classification is to identify the high-technology phenomenon in order to address it with specific policies: recognising those firms and industries that truly contribute to the economic development and well being of regions or nation States is a preliminary and fundamental task.

However, moving to a more general level, there are at least two problems associated with the use of input-based indicators. The first has to do with *time*. From recent history it is quite evident that what was considered high-technology in the past is no longer conceived as such. Are the input-based indicators analysed in this sub-section able to take into account the evolution of industries? My concern here is that a given industry can still have significant investments in R&D and produce innovations even when it can hardly be characterised as high-technology, at least in comparison to other firms and industries. The contrary applies as well: it is possible that, despite the decrease in investments in R&D, a firm deals with products that are still considered high-technology (Baldwin and Gellatly, 1999). This leads to the need to move the focus of the definitional process from elements related only to R&D activities to an understanding of the other underlying characteristics of what can be considered high-technology. While investments in R&D can be constant or even increasing (decreasing), in fact, other characteristics may change over time leading us to classify a firm or a sector as low technology (high-technology).

A second point is related to the *level of analysis*. All the indicators presented are mainly devoted to the identification of high-technology industries and treat them as homogenous entities composed of firms that share the same characteristics (Baldwin and Gellatly, 1999). What if we move to the level of the firm? In this case, it seems that the basic assumption of input- and output-based indicators may be questioned. These measures, as just described, assume that R&D intensity on the one hand (either expressed in terms of R&D expenditures or R&D employees), and innovative results on the other, are indicators of high-technology. Even though innovativeness is a crucial element of high-technology, it is possible that firms which do not devote a significant amount of resources to R&D activities or which do not come up with relevant innovations can be (or are generally) considered high-tech. Systems integrators are an example. The role of a systems integrator is that of an architect that designs and produces complex products and has the ability to join together, into a coherent whole, different components and to adapt the final system to the eventual changes occurring in each of its components (Geyer and Davies, 2000). Even though systems integrators often decide to produce in-house those components deemed crucial for the functioning and success of the whole system, for which they are responsible, many of the numerous components the final product is made up of are acquired from other companies. In order to perform its integration role, the systems integrator needs to master a wide range of capabilities, always broadening and deepening its technological knowledge in order to control its suppliers and to behave as

an intelligent customer (Granstrand et al., 1997; Prencipe, 1997). In other words, system integrators may need to know more than they do (Brusoni et al, 2001) which implies that they may possess highly-technological capabilities and knowledge without performing significant in-house R&D activities and/or engendering relevant innovations.

In conclusion, and given also the fact that the consequences of technological change can be observed in almost every industry (Mohr, 2001), the definitional process should take into consideration the different possible levels of analysis and should include product- and market-related dimensions. As Godin puts it: "In the light of these criticisms, some have decided to ignore the indicator, arguing that what distinguishes industries is not products but technologies—and market characteristics" (2004, p. 1226).

The academic approach to the problem of defining high-technology, to which the following sub-section is devoted, is based on the identification of common characteristics typical of high-technology settings. The term "setting" is used in this work to refer to all the three levels of analysis considered: the product, the industry and the market. It is worth noting that these levels of analysis are not always clearly distinguished and distinguishable in the literature: the aim of the following review is therefore to systematise the various contributions on this topic.

3.2 High-technology in the literature

As noted in the introduction to this chapter, the specific features used in the literature to characterise the concept of high-technology are quite variegated. The classification and organisation of the various contributions, moreover, is made difficult by the fact that their reference point is often not only different but also not always clearly stated. The systematisation of the various contributions dealing with high-technology attempted here is therefore based on the distinction between the three main levels of analysis that are often mixed-up in the literature: the product, the industry and the market. Each of them and their attributes are described in the sub-sections below and are schematically presented in table 1.2.

Table 1.2 – Characteristics of high-technology products, industries and markets

Product / Technology	Industry: the firm and its competitors	Market: the customers and their relationships with the firm
High complexity	High investments in R&D - Need for a strong scientific/ technical base - High knowledge intensity	Firm point of view Market uncertainty: - Fear, uncertainty and doubts about a new technology - Rapid change of customers' needs - New technologies revolutionise markets and demand - Doubts about the speed at which the innovation will spread - Inability to estimate the size of the demand - "Inexistence" of the marketplace
Innovativeness	Knowledge spillovers	Consumer point of view Technological uncertainty: - Doubts about the functioning of the new technology - Concerns about side effects - Doubts about the fulfilment of the timetable - Doubts about the capacity of the provider - Doubts about the magnitude and speed of the evolution of the technology
Rapid obsolescence: - Fast pace of development of a technology - Rapid replacement by new technologies	Competitive volatility: - Uncertain origins of future competitors - New competitors introduce "new rules of the game" - New competitors introduce new and different products	Tradability problems
Unit-one costs	Difficulties in forecasting the impact of a technology: - New technologies come into existence in a rudimentary form - Identifying uses for a technology is difficult and takes time - Unexpected uses can emerge - Complementary technologies are often needed	
Network externalities	High/rapid growth	
	Tendency to cluster	

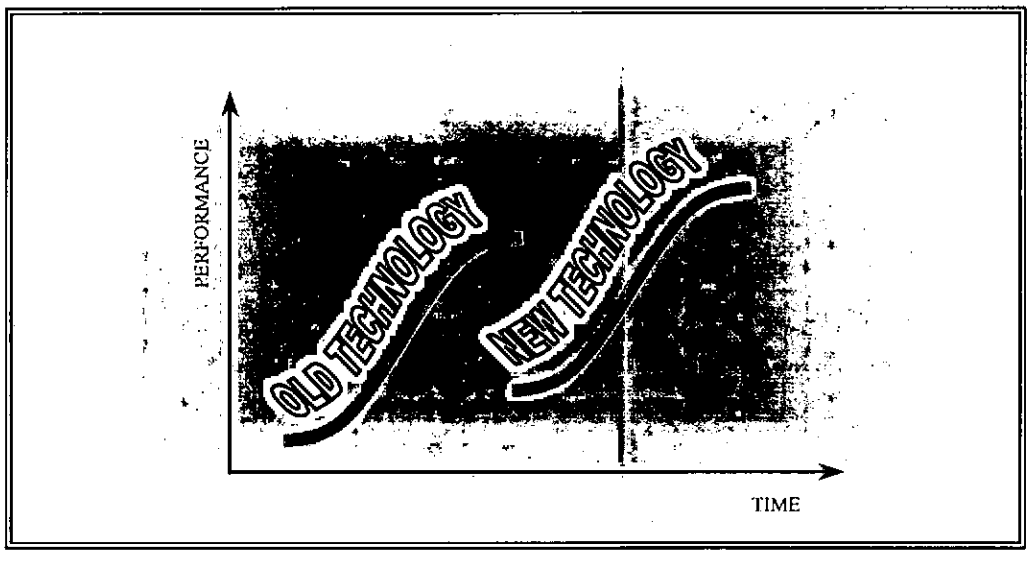
3.2.1 High-technology products

In this category, I grouped those characteristics which regard the inner features of a product and its underlying technology. The relevance of this dimension is clearly pointed out by Viardot: "A definition for high-tech products must take into account not only the particular industry but the product's characteristics as well" (1998, p. 6)

Often a product which is considered highly technological is perceived by users as *complex* (Möller and Rajala, 1999). This is linked to the technical (and scientific) knowledge embodied in these products which is required to make them work. By and large, the degree of complexity is the result of or is associated with the *innovativenss* of a product. As a consequence customers are faced with new devices, usually sophisticated, which they are not familiar with (Viardot, 1998).

Technologies evolve over time. A concept similar to that of product life cycle has been developed in the field of technology: the *technology life cycle*, which considers the evolution of technology performance over time (figure 1.1). Various stages can be identified, starting from the development of a technology, through its growth, until its maturity and, eventually, decline, each implying different strategies and choices (Ford and Ryan, 1981).

Figure 1.1 – The technology life cycle



Source: adapted from Mohr, 2001, p. 48[6]

[6] A similar approach can be found in Foster, 1987. In this case, the dimensions taken into consideration, however are performance and effort.

Figure 1.1 graphically presents two aspects of an important characteristic of technologies and high-tech products: that of *obsolescence*. The first aspect refers to the fact that the life cycle is usually very short, meaning that a technology moves rapidly from the development stage to maturity. In the figure above this is represented by the fact that each curve is quite short and steep. The result is the introduction, within short periods of time, of new versions of a product which make the previous ones obsolete. This concept is also referred to as the "cannibalisation" risk, that is the risk that a new product line "devours" the already existing lines within a company (Mohr, 2001). The typical example of such a process is in the field of personal computers, where new models with improved features are continuously introduced in the market by the same company.

The second aspect related to the rapid obsolescence of high-technology products, is represented by the right curve in figure 1.1. What often makes a given product obsolete is not the *evolution* of the technology embodied, but the *revolution* in the underlying technology. This means that the same function can be performed, usually better, by a product based on a completely new technology that can be more or less "close" or similar to the previous one.

Even though appealing and realistic, the idea of the technology life cycle, as in the case of the product life cycle, is unable to determine which stage a technology is going through, how long it will remain in that stage, when the new technology will replace the old one and how fast it will spread. An important insight provided by this concept, however, is that relying only on economic or monetary signals can be dangerous because it is quite common that a technology reaches a peak in revenues exactly when a new technology enters into the scene. This implies that a firm must constantly engage in the development of the next best technology, with the likely consequence that this may destroy the basis of the firm's current success. A greater risk would be, however, that a competitor commercialises the new technology first (Shanklin and Ryans, 1985; Beard and Easingwood, 1992; Mohr, 2001; Viardot, 1998).

Other two concepts are often linked to high-technology products. They are not essential characteristics of such products and, indeed, are usually found in consumer, mass produced goods. The first is that of *unit-one costs* and refers to a situation in which the knowledge embedded in the product represents a substantial part of its value. In practice, this implies that the costs of developing and manufacturing the first unit of a product are

much higher than the costs of reproduction. Software is an emblematic example of this phenomenon: creating the master copy of a software requires significant investments in terms of financial resources, human resources and time, but its reproduction has negligible costs (John et al., 1999).

The second concept is that of *network externalities (demand-side increasing returns)*, which exist when the value of a product is a direct function of the number of individuals using it. This means that the value of using a technology increases as the number of users increases. A classical example is the telephone and a more recent one is the Internet (Mohr, 2001).

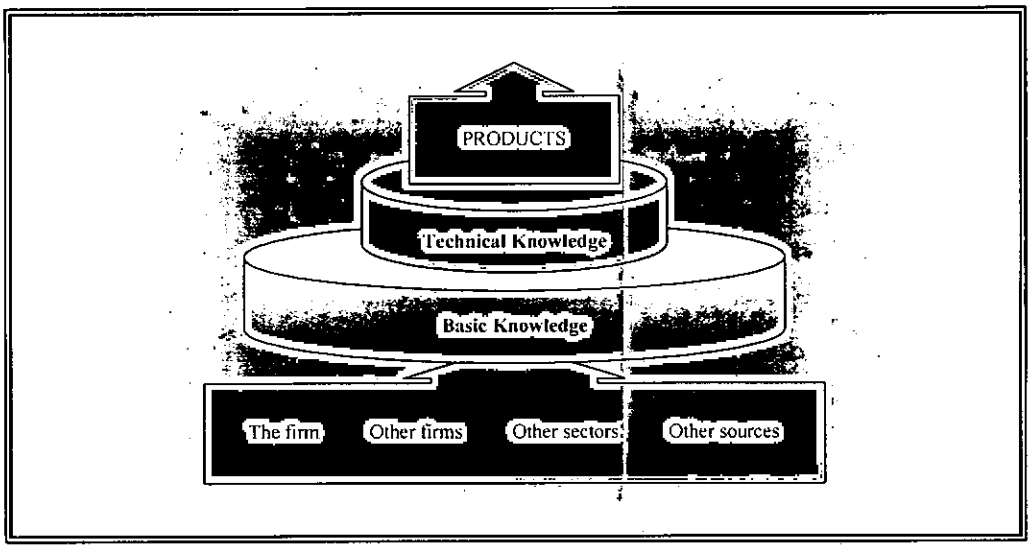
Summarising, high-technology products are characterised by high complexity and are very often innovative. They usually suffer from rapid obsolescence, given the rapid pace at which technologies evolve, and are fast replaced by new ones. Finally, this kind of products can present the unit-one costs effect and may give rise to network externalities.

3.2.2 High-technology industries

A second level of analysis regards the industry and the characteristics of firms and competition in high-technology settings. This is the only perspective which is considered in the governmental classification schemes described in section 3.1 in which, furthermore, the dimensions taken into account are rather limited.

The first feature usually attributed to high-technology firms and industries is related to what was already mentioned above about *R&D intensity*. The complex technical and scientific knowledge embodied in high-technology products, employed in their production and necessary for their functioning requires firms to devote significant resources to internal processes of research and development. It is interesting on this respect to distinguish between two kinds of knowledge (Figure 1.2).

Figure 1.2 – Basic and technical knowledge



Technical knowledge is strictly related to the activities of the firm and its production line. This type of knowledge is usually highly focused and specific to the company and encompasses that information that more widely and often the company employs in its activities. Another "part" of the research efforts of a firm, however, may not have a direct and immediate impact on its activities. The knowledge resulting from such an effort is in a certain sense more "*basic*", but not in the meaning traditionally given to this term when used in contraposition to the concept of applied knowledge. In this case I refer to knowledge a firm needs to master in order to keep the pace with technological developments in fields other than its own. This kind of knowledge may become more directly relevant to its activities in the future. The idea behind this discourse is that of *absorptive capacity* developed by Cohen and Levinthal (1990) who pointed to the importance for a firm to widen its knowledge horizon beyond what is immediately needed, thereby improving its ability to acquire, understand and use the knowledge originating from other sources and, eventually, other sectors.

If these considerations do not specifically refer to high-technology contexts, it is generally understood that firms operating in these environments are characterised by high knowledge intensity and need a strong scientific and technological base (Shanklin and Ryans, 1985; Beard and Easingwood, 1992; Viardot, 1998; Möller and Rajala, 1999).

It is worth remembering, however, what has been written in previous parts of this chapter with respect to the role of R&D-based indicators when evaluating the technological prowess of firms and sectors. It has been argued that this kind of measures may fail to include in high-technology categories those firms that do not perform high-technology internally but operate as assembler of knowledge, technologies and components developed by others. The discussion developed in this sub-section does not contradict the critic mentioned before because the framework is different. While governmental classification methods are based *only* on measures related to R&D intensity, in this case R&D intensity is just one of the features usually employed to characterise high-technology firms. Therefore, while R&D activities are important in high-technology contexts, not all firms that are classified as high-technology perform this kind of activities. As a result, R&D intensity is neither a *necessary* nor a *sufficient* condition for a firm or a sector to be classified as highly technological, but one characteristic among other features that may be found in these contexts.

An alternative way to consider the relationship between R&D intensity and high-technology implies moving from the following way of reasoning:

$$\text{R\&D} \Rightarrow \text{High-technology}$$

to this other approach:

$$\text{High-technology} \Rightarrow \text{R\&D}$$

This means that it is not the fact that firms invest a great amount of resources in R&D that makes them highly technological, but the specific characteristics of their environment that lead them to devote great efforts to this kind of activities.

Moving to other features of high-technology settings, the risk of imitation appears to be particularly severe, especially when the relevant technology is embodied in products. This point is generally referred to using the concept of *knowledge spillovers*. The main idea behind this concept is that knowledge is usually free to flow inside and outside a firm with two opposed implications. The positive implication associated with knowledge flows refers to the *internal* dynamics of the company. Knowledge fosters knowledge;

therefore, the more intense the exchanges of this fundamental resource within the company, the greater the opportunities to enrich the existing stock of knowledge, and, eventually, to engender a larger number of innovations (Mohr, 2001). The negative implication concerns the possible *external* leakages of strategic knowledge that may benefit competitors (Arora et al., 2002). Even though there are specific tools, patenting in the first place, designed to avoid or limit the consequences of spillovers, they are not always effective or able to completely solve the problem. It should be noted, however, that in some cases the problem can be less severe than it appears to be. Indeed, knowledge does not always possess the characteristics of a public good which can be easily, effectively and cheaply transferred to and applied in different contexts. Depending on the process leading to its creation, knowledge can be highly firm-specific and, as such, difficult to articulate and transmit. This is the concept, widely accepted in the literature, of *tacit knowledge* as opposed to that of codified knowledge. When knowledge is mainly of a tacit nature, it may be hard for competitors to understand and apply it, thus limiting the risks of imitation associated with external knowledge spillovers (Arora et al., 2002).

Another element used in the literature to describe high-technology industries is *competitive volatility* which refers to the uncertainty inherent the competition within high-technology environments. This concept has three different dimensions. The first refers to competitors: the *who* question. It is quite common that in highly technological settings new competitors come from outside the boundaries of a given industry. This results from the fact that modern technologies usually have many different applications in fields others than the one from which they originate, increasing the number of potential competitors and making it difficult to identify them. The second dimension relates to the *how* question. New players entering an industry, especially when they come from very different environments, often mean new "rules of the game": these actors bring their own strategies and tactics to the new context and end up influencing the competitive dynamics for all the participants in the industry. The last dimension is linked to *what* questions such as: what kind of products will be introduced by the new comers? Which other ways of satisfying consumer needs will be adopted? These elements contribute to the generation of a turbulent competitive environment in which leadership positions are not achieved permanently and where the basis of a firm success may be easily and suddenly demolished (Mohr, 2001).

Another perspective from which it is possible to look at the competition in high-technology environments is from the potential entrant point of view. The possible applications of a technology and, consequently, the sectors and incumbent firms it will affect are not always immediately clear. In other words, it is difficult to *forecast the impact* of the introduction of a given technology in a market. The origins of this difficulty are various. First of all, often technologies come into existence in a rudimentary form and predicting their future development trajectories can be quite problematic. Second, and as a consequence, the identification of the possible applications of a new technology can be a difficult and time-consuming task, and this is particularly true when the technology is the result of basic scientific research. Moreover, a technology originally devoted to a specific use, may, totally unexpectedly, end up to be a particularly effective solution to a completely different problem. A very simple example is the computer which was invented to carry out complex calculations, and which is now used in many different fields and to various ends. Finally, a fourth element which contributes to the problem of forecasting the impact of a technology is related to the concept of complementary innovations. It is rather common that for a given technology to be fully exploited, other complementary technologies need to be integrated to form a complex system. Often, however, these technologies have not been invented yet. Figuring out which other inventions can improve the utility of a technology can be an almost impossible task and forecasting the possible development time for these complementary innovations is a complicated matter. An example is the telephone which was invented more than one hundred years ago, but whose utility and performance has been dramatically expanded by facsimile transmission, conference calls, online services and so on (Viardot, 1998).

A fast growth rate is another characteristic of high-technology firms and industries (Temporal and Lee, 2001). This is considered to be a specific feature of small firms which are often created in response to the emergence of a technological opportunity. They try to establish a position in a new market when no large capital investments are required and they often tend to experience high rates of growth that are likely to benefit the local economy in which they are located (Shanklin and Ryans, 1985). This point of view is now less widely accepted and many claim that New Technology-Based Firms (NTBFs) are not able to improve the performance and development of national or regional economies. Maybe a more realistic picture of the role and importance of NTBFs is provided by Oakey (1995) who states:

> "Although most NTBFs do not have fast growth potential, they often represent a key source of technical innovations in the sectors of which they form a part (...) Indeed, experience from the semiconductor industry has shown that, given conducive economic conditions, NTBFs can grow both individually, and in aggregate, to make a substantial contribution to national sectoral employment in the long term." (p. 4).

As a result, as argued in the case of R&D intensity, high growth rates are not a sufficient condition for a firm to be classified as high-technology, and it is not even a necessary one. High growth, therefore, could be considered a *possible feature* of high-technology contexts.

A last element, also not to be considered as a necessary condition for an industry to be classified as technologically intensive, is the tendency of firms to locate in a same geographical area, or *to form clusters*. The most cited example of a high-technology cluster is Silicon Valley in the San Francisco Bay, California. This cluster is the result of an initiative of the Stanford University which decided (for economic reasons) to lease part of the university land to high-tech companies[7]. After more than fifty years, Silicon Valley is considered the global centre of high-technology development and the case has been widely studied by academic researchers (e.g., AnnaLee Saxenian (1996), *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*, Harvard Business Press).

The works of Marshall somehow pioneered the studies on clusters suggesting that the process of creation and accumulation of skills and know-how occurs in geographically delimited areas in which a favourable "industrial atmosphere" emerges facilitating the diffusion of technological innovations and economic growth (Evangelista et al., 2002). Among the benefits accruing to co-localised firms, mainly linked to the creation of an environment characterised by trust and thick social exchanges, are: the reduction of opportunistic behaviour, the tendency to voluntarily exchange reliable information, the reduction of information asymmetry and the development of a system of "social sanctioning" which favours agreements to be honoured (Maskell, 2001). The main advantage of the co-location of firms in a delimited geographical area is, however, associated with one of the elements already analysed in this subsection: knowledge

[7] Information from the web site: http://www.netvalley.com/svhistory.html

spillovers. If it is true that we are living in a globalised era where knowledge easily flows through information highways, it has been also observed that some kind of knowledge, that of a tacit kind, can only be effectively transmitted and exchanged through interpersonal relationships (Breschi and Malerba, 2001). Given the complexity of knowledge at the base of technologies and of technological innovation, its firm specificity and, as a result, its tacitness, it is possible to understand why clustering is rather diffused in high-technology contexts.

Summarising, high-technology industries (usually) present significant levels of investments in R&D capable of generating (positive and negative) knowledge spillovers. Uncertainty is linked to competitive volatility, which consists in the difficulty to forecast *who* the competitors will be, *how* they will manage the competitive game and *which* products will be the focus of future scenarios. On the other hand, from point of view of the potential new comer, the difficulties in dealing with competition are mainly linked to the problem of forecasting the impact of the introduction of a new technology in a given market. Even considering the doubts described in the foregoing discussion, firms operating in this kind of industries often experience high growth rates and tend to cluster in delimited geographical areas.

3.2.3 High-technology markets

The last level of analysis emerging from the reviewed literature, and which is not accounted for by the governmental indexes used to define high-technology, takes into consideration the market, that is the customer and his/her relationships with the firm.

Market uncertainty is a first characteristic of high-technology markets. It has a series of sources that I consider representing the point of view of the firm on the relationships with its customers. One of the origins of market uncertainty is the fear and uncertainty associated with the introduction of a new technology and the doubts about the kind of needs it is capable of addressing. As a consequence, the firm has to engage in activities aiming at diminishing these fears, like providing information and education to the customer and providing post-purchase assistance. Another relevant issue creating uncertainty is the rapid change of customers' needs in high-technology environments which may also depend on the introduction of new technologies that completely

revolutionise the market: the process of understanding and satisfying these needs, as a result, becomes rather complex (Shanklin and Ryans, 1985, Mohr, 2001). Other doubts that characterise the market for new technologies are related to the speed with which an innovation will spread and the consequent problem of understanding the process of technology diffusion. Linked to that is the issue of the emergence of standards which has a significant impact on the timing of the purchasing decision of customers. As a consequence of these factors, firms experience difficulties in defining demand, both in terms of size and characteristics (Moriarty and Kosnik, 1989).

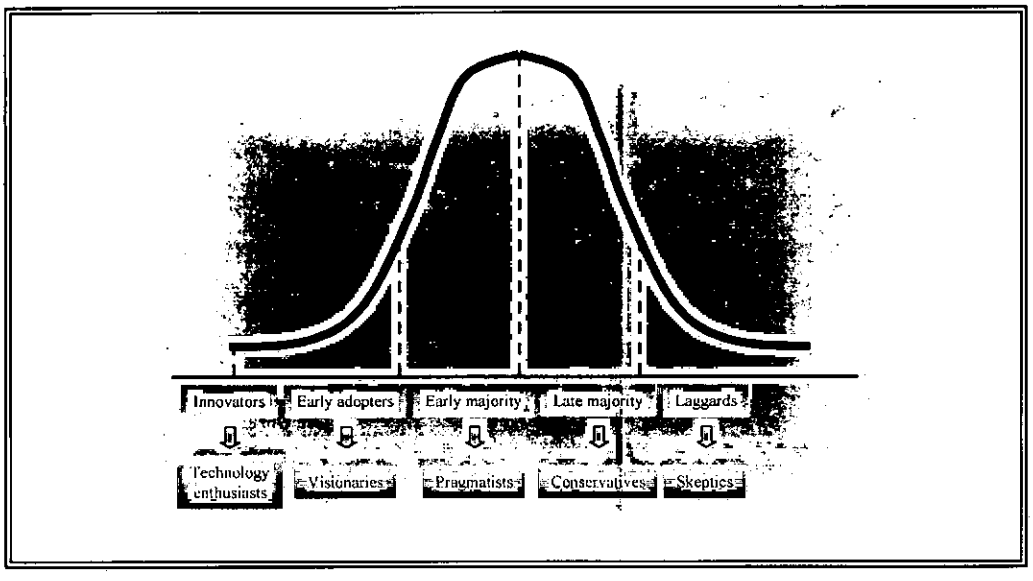
To deal with these difficulties, it could be useful for firms to analyse their present or potential markets keeping in mind the categories of customers typical of a high-technology environment. Traditionally five categories of customers have been identified: innovators, early adopters, early majority, late majority, laggards. With respect to high-technology, these categories have been re-labelled as follows (Moore, 1991; Mohr, 2001):

- *technology enthusiasts* appreciate technology for its own sake. They like being pioneers in their reference group and are prepared to tolerate the problems that may be linked to an innovation just launched into the market. These individuals, usually few in number as shown in figure 1.3 , can be an important source of ideas for companies.
- *visionaries* appreciate high-risk situations and are willing to adopt a new technological device when they envision that great advantage can be gain as a consequence. They are usually not very sensitive to price since they believe that the technology will lead to revolutionary breakthroughs in their field.
- *pragmatists* represent the mainstream market. They are not interested in *revolutionary*, but rather *evolutionary* change and adopt a technology when it is proven to be reliable. From a marketing point of view, reaching this part of the market is quite difficult because customers tend to be influenced by other pragmatists in their decision to buy but, at the same time, they tend to "move" all together towards adoption.
- *conservatives* are technology adverse who decide to buy only to avoid the rest of the world to pass them by. They are highly demanding and price sensitive.
- *skeptics* hardly become customers and adopt a technology only when absolutely necessary. The aim of the company is often no to sell *to* them but *around* them.

The main implication of this categorisation is that each type of cusotmer needs to be addressed with a different marketing strategy. For example, imperative when dealing with visionaries is high quality and efficient services in order for the firm to build-up its

reputation. Pragmatists, on the other hand, need to be reassured about the reliability of the device, which must be as simple as possible. They usually ask for an end-to-end solution to their problems and this often forces the firm to create partnerships with other companies in order to develop a whole product (Mohr, 2001).

Figure 1.3 – Categories of adopters



Source: Mohr, 2001, p. 152

In conclusion, the problem in high-technology settings from the point of view of the firm can be summarised in the words of Shanklin and Ryans (1985):

> "The marketplace for high-technology products exists, if at all, in a future that is often beyond most people's present experiences. The thriving high-technology company is one that is perceptive and creative in response to problems or desires that are largely unknown to potential buyers or users themselves." (p. 22)

When adopting the point of view of the customer, it is possible to speak about *technological uncertainty*. There are various sources of technological uncertainty and many are closely linked to the market uncertainties described above. First of all, customers can have doubts about whether the technology will function as promised. This is also related to the possible unexpected consequences and side effects of a technology.

Other problems are related to the timetable for availability of the new product: it is quite common in high-technology settings that new devices are announced long before they are launched into the market, or even before they have been completely developed. If this approach is part of a firm's marketing strategy aiming at generating interest and a waiting attitude in the market, it can lead customers to doubt about the capacity of the provider to fulfil the expected schedule. Other fears of customers are related to the competence of the producer to provide prompt and effective assistance and service after the purchase has been made (Mohr, 2001). Finally, the decision to buy a given high-technology product can be influenced by the uncertainty over the magnitude and speed of improvements: how fast will the technology be substituted by a new and more updated one? Is it more convenient to delay the purchase? (John et al., 1999). These questions require specific marketing actions able to balance the need for the continuous improvement and update updating of the portfolio of products in order to face competition and to sell these product in the marketplace.

A last aspect of the market of high-technology products is the relevance of tradability problems. These are common in transactions that involve the transfer of know-how together with a physical and tangible device. Problems derive from the difficulty to attribute a value to the knowledge embodied in a product or to transfer it in order to enable the user to exploit its potential (John et al., 1999; cfr. Arora et al., 2002).

To conclude this sub-section on the characteristics of high-technology markets, it is important, in order to properly orient their marketing activities, to distinguish between supply-side and demand-side markets. In *supply-side markets* the commercial applications of a (new) technology are considered only after it has been developed. In these situations, often referred to as "technology-push" situations, the product somehow creates its market and R&D is the prime mover of marketing activities. This most typically occurs when firms deal with radical innovations whose usefulness of benefits potential customers are unable to appreciate. *Demand-side markets*, on the other hand, are those associated with the development of incremental innovations. In this case changes are evolutionary in nature, products have well-defined characteristics and customers can rather easily articulate their needs and desires. It is important for a firm to understand in which kind of market it is operating, at a given moment[8], because this has significant

[8] This because usually supply-side markets are typical of an early market for a new technology, when a dominant design has not been established yet and when, therefore, an emphasis on innovation and creativity

consequences for its marketing activities. For example, in the case of supply-side markets, the market itself must be created, not surveyed: qualitative analysis are most useful in this case. Moreover, customers for radically new products in supply-side markets must be informed and educated, not simply stimulated. Pricing strategies can be different too since customers may be willing to pay a higher price for the newer device (Mohr, 2001; Shanklin and Ryans, 1985)

Summarising, markets for high-technology present, first of all, a high *market uncertainty*, linked to the characteristics of the users, their rapidly evolving needs and the fact that often these needs are beyond the individual's present experience. Moreover, high-technology markets are characterised by *technological uncertainty* which is related to the doubts, mainly of the customers, about the practical functioning of the technology and the capabilities of the firm providing it, both before and after the purchase. *Tradability problems* can also arise because of the knowledge embodied in the products exchanged. Finally, depending on the specific product that is being commercialised, markets can be referred to as *supply-side* and *demand-side*.

3.2.4 Comments and conclusions

Two concluding remarks seem useful at this point. First of all, it is worth noting that the three levels of analysis just described are interrelated: high-technology firms deal with high-technology products which are launched in high-technology markets. Depending on the reason for dealing with the phenomenon of high-technology, however, the emphasis can shift between the various dimensions and, consequently, between the underlying characteristics which are taken into account. For example, the policy maker will be more interested in the industry dimension, whereas from a marketing point of view focus will be primarily on the product and on the market in which it is sold.

A second consideration points to the fact that this approach is useful to characterise high-technology but is difficult to apply empirically to identify high-technology products, industries and markets. When can a product be considered sufficiently complex to be labelled high-tech? And, moreover, complex for whom? In the case of industries: how can the concept of competitive volatility be operationalised and then measured in order

can be profitable. When the technology matures and the growth of the market slows down demand-side conditions prevail (Shanklin and Ryans, 1985; Workman, 1993)

for it to be used to discern high- from low-technology sectors? As regards markets: how rapid and significant should changes in customers' needs be in order to classify the related market as highly technological? Which customers should be taken into consideration for this analysis? These are some examples of the difficulties related to translating the theoretically valid conceptualisations into a workable definition to be used in empirical research.

Chapter 2

Marketing high-technology

1. Introduction

In the previous chapter it has been pointed out that high-technology products have specific features which regard:

- their inner characteristics and those of the technology they embody;
- the industry in which they are produced;
- the market in which they are commercialised.

As a consequence, researchers dealing with the management of these types of products have raised the question whether marketing activities in high-technology settings is different from those typical of more traditional environments. Some consider the marketing of high-technology as simply a subset of "traditional" marketing (Viardot, 1998), while others conceive it as based on completely different strategies (e.g., Gardner et al., 2000). Research shows that, given the inherent complexity of the product, marketing in high-technology contexts is becoming more and more knowledge intensive (Möller and Rajala, 1999) and is proactive rather than reactive (Beard and Easingwood, 1992). There seems to be, however, a general agreement that, in any case, some kind of adaptation is needed when applying marketing principles to high-technology industries (e.g., Mohr, 2001).

Apart from the obvious etymological origin of the term which means "putting in the market" (Viardot, 1998), marketing can be defined as "*knowing customers and their problems, innovating solutions to those problems, and communicating them to a carefully defined target market*" (Webster, 1991, pp. 1-2; italics in original). And also "... marketing is more than a separate business function. It is the whole business seen from the customer's point of view" (p. 2). These definitions reflect the modern conceptualisation of marketing, which is seen not simply as a set of techniques or rules at the base of the functioning of the commercial department of a company, but as a "philosophy" that should influence all the activities of the organisation (Giacomazzi,

2002). Moreover, marketing can be considered to have a "border function" which translates into specific internal processes which enable the firm to interact with the different components of the external environment in which it operates (Cozzi and Ferrero, 1996). This interpretation is the concept of marketing at the basis of this work.

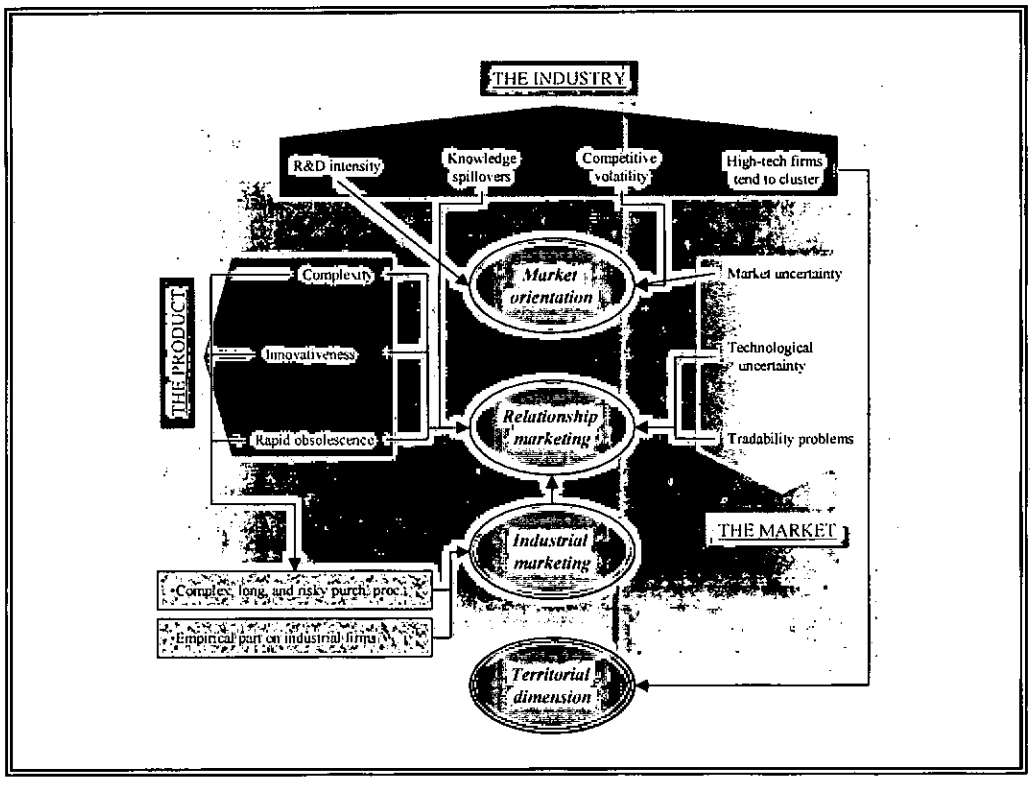
From the large amount of literature on marketing, three conceptual areas will be taken into consideration in this research:

- the concept of *market orientation*;
- the principles of *industrial marketing* ;
- the paradigm of *relationship marketing*.

These areas are significantly interrelated: having the customer as the primary reference point of a firm strategy, the basic idea of a market orientation, is particularly relevant in business-to-business contexts where the number of clients is usually small and their needs are rather specific. Marketing in industrial contexts, therefore, rests on the market orientation idea and usually (and hopefully) results in the development of long term relationships with customers. The relationship marketing approach, however, extends beyond the creation of significant relations with customers to embrace also those interactions that firms establish with other actors: suppliers, other firms, research institutions and public entities.

The reason why the three approaches mentioned above have been chosen has to do with the characteristics of high-technology settings described in the previous chapter (figure 2.1 overleaf). The most important factors pointing to the relevance of a **market orientation** philosophy are: R&D intensity, competitive volatility and market uncertainty. Developing a market orientation is essential for high-technology and research-intensive firms which, as will be explained later in this section, often tend to be too much concerned with technical aspects and, as a consequence, lose contact with their clients. Being in touch with the market may also help the firm to sense those changes in the needs of customers that may open new spaces for new products and new competitors from other industries. Moreover, all the factors which determine "*market uncertainty*" (e.g., rapid change of customers' needs, inability to estimate the size of the demand) may be better controlled by putting the client and his/her needs at the centre of the business.

Figure 2.1 –Approaches to marketing and high-technology characteristics



The development of a **relational approach**[1] to managing the interaction with clients is rooted in other important characteristics of high-technology products, industries and markets. First of all the complexity and innovativeness of the product generates fear, uncertainties and doubts in the user which may be strongly reduced if the firm would interact with them on a stable basis. Interaction may also reduce *technological uncertainty* (linked to factors such as the customers' concerns about side effects, their insecurities with regard to the functioning of the technology and the capabilities of the provider) and may foster a level of loyalty in clients able to avoid or reduce the problems associated with the rapid obsolescence of products and the risk of knowledge leakages: in both cases the creation of relationships with clients based on trust might persuade them to stay loyal to the firm in the face of new products/technologies or suppliers. Finally, the tradability problems associated with the difficulty of valuing the knowledge embodied in the technological product transferred and the related information asymmetry may be reduced through the creation of stable relations between supplier and client based on trust and loyalty.

[1] Even though the literature on relationship marketing considers not only the relationships with customers but also those with other actors (suppliers, competitors, public and private institutions), in this work the focus is almost exclusively on the first type of interactions.

The relevance of the literature dealing with **industrial marketing** for high-technology is less direct than the two strands of literature considered above. The characteristics of a high-technology product (complexity, innovativeness and rapid obsolescence) make their purchasing process a long, complex and risky undertaking. As a consequence more people are involved in the buying decision, each with a different role, knowledge and impact on the same decision. All these elements are typical of business-to-business markets. Moreover, if we consider high-technology producers (and not simply sellers) they mainly deal with industrial clients and their analysis of the final customer is only in terms of derived demand.

Another field of literature dealing with the **spatial dimension** is not specifically related to marketing and derives from the tendency of high-technology firms, at least in some sectors, to concentrate in geographic areas. This literature is important to understand and analyse the specific case of Pisa, in Italy, that will be the context of the empirical study.

This chapter considers the areas of study mentioned above in order to understand which of them, or which part of them, can be useful in order to determine how marketing can be organised and performed in contexts characterised by high technology intensity. Each of the following sections is dedicated to one of the basic pillars of the various fields of literature listed above and focuses specifically on those concepts which can be more directly applied to high-technology settings.

To begin with, a basic question seems important: why is it important to devote attention to marketing in high-technology contexts? The easiest way to answer this question is with the words of Woods and Remondi "The best technology will not necessarily win market predominance" (1996, p. 8). It is often the case that, in these specific contexts, the marketing dimension is underrated and subordinate to technical aspects. This translates in the predominance of R&D departments and managers over marketing and the development of an engineering orientation, as opposed to a market orientation, that may create a gap between the firm and its customers: concentrating only on the technical and functional aspects may result in the lack of attention to the acceptance of the technology by the target market, which is, at the end, the essential element determining the success of

the firm (Mohr and Shooshtari, 2003). If a technical orientation is a necessary ingredient for success in high-technology markets, it is not sufficient: many of these firms (especially smaller ones) fail exactly because of the inadequacy of their marketing and, more generally, of their managerial capabilities (Mohr, 2001). It is quite common, indeed, that in these small high-tech firms "marketing" equals "sales" and therefore it is considered simply a set of practical techniques used to persuade the customer to buy the product. In this way, a wider view, that encompasses the study of the market in order to understand and involve client in a deeper and more interactive kind of relation, is completely lost (Johne and Rowntree, 1991). As Shanklin and Ryans put it: "the technology company's success depends not only on its continued ability to develop new products and processes (its R&D component), but also on its ability to make its target markets aware of their availability and quality" (1985; p. 121). Therefore, the successful high-technology companies not always have the best product or technology, but they have developed the best marketing strategy (Viardot, 1998). Indeed, given the trend toward markets populated by similar products and technologies, competitive differentiation needs to be based on marketing strategies and tactics (Woods and Raimondi, 1996).

2. The concept of market orientation

Market orientation is generally considered at the heart of modern marketing management (Narver and Slater, 1990). It finds its philosophical foundation in the idea of *marketing concept* which states that "an organization's purpose is to discover needs and wants in its target market and to satisfy those needs more effectively and efficiently than competitors" (Slater and Narver, 1998, p. 1001). The concept of market orientation is an operational translation or the actual implementation of the marketing concept philosophy.

Market orientation can be defined as a corporate culture that places the creation of superior and continuous customer value at the centre of business activities. Moreover, an actual market orientation should not be simply limited to a focus on clients, but should assume a wider perspective able to take into consideration the environmental forces (e.g., competitive dynamics) that influence the company and, therefore, its capacity to satisfy its customers (Valdani, 1996). This objective is achieved by having all the departments and functions of a firm focused on knowing and understanding final customers (actual or potential), their/its needs (again, actual or future) and the elements influencing their/its

preferences and choices (Kohli and Jaworski, 1990; Slater and Narver, 1995). Researchers distinguish between market and marketing orientation. While a *marketing oriented* firm has its marketing department focused on customers and their/its needs, in a *market oriented* business *all* functions and activities are organised around the customer and are directed towards the creation of superior value (Kohli and Jaworski, 1990). The marketing function should participate in the formulation and implementation of strategies, creating a bi-directional flow of information able to influence these strategies and the ability of the company to adapt to the various situations of the environment (Cozzi and Ferrero, 1996).

It is worth noting that giving priority to the customer does not mean losing a profit orientation. Profitability remains a goal of a firm which is not in conflict with a market orientation (Narver and Slater, 1990). On the contrary, a profitable and therefore viable business provides a certain degree of stability and, as such, is a value for the customer. Moreover, some studies have found a relationship between market orientation and a firm's achievement of a position of sustainable competitive advantage leading to superior market performance and profits (e.g., Narver and Slater, 1990; Jaworski and Kohli, 1993).

There are, however, other studies that raise doubts about the existence of this relationship between market orientation and performance, at least in some situations. Christensen (1997) and Christensen and Bower (1996) start by making a distinction between sustaining and disruptive technologies. *Sustaining technologies* tend to improve the performance of established products addressing existing, mainstream markets. *Disruptive technologies* may perform worse than established products, are able to satisfy specific and generally new groups of customers. Indeed, they are not aiming at mainstream markets. In their analysis of the disk drive industry, Christensen and Bower (1996) noted that leading firms were not able to introduce new technologies capable of satisfying the needs of a restricted number of customers in remote or emerging markets (disruptive technologies). New entrants, on the contrary, had the opportunity to exploit these innovations which later became the standard in the industry. They concluded that "...a primary reason why such firms lose their positions of industry leadership when faced with certain types of technological change has little to do with technology itself – with its degree of newness or difficulty, relative to the skills and experience of the firm. Rather,

they fail because they listen too carefully to their customers – and customers place stringent limits on the strategies firms can and cannot pursue" (Christensen and Bower, 1996, p. 198). They also deduced that "In light of this research, the popular slogan, 'Stay close to your customers' (...), appears not always to be robust advice" (Christensen and Bower, 1996, p. 211).

In another study, Zhou et al. (2005) distinguish between technology-based and market-based innovations. *Technology-based innovations* usually represent state-of-the-art technological advances and improve customer benefits along traditional dimensions. They generally address mainstream markets. *Market-based innovations* may not necessarily use the most advanced technologies and are not able to satisfy customers in the mainstream market. They may perform worse than existing products along the traditional dimensions, but are designed to provide new and emerging segments of the market with specific features which they value. In other words, they introduce new benefit dimensions and somehow disrupt the customer-preference structure. Zhou et al. (2005) conclude that a market orientation has a positive impact on the development of technology-based innovations, but it has a negative effect on market-based innovations. This because focusing on (current) customers fosters the ability of companies to introduce improved products able to satisfy mainstream markets, but it hinders the firm to search for new opportunities from other sources (e.g., firms in different industries, non-traditional competitors) or in future or emerging markets.

To somehow respond to similar sets of considerations, Slater and Narver (1998) point out that those who claim that a market orientation is not (always) a positive component of the strategy of a firm consider it a customer-led philosophy. A *customer-led* organisation, in fact, has a short-term focus and its objective is to respond to customers' expressed needs. It adopts, therefore, a reactive strategy which, for the collection of information about the customer's perception of existing products and services, mainly relies on focus groups and customer surveys. *Market oriented* firms, on the other hand, adopt a longer-term perspective compared to customer-led businesses and attempt to uncover the latent needs of their customers and to identify their competitors' capabilities by developing a more generative than adaptive learning process (Slater and Narver, 1995). In combination with more traditional market research techniques, market oriented firms use other tools in the attempt to anticipate market demand (e.g., collaboration with lead users) and they act more proactively. Some of the characteristics of a market oriented organisation can be

found also in customer-led firms, but not to the same extent and in the same continuous and consistent way. (in table 2.1 the characteristics of these two different philosophies are summarised).

Table 2.1 – Key differences between customer-led and market oriented philosophies

	Customer-led philosophy	Market oriented philosophy
Strategic orientation	Expressed wants	Latent needs
Adjustment style	Responsive	Proactive
Temporal focus	Short-term	Long-term
Objective	Customer satisfaction	Customer value
Learning type	Adaptive	Generative
Learning process	Customer surveys Key account relationships Focus groups Concept testing	Customer observation Lead-user relationships Continuous experimentation Selective partnering

Source: Slater and Narver, 1998, p. 1004

A similar distinction has been proposed more recently by Barlow Hills and Sarin (2003). In their article, these authors point at the importance of adopting a market driv*ing* instead of a market driv*en* approach for high-technology firms. The idea is that *market driven* organisations are focused on current needs in existing markets, whereas *market driving* firms are able to lead changes in their environments at the industry, market and product level. Their argument coincides with that of Slater and Narver presented above, but they are caught in the same misunderstanding as Christensen and Bower because they associate a reactive market driven strategy to the idea of market orientation.

The distinction between customer-led and market oriented philosophies or that between market driven and market driving organisations, does not resolve the debate about the advantages and disadvantage for firms of developing a market orientation. Understanding also the latent needs of customers has proven to be insufficient because this does not automatically mean that the firm is also able to detect and satisfy emerging needs of new segments of customers. In other words a market orientation is considered to be associated with a (present) customer orientation. As Zhou et al. (2005) put it:

> "Market oriented firms are able to identify customers' latent needs and satisfy those needs by offering tech-based innovations. However, adopting a market orientation *alone* hinders the market-based innovations that initially address the needs of new and emerging markets. To resolve this issue, firms should couple a market orientation with entrepreneurial values, which encourages frame-breaking actions, enhances truly innovative abilities, and enables firms to escape the myopia of their served markets" (p. 55; emphasis added).

If we agree with Hamel and Prahalad (1991) that "[o]f course it is important to listen to customers, but it is hard to be a market leader if you do no more than that" (p. 85), the crucial point is the interpretation of the concept of market orientation. According to Kohli and Jaworsky (1990), the central element of market orientation is the idea of *market intelligence* rather than customer focus. Market intelligence is a wider concept because it also includes the analysis of exogenous factors affecting customers' preferences. From these considerations, it is possible to provide a wider conceptualisation of market orientation: it is not simply a focus on current customers and not even on demand in general, but it implies constant attention for the market conceived in the broadest sense including all the forces operating in it: suppliers, competitors, actors in other industries, institutions, together with current and future customers. In other words listening to customers is only one element of the market orientation of a company and the importance of the various elements changes depending on the situation. Specifically, in stable environments a rapid response to customer demand in order to increase immediate satisfaction can be a viable approach leading to a sustainable competitive advantage and, therefore, to profit. In more dynamic settings, however, a more proactive attitude aiming at anticipating rapidly evolving consumers' needs and at identifying new opportunities in different domains is required in order to gain an enduring advantage over competitors (Slater and Narver, 1998).

Given the characteristics of high-technology settings, the ability to stay in touch with the market becomes vital. In firms operating in high-technology industries there is a strong tendency to be too much engineering oriented: the focus is on technicalities and functional aspects without a clear understanding of the final market. This is particularly true for small high-technology firms which often do not have the resources to develop or acquire essential marketing capabilities (Oakey, 1995, p. 13). If being engineering oriented is important in order to keep the pace of rapid technological development, the

firm may run the risk of not having a market. A market orientation may or should be the way (better, one of the instruments) to find a balance between being leapfrogged by competitors, by developing the ability of sensing new opportunities (and threats), and not being understood by the final customer.

3. The principles of industrial marketing

In an industrial (or business-to-business) market, clients are organisations which buy goods and services to be used in their activities and not individual consumers, who usually buy products for their personal use (Giacomazzi, 2002). Therefore, what differentiates industrial from consumer markets is the type of clients which are served rather than the nature of the products sold (Fiocca et al., 2003).

Even though they are generally referred to as *industrial*, it is possible to identify three different categories of clients in industrial markets (Webster, 1991):

- *industrial* customers include manufacturing firms and distributors who buy products and services in order to produce or resell an output which is sold to other users, being either intermediate or final customers. A specific type of manufacturer included in this category is the so-called OEM (Original Equipment Manufacturer) who incorporates components from other manufacturers into goods it produces and resells with its own brand name;
- *institutional* customers are organisations like hospitals, educational bodies and similar kinds of other institutions;
- *governmental* customers encompass agencies and departments at local, regional, national and international level.

The literature on industrial marketing is relatively recent and it may follow two different approaches. The first simply considers a business-to-business situation as a special case of a business-to-consumer context and therefore marketing can be based on the same principles and schemes (mainly linked to the 4 Ps paradigm). The other approach, deems fundamental to assume a radically different perspective when analysing industrial markets instead of consumer markets by adopting an alternative paradigm with relationships at its centre (Cozzi and Ferrero, 1996). This second perspective will be adopted in this research as will become more clear at the end of this section.

There are at least two reasons to take the specificities of industrial markets into consideration. The first and more straightforward reason, is that the firms that will be part of the empirical study mainly operate in such contexts. The second reason is linked to the characteristics of high-technology products. As pointed out above, complexity, innovativeness and rapid obsolescence are the main characteristics of high-technology products. The related purchasing process becomes, therefore, complex, long and risky as it is in a typical business-to-business situation.

With regard to *complexity*, the purchasing process in an industrial market occurs between complex entities. As a consequence it is necessary to coordinate the activities, resources and individuals of these more or less complex organisations who each have their own (and often contrasting) objectives. Moreover, since the need for a continuous supply of resources and materials is constant in a company, it is quite common that the purchasing (selling) process consists of a flow of exchanges, over a more or less long period of time, with the same (usually few) suppliers (clients) (Fiocca et al., 2003). Complexity is also linked to the various perspectives and actors involved in and influencing the purchasing process in the buying company. It is possible to identify the following perspectives (Fiocca et al., 2003):

- *company perspective.* The general strategy of the firm influences its purchasing decisions. For example, it varies if the firm wants to achieve a cost leadership or aims at being an innovator;
- *functional perspective.* The various functions and departments in each firm have a different status: depending the department which is more directly involved in a given purchase, the way in which the related decision is taken can vary. Besides the general culture of the company, this decision is also affected by the specific culture that develops within a department;
- *individual perspective.* Choice is also determined by the attitude of the single individual dealing with the purchasing process, who can be more or less risk adverse, more oriented toward the consolidation of relationships with a stable set of suppliers or rather involved in the continuous identification of innovative solutions, and so on.

It is usually possible to identify the following various actors with different roles involved in the purchasing process, (Fiocca et al., 2003):

- the *initiators* are those that first perceive the need for a purchase;

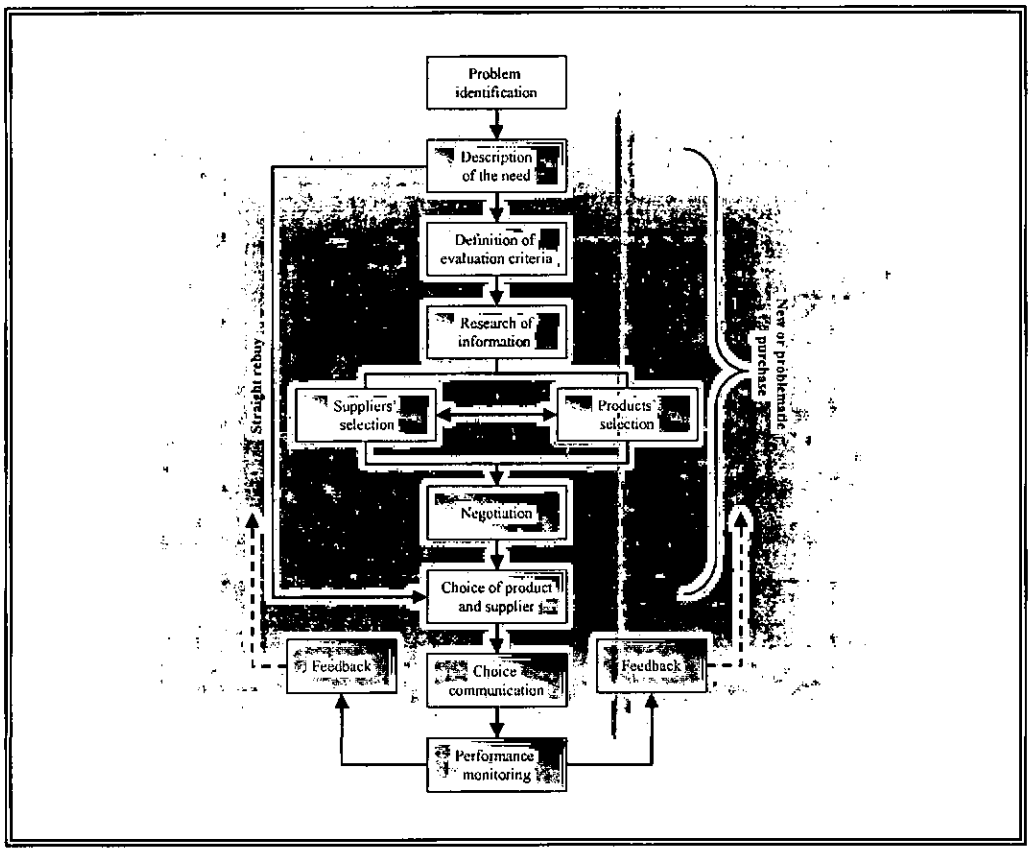
- the *influencers* are usually experts whose competencies are able to orient the choice of the suppliers and the definition of the characteristics of the product to be bought;
- the *buyers* manage the suppliers, analyse the alternative offers and stipulate the contract;
- the *decision-makers* take the final decision about both the product and the supplier;
- the *gate-keepers* have a monitoring role and verify the correspondence of the goods acquired to the needs they are supposed to fulfil;
- the *users* are those who will employ the product/service in their activities.

The interaction among the actors, their relative power and the importance of each perspective determine the final purchasing decision of a firm and it is important for the selling company to know and understand the conflicts and balances between these forces existing in the client company. This is somehow and to some extent possible given the restricted number of this type of customers.

One important consequence of the complexity of the purchasing process just described is the *length* and articulation of it. It can be schematically represented as in figure 2.2 overleaf.

After the identification of the problem and the description of the need to be fulfilled, the process may proceed in two different directions. If the company is facing a routine problem, it will, more likely, decide for a straight rebuy and will contact the usual supplier. If, on the contrary, the situation is perceived as different from previous ones (new or problematic purchase), the process becomes longer (Webster, 1991). First of all, the criteria that will be used to evaluate the different alternatives are decided. The company is interested in finding an answer to the question: "which elements are to be considered most important in order to make a choice?". In order to identify the alternative products/services and the possible suppliers able to solve the identified problem, the company acquires information from various sources that are selected depending on the aims and the relevance of the purchase. After a negotiation phase in which the offers of different suppliers are analysed, the product/service and the supplier are chosen. The experience resulting from the purchasing process is then monitored in order to obtain feedback for future decisions.

Figure 2.2 – Phases of the purchasing process



Source: adapted from Fiocca et al., 2003, p. 45

The length of the buying process is also influenced by the level of perceived *risk* associated with the purchase, which is particularly high when the situation is different from that of a straight rebuy. The consequences associated with the introduction of a new product in the company or the use of a new service can be, indeed, significant. For example, it may be necessary to adapt some procedures or to train the people which will work with a given product. Moreover, the introduction of a new product may influence the performance of the firm in ways which are difficult to anticipate and which can impact on the efficiency and effectiveness of the whole company. Webster (1991) identifies the following types of uncertainty:

- *need uncertainty*, which refers to the difficulty to identify the product that can be used to solve a given problem;
- *market uncertainty*, which occurs in markets where there are many suppliers offering different solutions: the comparison between them becomes, therefore, problematic;
- *transaction uncertainty*, linked to the problems that may occur in getting the product from the seller to the buying company.

When need uncertainty is high, the buyer is more likely to engage in longer decision-making processes, to pay more attention to the quality of the alternative offers, to look for more information and to develop higher levels of loyalty. The most relevant consequence of a high level of market uncertainty is the propensity of the buyer to contact more suppliers and to rely on the advice of internal and external experts. Finally, when transaction uncertainty is high the buyer considers the ability of the supplier to reliably deliver the product/service and, again, many alternative suppliers are considered before the final decision is made (Webster, 1991).

Many of the aspects just described are very often found in high-technology environments. Even in consumer markets, the people involved in the purchase may be more than one and the decision-making process can become lengthy and articulated. This happens because, a high level of risk is associated with the acquisition of a high-technology device and there is uncertainty (of all the types identified above) about its functioning and consequences. The implications that can be derived are, therefore, similar. For the purpose of this study, these implications are mainly two.

First, in high-technology markets, as in business-to-business situations, the client does not simply buy goods with possibly a set of collateral services, but he "buys" the supplier, that is, its performance as a whole. As a consequence the reputation of the firm assumes an extremely important role and its communication strategy should be oriented at building a positive image and a strong corporate brand[2]. The result of these considerations is that the advertising activities of a company evolve towards a wider and more sophisticated *communication strategy* characterised by a greater and deeper information content (Fiocca et al., 2003; Duncan and Moriarty, 1998). In addition, there are two other aspects that influence the communication activities of the company. First, the homogeneity of customers that can be reasonably assumed in a consumer market, is an inappropriate assumption in an industrial setting, where each client needs to be considered (and, therefore, treated) in a different way (Håkansson and Östberg, 1975). Second, a restricted number of clients typically makes up the largest part of sales of the company, while other clients are far less relevant. This can be referred to as the 20/80 rule: the 20 percent of customers represent the 80 percent of a company's revenues

[2] Adopting a *corporate branding* strategy means that the name of the firm assumes the central role in the communication activities of a firm and its products profit from the power of the company image. An alternative strategy is the so called *product branding* strategy in which each product of a given firm stand on its own and has its own brand. A balance between these two approaches is *house or endorsement branding*: in this case the company name accompanies the single brand of each product (Temporal and Lee, 2001).

(Mohr, 2001). Both these aspects point to the importance of one-to-one communication in high-technology as in industrial settings, while advertising in the traditional way assumes little weight.

The second implication refers to the role of the client in the supplier's development and production process. Given the small number of relevant clients, it is possible and common to involve them in the activities of the producer. At a simpler level, the participation of the industrial customer occurs in the last phases of the production process in order to adapt the product/service to its specific needs. Both parties benefit from this approach: the customer obtains a product with the characteristics needed, the supplier reduces the risk of manufacturing a product that will not be accepted in the market and establishes a long-term relationship with a committed customer.

From a more sophisticated point of view, the involvement of the customer in the activities of its supplier can occur at an earlier stage of the development and production process. Quite often in industrial settings, the client of a manufacturing company is one of the most important sources of its innovations. As von Hippel (1977) puts it:

> "The conventional wisdom is that customers provide the needs, while manufacturing firms develop the solution to the needs. But, if one thinks about it, one sees that any information about a need provides information about the nature of a product responsive to the need as well." (p. 64)

The basic idea in this case is similar to that, expressed above, related to the adaptation process: there is an interest of both parties in engaging in the innovative effort. The customer will obtain a product able to satisfy its needs and the supplier may be the pioneer in developing and launching an innovative product into the market. Even though this may be more easily the case for incremental innovations, where the client has already an idea about what can be an answer to its needs, the development of a collaboration represents a significant advantage for the manufacturing company which, in developing this kind of relationship, creates a network able to provide useful information.

In more general terms, the characteristics of industrial and high-technology industries make the development of long-lasting and deep relationships between the client and the

supplier not simply feasible, but necessary. The following section is, therefore, devoted to the principles of the relationship marketing approach.

4. Relationship marketing

Relationship marketing is a quite recent development of marketing theory and practice. The 1950s were the years of mass-marketing which reflected the predominant mass production approach of firms and the model of the large integrated company. During the 1970s, after a period in which companies tended to diversify their market portfolios giving rise to big conglomerates, the focus of marketing activities was on market segmentation. The trend toward internationalisation was particularly evident during the 1980s: the challenge posed by the necessity to adapt products to the specific tastes and requirements of the various geographical areas paved the way, in the following decade, to an increase in the personalisation of companies' offer and, as a consequence, marketing strategies focused on the principles of relationship marketing (Buttle, 1996; Gordon, 1998; Cozzi and Ferrero, 1996).

The evolution toward relationship marketing is the consequence of some changes and challenges faced by firms and their markets, together with dynamics internal to the marketing discipline itself which led to a re-discussion of the basic concepts and principles on which it was based (Cozzi and Ferrero, 1996). First of all, environments are becoming more dynamic and this shrinks the time horizon available to the marketing experts to study the market, to understand customer needs and to develop answers to these needs. Moreover, markets appear to be much more fragmented than in the past: consumers are more sophisticated and demanding, their tastes are in continuous evolution and their requirements are more and more personal. These individuals ask for high quality goods with a strong service component and for larger choice. These types of consumers also offer opportunities for firms: knowledgeable customers can become involved in the production process in order to develop goods able to create value to them. The recent developments of technologies, and communication technologies in particular, allow companies to interact with their customers and to take advantage of this opportunity. Finally, competition is more intense and complex with more products and vendors available and this forces firms to look for other sources of competitive advantage (Gordon, 1998; Buttle, 1996; Grönroos, 1999)

Originally, some of the elements that were typically found in business-to-business exchanges, made these situations particularly open to the adoption of a relationship marketing approach. Specifically, the complexity of the purchasing process (analysed in the previous paragraph), the symmetry and equilibrium between the parties involved in terms of the tools used in the exchange and the relevant competencies, and the interdependence between the purchasing/selling process, sensibly reduce the possibility or advantages of spot interactions and are at the base of the pioneering attitude in business-to-business contexts with respect to the relationship paradigm. If, at the beginning, this evolution of marketing was deemed as an anomaly typical of industrial settings only, today the widespread changes described above make this paradigm more generally useful given the overall need to interact more closely with customers in order to better understand their needs, their expectations and the value products are able to provide to them (Grandinetti, 1993). Besides industrial marketing, other contributions to relationship marketing come from the fields of service marketing, quality management and, more indirectly, from organisational theory (Gummesson, 1994).

Gummesson (1994) states that "[r]elationship marketing is marketing seen as relationships, networks and interactions" (p. 5). Its implementation implies that everyone inside the firm is a part-time marketer and that both seller and buyer can be active in their interactions. According to Grönroos (1999), relationship marketing "is the process of identifying and establishing, maintaining, and enhancing, and when necessary also terminating relationships with customers and other stakeholders, at a profit, so that the objectives of all parties involved are met; and this is done by a mutual exchange and fulfilment of promises" (p. 328). Another definition is: "Marketing is to manage the firm's market relationships" (p. 328). In a similar vein, Gordon (1998) defines relationship marketing as the "the ongoing process of identifying and *creating new value* with individual customers and then *sharing the benefits* from this over a lifetime of association. It involves the understanding, focusing and management of ongoing collaboration between suppliers and selected customers for mutual value creation and sharing through interdependence and organizational alignment" (p. 9). Adopting a relationship marketing approach means, therefore, that the firm values as essential the role of its customers *as individuals* in the processes of developing those products they value. In other words, the customer is not simply seen as a purchaser (or a captive – Grandinetti, 1993) to whom the company sells the products it manufactures, but as a subject that chooses the goods he or she wants in order to obtain the benefits he or she

expects. The value is thus created *with* customers, not *for* them. This basically requires the company to operate in real time in a continuous effort to align its internal functions and processes to those of its customers in order to allow the relationship to evolve over time (Gordon, 1998).

Given this definition, it is evident that relationship marketing builds on the principles of *"traditional" marketing*, but differs from it and other related approaches. Whereas marketing in its classical form is based on market segmentation, relationship marketing has the individual as its target. Moreover, relationship marketing is not simply *relationship selling*. Also in this case the selling company tries to follow the purchasing process of clients in order to understand, anticipate and, therefore, satisfy their needs. The perspective is, however, significantly different since it is usually the perspective of the seller more than of the client. This means that the aim of the company is still to persuade the customer of the value of an already existing product rather than to identify what can be most appropriately offered to and developed with the customer. Often relationship marketing is used interchangeably with *database* and *loyalty marketing*. The first refers to the processes of gathering and analysing data on customers and their behaviour. Loyalty marketing entails all the firm's programs aiming at providing incentives for buying or using the firm's goods and services. These elements are usually part of the relationship marketing efforts of a company, but constitute only a piece of the picture which is much broader and complex (Gordon, 1998; Grönroos, 1999).

At the base of the application of a relationship marketing approach there are two economic arguments: first of all, it is more expensive to win a new customer than it is to retain en existing one. Second, the profitability of a relationship increases with time (Buttle, 1996). But which relationship? The types of relationships that are the base of the described process of joint value creation are characterised by high levels of trust and commitment. *Trust* can be assumed to exist when each party in an exchange believes in the other party's reliability and integrity. *Commitment* refers to the relationship more than to the individuals involved in it and can be conceived as the parties believing that the relationship is important and deserves their efforts to be maintained over time. When both trust and commitment are present they tend to foster efficiency and effectiveness in companies' operations (Morgan and Hunt, 1994).

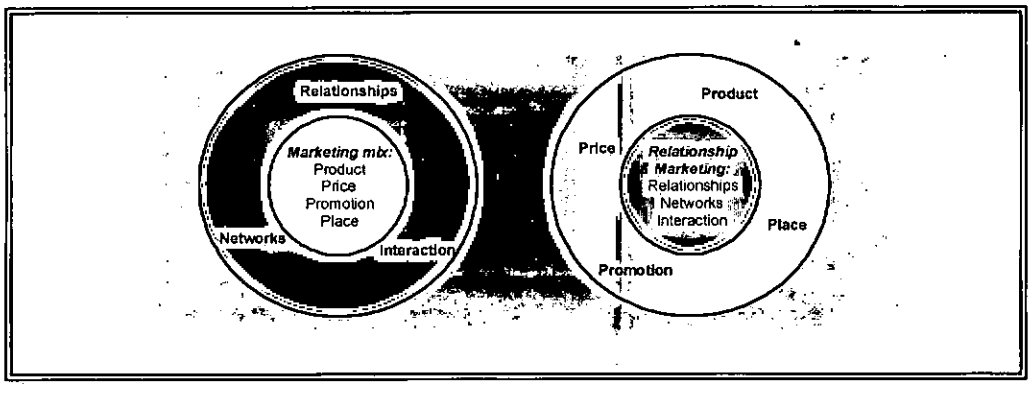
It should be kept in mind that, apart from these benefits, the building and maintaining of these "healthy relationships" (Buttle, 1996) with customers may have some costs and risks. As regards the *benefits*, the firm faces a reduced level of uncertainty, especially because the requirements of its clients are much more clearly defined. Exchanges are more efficient and characterised by an higher level of social satisfaction. Moreover, there is the possibility to learn from customers and acquire new capabilities. Finally, there is the possibility of significant gains for both parties associated with open communications and alignment of goals. On the *costs* and *risks* side, it should be noted that time and resources need to be devoted to the initial process of identifying common goals and to the ongoing management of the relationship. Conflicts that can be difficult to solve may arise between parties. There is also the risk of a loss of autonomy and control together with the problem of leakage of secrets and valuable information. One of the most severe risks is that of creating lock-in effects: if it becomes costly to end a relationship it may be difficult to engage in exchanges with better partners (Dwyer et al., 1987; Mohr, 2001).

Given these risks, it is important for a firm to accurately evaluate whether the relationship marketing approach could be useful and valuable for them. Moreover, since not all customers are worth retaining, it has to be established which of them contribute most to the company's performance in order to consequently choose those customers to develop deep relationship with (Buttle, 1996; Gummesson, 1994). Indeed, in some cases relationship marketing is inappropriate. In some industries, for example, there may not be much value to be jointly created, or customers may not be interested in bonding with their suppliers. In some situations the time horizon of the exchange is too short to allow a relationship to be built. A firm may lack the resources, capabilities and internal consensus necessary for an effective strategy based on this marketing approach. Moreover, if adopting such an approach implies considerable organisational changes (both in terms of infrastructures, logistics and business processes) it could result in a significant waste of resources that makes the adoption not economically feasible (Gordon, 1998).

Adopting a relationship marketing approach has very important implications for the marketing strategy of a firm. Traditionally, the marketing theory summarises the pillars of marketing activities into the so-called four Ps, corresponding to four words encompassing the various aspects of the commercialisation of goods: *P*roduct, *P*rice, *P*romotion and

*P*lace. These concepts will still be needed, but there is a shift in the interpretation of their role: from being *founding* elements of marketing they become *contributing* parameters to relationships (Gummesson, 1994; Grönroos, 1999) (see figure 2.3 overleaf). Some changes are also needed in their development and implementation:

Figure 2.3 – The marketing mix and the relationship marketing paradigms



Source: Gummesson, 1994, p. 9.

PRODUCT

The *product* is not simply the outcome of a process of bundling together tangible and intangible characteristics and benefits which, in the mind of the firm, correspond to the customer's expectations. Rather, products are aggregations of individual benefits selected and even designed by customers.

PRICE

Price becomes more and more linked to the value the good is able to create for the customer: if the product is highly personalised, the customer is willing to pay more for it. As a result, in some sense, prices too are customised, which means that they are less linked to the individual considerations of the supplier, often only related to production costs.

PROMOTION

Relationship marketing is based on a continuous flow of information between customer and supplier and this is even easier today thanks to the development of Information and Communication Technologies (ICTs). As a consequence, the *promotion* activities of a firm change significantly because the customer chooses when, how and how often to interact with the supplier. In other words, promotion is moving away from *persuasion*

and is becoming *communication* where listening is becoming as important as saying. In this extended and richer nuance, from being only one of the levers of the marketing mix of a company, it becomes the same essence of marketing (Grandinetti, 1993; Dunacan and Moriarty, 1998).

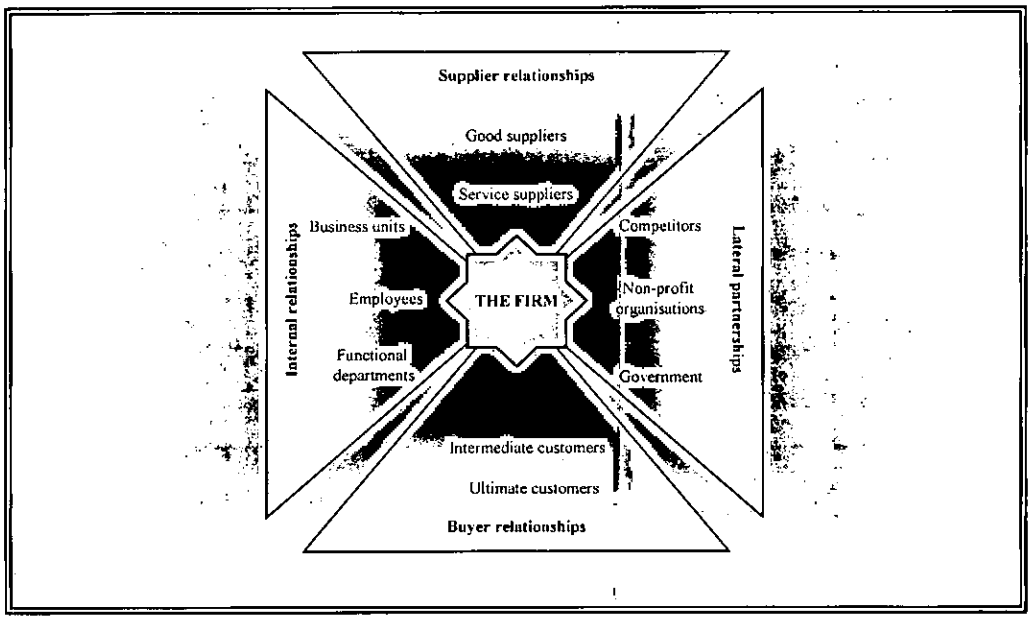
PLACE

As regards *place*, from a relationship marketing perspective firms need to reconsider their links with distribution channel intermediaries. Intermediaries must be seen as a fundamental element in the process of transferring value to the customer; better: they must be treated as they were the best customers of the firm and not just as its channel to the market (Gordon, 1998). This attention to intermediaries assumes crucial importance when the firm is not able to or cannot reach all its customers: in such situations developing deep relationships with intermediaries becomes the only way to get in touch with customers (Grandinetti, 1993).

This last point leads us to an important consideration. In the foregoing discussion, the focus has been on the linkages between the firm and its customers. It is worth noting, however, that in more recent studies the attention has moved toward the consideration of a wider set of relationships involving individuals and institutions other than only the customer. When adopting this perspective, relationship marketing can be more properly defined as a series of "activities directed toward establishing, developing and maintaining successful relational exchanges" (Morgan and Hunt, 1994, p. 22). Figure 2.4 shows this wider perspective on relationship marketing. Besides customers (the final and intermediate ones) and suppliers of goods and services, the firm needs to build relationships with competitors, governments institutions and with all relevant stakeholders. In addition, at the base of the success of a relationship marketing strategy and of the firm as a whole there is a strong commitment of the individuals working for the company. In order for employees to be the tool through which value is created with and for the customer, specific attention should be devoted to bonding them to the company (Buttle, 1996; Gordon, 1998). It should be kept in mind, however, that stakeholders may overlap. For example, customers may also be employees or investors. As a consequence, the way in which relationships are managed should vary according to the different roles of the interlocutor inside and outside the company (Duncan and Moriarty, 1998). The consideration that all these actors contribute to the creation and strengthening of the relations with customers is essential to this extended view of

relationship marketing. While in the past competition took place between firms, now chains of relationships compete with one another (Gordon, 1998).

Figure 2.4 – The wider view of relationship marketing



Source: Adapted from Morgan and Hunt, 1994; p. 21

The rationales for the application of the relationship marketing paradigm occur, in particular, in high-technology environments which are highly dynamic and where competition is intense and volatile. Consumers are usually quite knowledgeable and ask for reliable and high-quality products with high value collateral services. Moreover, the characteristics of high-technology products and markets offer the possibility to engage in deep interactions with customers: because products are durable or semi-durable goods, the time horizon is sufficiently long for valuable relationships to be built. In addition, these goods are usually costly and have the potential to impact considerably on the life and activities of the buyer/user, making constant interchanges advantageous for both parties. The uncertainty which is linked to high-technology purchases can be reduced by allowing the client to communicate on an interactive basis with the supplier. To involve users early on in the development and production process can be a source of competitive advantage for the firm because they can provide innovative ideas. It is worth noting, however, that, according to what was said above, not only the interaction with clients provides benefits to the company, but also the development of a wider net of relations with relevant actors (suppliers, competitors, other institutions) that can help it to better

understand and approach the market. The relationship marketing approach is, therefore, a useful perspective that high-technology firms should take into consideration.

Together with the "who" question, it is important to consider also the "where" question. Not only: "With whom do or should the firm build significant relationships?"; but also: "Where are these partners located?"; "Is it better to have closer or global partners?". This argument is linked to what was already said in the first chapter about the tendency of high-technology firms to cluster. The next section is dedicated to the characteristics of such agglomerations.

5. The territorial and political dimensions

A characteristic of high-technology firms and industries is their tendency to cluster, that is, to locate in a restricted geographical area. This is not necessarily so: as pointed out in the first chapter, clustering cannot be considered a necessary nor a sufficient condition of high-technology. However, there are many examples around the world of concentrations of firms working in high-technology, the most famous of which being Silicon Valley. The reasons for the creation of agglomerations of firms have been widely analysed in the literature, together with the main associated advantages and disadvantages.

Various approaches have been developed to describe such phenomena and different concepts have been employed to refer to these territorial concentrations: innovative milieux, industrial districts, localized production systems, new industrial spaces, regional innovation systems, learning regions[3]. For the purposes of this research, however, I will employ the term cluster to refer to the territorial dimension of the subject under study.

A *cluster* (or *district*)[4] is defined by Porter as a "[g]eographic concentration of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institutions... in particular fields that compete but also co-operate" (Porter, 1998, p. 197). Another definition is provided by Cooke (2001): "[G]eographically proximate firms in vertical and horizontal relationships involving a localized enterprise support infrastructure with a shared developmental vision for

[3] For a review and an analysis of these different concepts see Mouleart and Sekia (2003).
[4] These two terms are not always used interchangeably and different authors propose different definitions. In this work, however, I will use them as synonymous.

business growth, based on competition and cooperation in a specific market field" (p. 121). This concept is based on the idea of "network", but is somehow different from it. First of all, *networks* are not necessarily spatially concentrated, that is, they do not use the territory as a relationship medium (Carayannis and Wang, 2004). They are more likely to be composed of a smaller number of members than clusters and tend to work on agreed objectives. While clusters are based on informal interactions and consist of generally looser arrangements arising from a "natural" process inside a delimited geographical space, networks are typically more formal and the result of a specific choice of the firms involved. Moreover, while continuous interaction and information exchange characterise both clusters and networks, in the former case trust and reciprocity, resulting from the existence of a shared identity within the local area, play a more important role. In other words, the idea of embeddedness, which refers to the degree to which a firm is immersed in the environment in which it operates (Autio, 1995), pertains to clusters more than to networks. Another interesting element of differentiation relates to the role of cooperation. In the case of networks, cooperation is a means to an end: the competitiveness of the system and the single member firms. Cooperation, on the other hand, is a constituent element of clusters. Competition among clustered firms coexists with cooperation and it is exactly the balance between these two elements that constitute the value added of the system (Cooke, 2001).

An important observation is needed at this point. The simple co-location of firms in a delimited geographical area is not sufficient to identify a cluster: the sharing of a common vision and the development of deep relationships is essential. It is the perception, common to all actors, of being part of a system based on reciprocity and trust that "makes the difference", otherwise it is possible to speak of simple *agglomerations*, in which firms passively exploit some local endowments without aiming at the development of a certain degree of embeddedness which facilitates interactive learning and innovation (Bresnahan et al., 2001; Cooke, 2001). Following Maskell (2001), it is possible to speak about urbanization and locational economies. *Urbanization economies* are those accruing to firms for the simple fact of sharing common resources and services available in the area. *Locational economies* (related to clusters) encompass those advantages resulting from the co-location of interrelated economic activities in the same geographic location.

One of the first people who studies local agglomerations is Alfred Marshall who suggested that the process of creation and accumulation of skills and know-how occurs in

geographical areas in which a favourable "industrial atmosphere" emerges which stimulates the diffusion of technological innovations and economic growth (Evangelista et al., 2002). The glue keeping a cluster together is the so-called *social capital*, which "is the expression of norms of reciprocity and trust between individuals and organizations that are embedded in a system of cooperation and favour exchange which gives advantage to those that belong, usually, to a particular locality or non-proximate community linked by ethnicity or religion" (Cooke, 2001, p. 11). The most often cited benefits associated with the creation of local clusters are the so called "Marshallian externalities" (Breschi and Lissoni, 2001):

- *economies of specialisation*, linked to the availability in the cluster of a greater number of specialised suppliers and services specific to the activities developed in the area;
- *labour market economies*, which refer to the capacity of localised industries to attract specialised workers, thus creating an abundant supply of qualified labour available to the firms operating in the area (Keeble and Wilkinsons, 1999);
- *knowledge spillovers*, related to the ease with which information and knowledge spread within the area, thus "contaminating" all the actors in the cluster. This is made possible, it is argued, thanks to the geographical proximity of individuals and firms favouring face-to-face interaction which enables the transmission of tacit knowledge. Therefore, knowledge does not simply spill over generating externalities, but spillovers tend to be geographically bounded (Feldman and Audretsch, 1999).

Other advantages associated with clusters are: the possibility of small firms to jointly exploit those economies of scale and scope which it was thought only large firms could enjoy (Ingley, 1999); the opportunity to develop more innovations thanks to the interaction between customers and suppliers and knowledge centres which are much more common and frequent in delimited geographical areas (Wever and Stam, 1999); the usually higher rate of new business formation made possible by the availability of more clear information on unfulfilled needs and new market opportunities (Feldman, 2001; Cooke, 2001); the creation of a significant demand for the goods produced in the area. At the basis of such advantages is the idea that firms cannot be considered isolated actors in an external environment, but are part of the local context in which other firms and institutions operate. Firms located in a given area take advantage of positive external effects (*externalities*) that can be direct (linked to the direct exchanges between organisations) or indirect (associated with the specific endowments of the area; e.g., the

presence of universities, venture capitalists, etc.) (DeBresson and Amesse, 1991; Bresnahan et al., 2001).

Some *risks* can however be associated with clusters. They can present a general resistance to change and to the opportunities coming from or available outside the regional environment. New competences are not accepted when are perceived as too different from those of the entrepreneurs in the area. Diversification is, sometimes, not even considered. These elements can generate lock-in effects that may lead to the decay of the cluster (Cooke, 2001).

If studies focussing on economic clustering have emerged in order to understand the process taking place in traditional industries in, for example, Italy, more recently it has been observed that innovative activities in high-technology contexts tend to cluster as well, especially those in complementary industries sharing a common science-base (Feldman and Audretsch, 1999). Generally speaking, firms joining together to form networks and to develop innovations are a rather common phenomenon, but, thanks to personal, cultural and symbolic factors, localised networks (i.e. clusters) appear to be more durable (DeBresson and Amesse, 1991). Apart from all the advantages generally associated with clusters, in high-technology industries the main benefits accruing to firms operating in these geographical areas are linked to knowledge spillovers (see also chapter 1). The complexity and the tacit nature of knowledge at the basis of high-technology production, make the interpersonal transmission of it more effective. Thanks to the proximity of actors and of interfirm mobility of workers, innovative knowledge tends to diffuse locally while it takes time to spread across larger distances (Breschi and Malerba, 2001).

From these considerations, it is possible to draw two conclusions. First, when analysing high-technology contexts, it is important to consider the *territorial dimension*, in order to study and understand the (possible) role and relevance of the local relationships among the actors in a given area. These ties coexist with the linkages that these actors develop at a global level: the interaction between these two levels is essential to understand the dynamics of the cluster. Second, there is a *political dimension* of the phenomenon. Clusters tend to assume a significant role in the economic life of places where they exist, being them cities, provinces, regions or wider territorial areas: it is therefore normal and advisable for the political authorities governing these areas to formulate policies able to

address the issues related to cluster economies. Indeed, the question is whether the spontaneous initiatives of firms suffice to foster and sustain the development of clusters. And if not, which public policies would be able to reach this goal? Traditional "technology push" and top-down instruments (e.g., contributions to the R&D activities of firms) seem to be less desirable than more indirect support mechanisms and enabling conditions (e.g., training, infrastructures, etc.) with the consequent transfer of the decision making process on these issues from central governmental bodies to regional and local administrations. Paradoxically, in the era of globalisation of science, technology and knowledge, the importance of regions has increased (DeBresson and Amesse, 1991; Bresnahan et al., 2001). Indeed, as Cooke, observes: "... microcosms enable macrocosms to function" (2005, p. 1147), in the sense that large companies (starting from those in the biotechnology sector) are trying to overcome knowledge asymmetries by embedding themselves in regional and local clusters to exploit their regional knowledge capabilities and systematic innovation strengths.

6. Conclusions

The aim of this chapter has been that of drawing, from the various approaches to marketing (and not only marketing), those elements that seem most relevant to the development of marketing activities and strategies in high-technology contexts.

Given the characteristics of high-technology products, markets and industries, the focus of marketing strategies seems to be on the relational dimension to which the other issues considered in this chapter can be linked. The importance of developing deep relationships with customers finds its origin and consequences in the adoption of a market orientation according to which the client rather than the technology is at the centre of a firm's activities. When considering *how* these relationships should be created and maintained, the literature on industrial marketing may be useful, because the understanding of the client firm and its internal decision-making processes is crucial. Moreover, the restricted number of clients and their heterogeneity, typical of business-to-business contexts, make them a precious source of new ideas and innovations. When we give a spatial dimension to these relationships, the role of the territory and of geographical proximity should be taken into consideration in order to understand whether and how much the presence of cluster dynamics are important for the growth of high-technology firms. From this analysis fundamental elements emerge that should orient and influence the policy-making

processes at different institutional levels with respect to high-technology industries and markets.

Following these considerations, the empirical part of this study has been developed with the following aims and questions:

1. How do small high-technology firms *actually* organise their marketing activities? Do they *really* apply the principles described in the literature presented in this chapter? If not, does this hinder their growth and success?
2. How do these firms develop relationships with their clients? Are they actively pursued because of the benefits that can be derived or are they the inevitable consequence of the characteristics of the firm specific activity (e.g., the level of personalisation of the product)?
3. Do the relationships that have been developed follow a specific locational path? Are there[5] cluster dynamics that justify or require policy interventions aiming at fostering such geographical concentrations because of their importance to firms?

[5] In the Province of Pisa, the area where the empirical part of this research has been developed.

Chapter 3

Methodology and introduction to the empirical part

1. The case study approach

For the empirical part of this research, whose questions and aims were described in the final part of the previous chapter, a case study approach has been used. A case study can be defined as an empirical enquiry that investigates a contemporary phenomenon, over which the researcher has no control, within its real life context. It is usually employed when "how" or "why" questions are posed and is particularly suited to approach the complexities and contradictions of real life (Yin, 1994; Remenyi et al., 1998; Flyvbjerg, 2004). The aims of a case study research may be different: it is possible, therefore, to distinguish between (Tellis, 1997):

- *explanatory* case studies, where causal links are searched for;
- *descriptive* case studies, where the aim is to present events as they occur in real life in order to compare them with others or with idealised theoretic patterns;
- *exploratory* case studies, usually employed as a prelude to wider research programs.

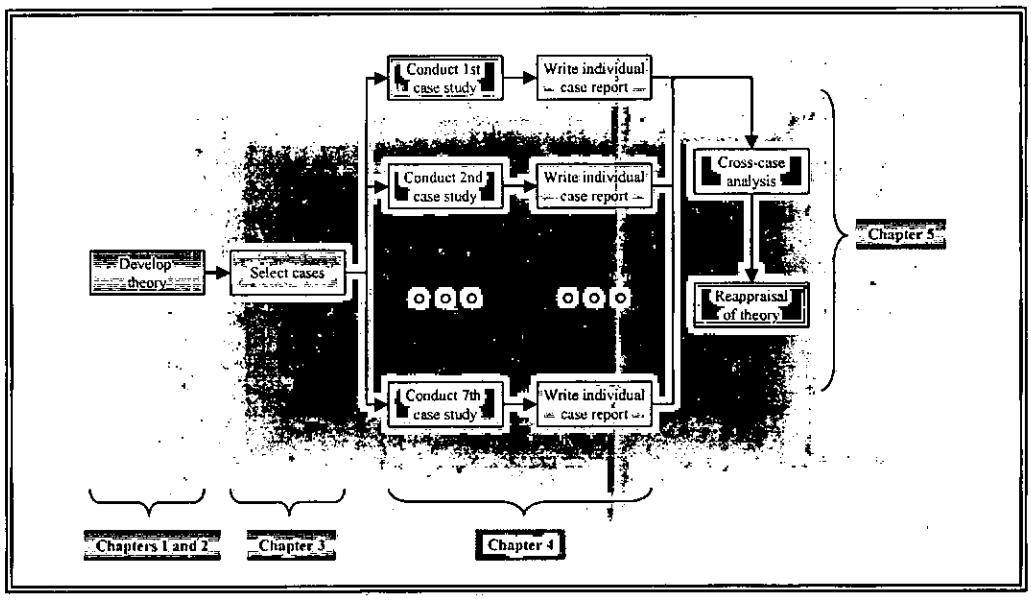
The kind of research conducted in this work is both of a descriptive and an explorative kind. The questions asked are mainly of the "how" type and are intended to investigate a topic with not clear hypothesis in mind but with the aim of possibly develop some. Moreover, following the logic of replication, a multiple case study design has been chosen.

The general purpose of case studies, as will be better explained later, is not to assess the incidence of phenomena, and cases. When a multiple case study designs is chosen, cases are not to be considered as sampling units. On the contrary, what this research approach aims to achieve is an *analytic generalization* (versus a *statistical* one) in which the previously developed theory is the reference point with which empirical results are to be compared (Yin, 1994; Remenyi et al., 1998). This theoretical background may be, therefore, either supported, rejected or adjusted by the case study(ies). As a consequence,

cases are not chosen because of them being representative of a wider population but on the basis of expectations regarding their information content (Flyvbjerg, 2004).

The steps followed in developing the empirical research pretty much follow Yin's (1994) suggestions and is summarised in the following figure (3.1):

Figure 3.1 – The empirical research process



Source: adapted from Yin, 1994, p. 49

THE CONTEXT

The firms selected to be included in the empirical part of this research are located in the Province of Pisa. In this area more traditional manufacturing sectors (furniture, footwear, leather and textiles) are experiencing a slow but constant decline. They are still important for the local economy but they are undergoing a process of consolidation and restructuring. On the other side, a well-developed public research system is able to attract, form and retain relevant human resources in the city, to generate high-technology start-ups and to attract external companies to the area (Di Minin et al., 2003).

Pisa is a medium-sized city with three Universities (the University of Pisa, the Scuola Normale Superiore and the Scuola Superiore Sant'Anna) and a strong public research system. Other important institutes present in the area are:

- the *National Research Council (CNR)* specialised in computer science, physics, mathematics, geology, chemistry and natural sciences;

- the *National Institute for Nuclear Physics (INFN)*, dealing with particles dynamics and theoretical Physics;
- a laboratory of the *National Institute for Energy and Environment (ENEA)*.

The process which is leading to the creation of a high-technology cluster, is based on the fundamental role of the university and on the heavy investments in scientific research made by the public sector. New high-technology firms are often founded as spin-offs of research centres and Universities and established firms are attracted in the area by the presence of a qualified labour force. If the University of Pisa is the birthplace of Information Technology in Italy (in the 1955 a team of professors built the first Italian computer, CEP – Pisa Electronic Calculator), the high-technology phenomenon in the area is now rather diversified given the presence of firms in sectors such as microelectronics, pharmaceutical and telecommunication (Di Minin et al., 2003).

The development process of this agglomeration of high-technology firms has also been studied, in the context of Regional Innovation Systems. The *Pisa Model* (Cooke, 2004) is considered a "*grassroots*" Regional Innovation System in contrast to the "*integrated*" type (diffused, for example, in Germany, where there is a strong concentration between the regional government and the industry) and the "*dirigiste*" type (very centralised, following the French tradition). In a "grassroots" regional profile, it is possible to find the "classic cluster", in terms of innovation policy and practice, which is characterised by informal governance systems, fast market response and constant, often cooperative, upgrading. Capital mainly comes from local banks and reputation is a fundamental asset. Similar models may risk not being able to link *explorative* knowledge, represented by research, to the *exploitation* knowledge which allows the former to be transformed into products or services that have market value. To make this transition a boundary-crossing agent is needed and, in the case of Pisa, this role has been played by the Scuola Superiore Sant'Anna, one of the three Universities in the city. Its role has been that of creating interdisciplinary networks able to transmit, inwards and outwards, knowledge to and from international networks (Cooke, 2004). It is this bridging role which is considered by Cooke (2004) the element that has attracted to the area such a high concentration of high-technology firms operating in different sectors.

The analysis of the high-technology sector in the area of Pisa has been the objective of a project carried out by the In-Sat Laboratory of the Scuola Superiore Sant'Anna in Pisa of which this thesis is part: the *Osservatorio sulle Imprese High-Tech della Provincia di Pisa* (Observatory on the High-Tech Firms in the Province of Pisa). This project was initially promoted by the Province of Pisa and financed by the Region of Tuscany with resources from the European Social Fund. The duration of the project was three years (May 2001-May 2004) but it has now become a permanent initiative of the In-Sat Lab and is now expanding to include the Province of Livorno, Lucca and Grosseto.

The main objectives of the *Osservatorio* can be summarised as follows:

- identification and analysis of the high-tech sector in the Province of Pisa;
- continuous analysis of the trends of sales and employment of the high-tech sector;
- evaluation of the competitiveness of the firms in the area;
- identification of the difficulties and needs of these firms also from a public policy perspective.

The main activities of the *Osservatorio* are the publication of an annual report presenting the results of the intense research work developed around a questionnaire administered to the companies which are part of the database, and the organisation of workshops and seminars on specific themes deemed to be particularly relevant to this type of firms. At a higher level, the *Osservatorio* wants to be the ideal place for discussing themes related to the world of high-technology where, on the one hand, entrepreneurs can express their difficulties and needs and, on the other, policy makers can find useful information able to orient their activities[1].

In total, roughly 226 firms operating in various sectors are inserted in the database of the *Osservatorio* (see table 3.1 overleaf).

[1] For more information on the activities and results achieved by the *Osservatorio* visit the web site: www.osservatorio.sssup.it

Table 3.1 – Firms in the database of the *Osservatorio*

Sector	Number of firms	Percentage on the total
IT R&D	55	24,3%
IT Services	54	23,9%
Innovation services	25	11,1%
Mechatronics	21	9,3%
Energy and environment	15	6,6%
Telecommunication services	10	4,4%
Telecommunication R&D	8	3,5%
Pharmaceutical	7	3,1%
Microelectronics	6	2,7%
Biomedical	5	2,2%
IT Diffusion	1	0,4%
Other	19	8,4%
Total	**226**	**100%**

Source: Osservatorio, February 2006

These firms, generally speaking, are relatively innovative, invest significantly in R&D and are often characterised by a rapid pace of growth. Their main limit is their small size, the almost exclusively local market and the lack of intense networking activities both between firms and Universities and among firms (Di Minin et al., 2003). The following table presents the main opportunities and obstacles for the development of the high-technology sector in the Pisa area (Table 3.2 overleaf).

Table 3.2 – Analysis of the main opportunities and threats for high-technology development in Pisa

Actors	Pros	Cons
University system	- outstanding public research base and well-developed systems for education and training; - capacity of acting as catalyst to attract and retain students and potential entrepreneurs; - several technology transfer organisations and some technology poles.	- networking activities within the area appears low and this hinders firms growth and transfer of knowledge from public science; - a main challenge for the area is how to encourage a more positive attitude towards risk-taking and adaptation to new trends in the educational sector.
High-tech firms	- fast and significant rise of new firms; - emerging new corporate governance; - steady growth of the sector: the number of high-tech companies has risen constantly during the '90s, including foreign multinationals, local companies, start-ups and spin-off companies; - overall, good innovation capacity.	- lack of intense networking activities among firms; - weakness of high-technology-led initiatives by local associations; - absence of formally agreed strategy and lack of clear leadership in the high-tech community; - low capacity to enter extra-regional markets and low marketing skills of the technical entrepreneurs.
Human resources	- highly qualified; - rather abundant; - less expensive than in the North of Italy and the North of Europe.	- low possibility of labour mobility inside the area and risk of losing talents; - low attitude towards entrepreneurial risk.
The area of Pisa	- good quality of life; - presence of good transportation infrastructures (port, airport, highways, rail); - central geographical position in Italy; - presence of some high-tech incubator infrastructures.	- limited regional market; - low presence of innovative finance instruments; - lack knowledge business services; - need for better organisation of networking institutions and infrastructures.

Source: Di Minin et al., 2003, 10-11

CASE SELECTION

The cases presented in the next chapters are seven companies selected from the database of the *Osservatorio*. For privacy reasons, they will be referred to by the numbers 1 to 7. The selection process has been facilitated by the information available from the project on which this research is based: much of the information had been collected previously and the research group had developed a direct knowledge of these firms and of the people running them.

A visit to the web sites of the various firms in combination with this personal insight of the members of the research group of the *Osservatorio*, has helped to evaluate the relevance of each possible case in relation to the subject of study and their informational potential. Firms 1 and 2, for example, were known to be in a phase of their development where marketing issues were particularly relevant, while firms 5 and 6 were selected for the particularity of their products that stimulated curiosity about how they perform their marketing activities.

Moreover, the selection has been made with the aim to provide a certain degree of variety: the choice of firms from different sectors, the inclusion of a firm having final instead of industrial customers (case number 4) and the selection of a university spin-off (case number 3).

The software company number 7 has been included in the research because of the particularity of the sectors in which its products are used (libraries, universities, Public Administrations). Indeed, the wide variety of products provided by software companies has made it very difficult to identify those that could be considered "really" high-technology. However, the inclusion of one of them has been decided in order to guarantee, as has been already pointed out, a degree of variety. In table 3.3 some general information about each case is summarised.

Table 3.3 – Main characteristics of cases

Firm	Sector / Activities	Sales 2004 (€)	People employed 2004	Main peculiarity	Interviewee
1	Microelectronics	1.931.000	27	Phase of development	CEO
2	Industrial automation	1.815.000	18	Phase of development	CEO
3	Mechatronics	125.000	3	University spin-off	Managing director
4	Domotic	165.000,91	4	Type of client served (final customer)	Subsidiary director
5	Professional digital cameras	400.000*	3*	Particularity of products provided	Managing director
6	Industrial automation	200.000	5	Particularity of products provided	Managing director
7	Software	797.575,83	25	Ensure variety and particular destination of products	CEO

*These data are the forecast for 2005, since the company was established in January 2005

Taken as a whole, the idea behind the choice of these firms has been that of selecting firms that could have, for different reasons, specific and unique characteristics. This because, as will be better explained later, it is exactly the exception that may render the case interesting when challenging existing theories or when identifying new trends of development.

CONDUCTING AND REPORTING CASE STUDIES

The case studies presented in this study are primarily based on in- depth interviews with a key informant inside each firm. These were mainly the presidents or the CEOs of the company. They were contacted by phone and a meeting was arranged in their company. The interviews were articulated around the following themes:

- the firm: history, activities, organisation, products etc.;
- the marketing activities: organisation, activities, challenges etc.;
- the relationships with clients and other firms;
- locational and policy issues.

The outline of the specific questions is reported in Appendix A[2].

Some quantitative information (e.g., sales, employees, R&D investments) was also gathered in order to better characterise the firms under study. This information was collected by asking the key informants, some time after the interview, to fill-in a table and send it back by e-mail (see Appendix B).

The remaining information was collected from the websites of the firms and from all the other documents that the key informants presented and considered useful for understanding the firm.

The cases will be presented in the next chapter according to the same layout. The structure of each case is based on the outline of the interview and, therefore, they are divided in the following sub-sections:

- *the firm and its context*: the history of the company is presented together with the description of its main products and activities, some quantitative data and a portrayal of its clients and competitors;

[2] The mean duration of interviews was one hour and 16 minutes and the range was between one hour and one hour and 35 minutes Each interview was tape recorded and transcribed soon after the meeting in order to add further comments on the impressions received during the interview. The transcription process resulted in 108 pages.

- *marketing activities*: the focus is on what the firm means by marketing, which marketing activities it performs and, more generally, how it commercialises its products. Given the specific characteristics of the firms (especially their small size), specific attention is given to the difficulties they face in performing marketing;
- *the relationships with clients*: the depth of the interactions that the firm builds with its client is determined especially by the type of exchanges which are established and by the direction these exchanges follow. The focus is also on the eventual (marketing) relationships that firms establish with other firms (e.g., competitors, suppliers, etc.);
- *locational and policy dimensions*: the reasons for locating the company in the area of Pisa are analysed in order to understand whether it is possible to speak of a high-technology cluster, as it is often claimed by newspapers and politicians. The part on policy aims to understand what the local public actors could do in order to help the high-technology sector in the area (given the presence of this concentration of firms) although they may not be considered a "real" cluster;
- a last sub-section will summarise the case and key issues which have emerged will be pointed out.

It is worth noting that in describing the cases, a detached and objective perspective is adopted and comments and interpretations are avoided. A more critical attitude will emerge in the last chapter where the conclusions drawn from the cases will be presented as the general conclusions regarding theory implications.

DRAWING CONCLUSIONS

The process of drawing consists of four steps. In the first, a general overview of the cases is provided. Particular attention is paid to the unexpected elements which emerged from empirical research. The second step, consists of a more detailed cross-case analysis which leads, in the following step, to a reappraisal of part of the literature described in chapter 2. The last step, departing from the revision of the literature, provides a model to be tested in future research.

2. Limits and further considerations

Before presenting the various case studies following the procedure described above, some further considerations on the method employed should be added.

There are various prejudices (or misunderstandings, as Flyvbjerg (2004) names them) against the use of case studies as a method for scientific research. Generally speaking there is the tendency to prefer quantitative and statistical evidence to the more "soft" qualitative insight that emerges from the case study approach. This is due to the fact that the former approach appears to be more objective than the latter. Indeed, it is often claimed that the knowledge emerging from case studies is biased because the role of the interpretation by the researcher is crucial. However, it should be remembered that also results from quantitative research need to be interpreted in order for those "numbers" to mean something for somebody. Also in this case the researcher plays the role of interpreter.

Another issue is that of generalisability of results. Both in single and multiple case study design, as already noted above, cases cannot be considered sample units and therefore conclusions drawn from them cannot be "transferred" to wider populations. However, the aim of case study research is to make inferences not towards wider populations from which cases have been drawn, but towards existing knowledge in order to confirm it, reject it or to fill its gaps. This means that case study research tries to reach *analytical* and not *statistical* inference, that is, research does not aim at enumerating frequencies but at describing complex concrete events (Remenyi et al., 1998). The objective, therefore, is not generalisation, but particularisation. As Stake (1995) puts it:

> "The real business of case study is particularization, not generalization. We take a particular case and come to know it well, not primarily as to how it is different from others but what it is, what it does. There is emphasis on uniqueness, and this implies knowledge of others that the case is different from, but the first emphasis is on understanding the case itself" (p. 8).

And also:

> "Quantitative researchers regularly treat uniqueness of cases as "error", outside the system of explained science. Qualitative researchers treat the uniqueness of individual cases and contexts as important to understanding" (p. 39).

Moreover, one may question the very objective of generalisation: it may be possible that formal generalisation is overrated as the main source of scientific knowledge, as,

generalisation is only one way in which knowledge can be created and accumulated (Flyvbjerg, 2004). Indeed, what derives from focusing on uniqueness is either the identification of discontinuities in established theories and theoretical assumptions, or the recognition of new trends of development that only particular cases at the forefront may allow researchers to sense.

Another misunderstanding about the case study method is that it is often considered useful only in the first phases of research, when hypotheses are generated or refined and not for hypothesis testing. Apart from the fact that this observation may hold for explorative case studies, the usefulness of cases for the testing of hypothesis depends on the cases chosen. An example is the *critical case*, which is a case chosen in order to collect information that allows deductions such as "if this is (not) valid for this case, then it applies to all (no) cases". Therefore, the conclusions drawn from this case may well be used to reject or confirm previously developed hypotheses (Flyvbjerg, 2004).

A related issue is that case studies are often considered to be biased towards verification thus confirming the researcher's preconceived ideas. Apart from the fact that it seems that human understanding tends "to be more moved and excited by affirmatives than negatives" (Bacon, 1853[3], cited in Flyvbjerg, 2004, p. 428), these assumptions about case study research needs to confirmed more convincingly as "experience indicates that the case study contains a greater bias towards falsification of preconceived notions than towards verification" (Flyvbjerg, 2004, p. 429). Moreover, to confirm hypotheses or theoretical propositions cannot be considered a no-result. As Stake (1995) puts it: "A positive example is likely neither to establish a generalization nor to modify one, but may increase the confidence that readers have in their (or the researchers') generalization" (p. 8).

A concluding remark that can be used to somehow answer all these concerns departs from considering the inner objective of research: that of understanding. Each method used in research is legitimate as long as it improves understanding of real life phenomena. If, following the discourse of Sutton and Staw (1995), methods that do not build causal relationships are not conducive to *theory*, it may be that we are in the domain of *theorising*, that is, in the early stages of the process of theory development (Weick, 1995).

[3] Bacon, F. (1853), *Novum Organum*, in *The Physical and Metaphysical Works of Lord Bacon*, book 1. London: H. G. Bohn.

As an example of the value of case study as a research method, it should be remembered that one of the fathers of modern economy, Adam Smith, started his influential masterpiece with a case study, describing in detail the way production was conducted in *one* pin factory. In his words: "The effects of the division of labour, in the general business of society, will be more easily understood by considering in what manner it operates in some particular manufactures" (Smith, 1979, p. 14)

In conclusion, as Eysenck[4] cited in Flyvbjerg (2004) states: "Ssmetimes we simply have to keep our eyes open and look carefully at individual cases – not in the hope of proving anything, but rather in the hope of learning something" (p. 422). With this spirit the empirical part of this work has been developed and will be presented in the following chapter.

[4] Eysenck, H. J. (1976), "Introduction", in Eysenck H. J. (ed.), *Case Study in Behaviour Therapy.* London: Routledge & Kegan Paul.

Chapter 4

Case studies presentation

1. Case study 1 – Marketing as business development

1.1 The firm and its context

HISTORY, STRUCTURE AND DATA

Company 1 is a semiconductor company with a solid experience in system-on-chip design and verification and in fault-tolerant integrated circuits. Headquartered in Pisa with offices in Turin and Nice, it was founded as a Limited Liability Company (S.r.l. in Italy) in August 2000 from the initiative of three partners. In 2002 it became a Public Company (S.p.A. in Italy). Besides the three original ones, today the company has among its partners:

- the Chamber of Commerce of Pisa, which has entered the company through the *Fondo Rotativo*, a fund created by the Italian Financial Law in 2004 whose resources are employed in the acquisition of short-term minority equities in the capital of medium and large firms in order to stimulate and finance their growth programmes;
- the SICI (*Sviluppo Imprese Centro Italia*), a public company participated by some of the most important banks in Tuscany, that administers funds aiming at financing the programmes of growth of small and medium sized companies;
- some employees, who bought company's shares.

The company went through a downturn between April 2001 and June 2002, during the explosion of the "bubble" of the New Economy and the consequent crisis of the high-technology sector as a whole. The choice in this situation was between closing dawn or somehow re-launching the company. The way chosen was the latter: new investments were made and the company started to produce its own products and ceased to be simply a service company. This strategy revealed to be successful and, in spite of that period of general crisis, the sales of the company have always been increasing. Table 4.1 and figure 4.1 show some data of company 1.

Table 4.1 – Company 1: some data

	2000	2001	2002	2003	2004	2005 (Forec.)
Equity capital (thousands €)	10	100	200	200	279	413
Sales (thousands €)	28	639	816	1444	1931	2077
Investments in R&D (% of sales)	0%	21,2%	39,7%	10,9%	11,5%	16,6%
Marketing expenditures (% of sales)	-	-	-	-	-	-
Number of partners	3	4	6	6	8	15
Number of people working in the company	6	18	20	22	27	29
Geographical distribution of sales (% of sales for each market)	*Reg.* *Nat.* *Glob.* 100%	*Reg.* *Nat.* 25% *Glob.* 85%	*Reg.* *Nat.* 27% *Glob.* 73%	*Reg.* *Nat.* 3% *Glob.* 97%	*Reg.* *Nat.* 12% *Glob.* 88%	*Reg.* *Nat.* 15% *Glob.* 85%
Number of patents	Italy EU US	Italy EU US	Italy EU US	Italy EU 1 US	Italy EU 1 US 1	Italy EU 1 US 1

Figure 4.1 – Company 1: some data

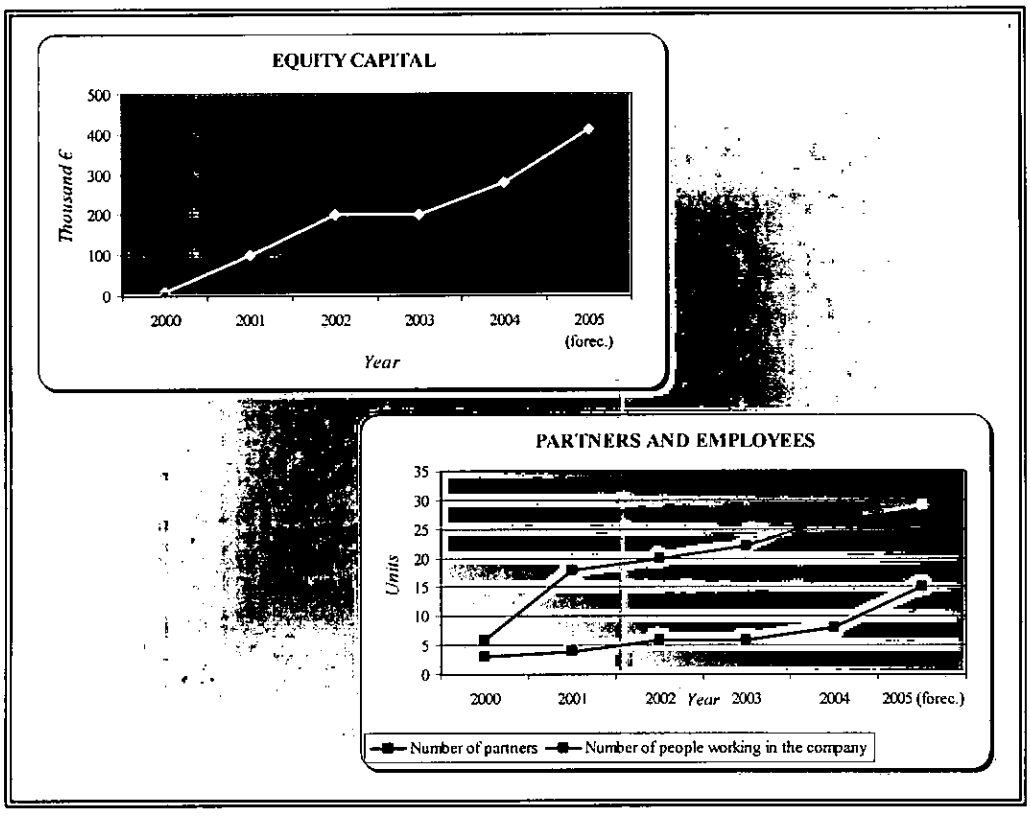
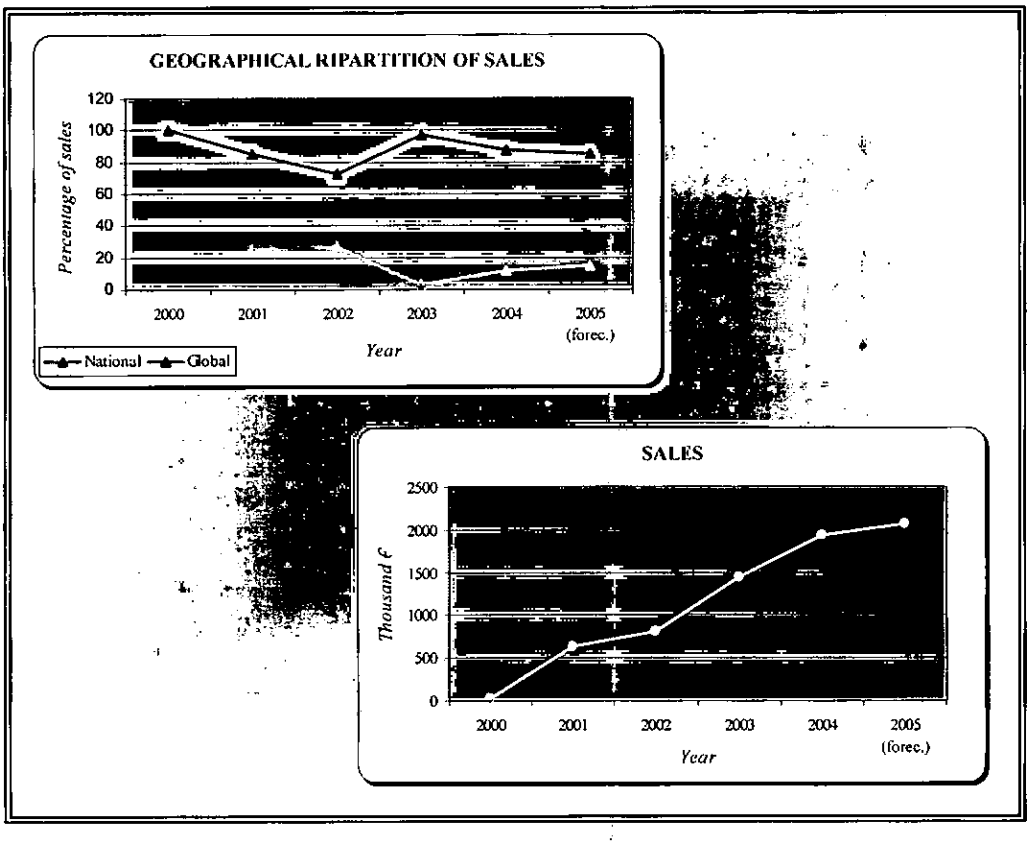


Figure 4.1 – Company 1: some data (cont.)



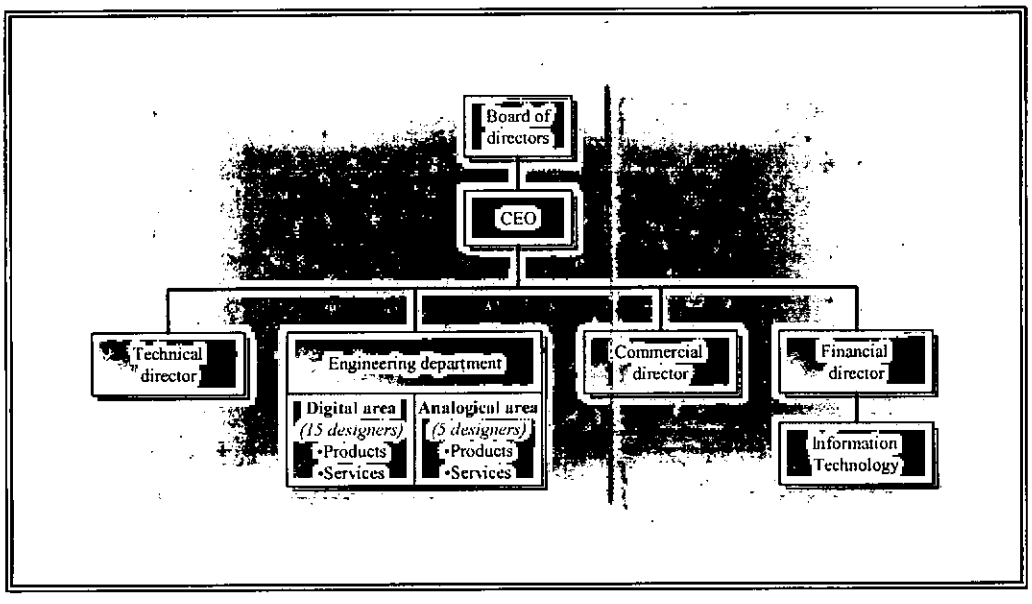
As regard the organisation chart of the company (see figure 4.2 overleaf), the Board of Directors is composed by the three original partners, one of which, the key informant for this research, has the role of CEO. The technical director, one of the founders of the company, is the inventor. At the beginning he was also responsible for the production, but later the company decided that it was better to leave him free to concentrate on technology in order to keep the pace of its evolution. As the CEO puts it:

> "... we like to define him an all-around player. Basically, he is the inventor, the one who makes it possible for the company to be ahead of the evolutions of the technology, which is the only way to stay on the market."

Two coordinators oversee the engineering and productive activities: one for the digital area (that employs 15 designers) and one for the analogical area (with 5 designers). To complete the structure, there are a commercial director and a financial director. The latter manages all the activities linked to the economic and financial aspects of the company (fiscal aspects, financing, purchases) and the organisation of the information technology

net inside the company. At present, there are about 30 people working inside the company, 70% of which with long term contracts.

Figure 4.2 – Organisation chart of company 1



ACTIVITIES

The activities of company 1 are twofold. On the one hand, it provides design services in the domain of integrated circuits, that is it, behaves as consultant for other companies: they may ask for a complete project or for parts of projects for which they do not have the specific competencies needed. Depending on the level of interdependence with the client company, the price may be established:

- for the project as a whole, and the company has to provide a complete project with the characteristics required and within the established deadline;
- based on the amount of time and material employed in the accomplishment of the project, and this is often the case when it is not possible to clearly distinguish the responsibilities of each of the parties involved.

The provision of such services has also a strategic value for the company since they are the door through which it enters the client company, starts taking part to its design activities and learns how to better solve its problems.

On the other hand, company 1 creates its own software products. These are basically codes that are employed in the verification of some specific steps in the design of

microchips and that are licensed on an annual, triennial or longer term basis. Summing up, the company does not produce microchips, but designs them or creates devices which allow and ease their production.

CLIENTS AND COMPETITORS

Company 1 operates in a business-to-business context and its clients are among the ten most important firms in the semiconductor industry, like Philips, ST Microelectronics, Sony, Toshiba, NEC, Siemens, Infineon. Its market is therefore global: the greatest part of last year sales came form Europe, 12% from Japan and only 8% from Italy. The United States have a negligible weight in the activities of the firm.

As regards competitors, especially for services, they are located in India and China where valuable engineers cost respectively four and ten times less than in Italy. Since reducing the cost of the labour force in Italy is not a feasible strategy, at least one not under the company control, the only way to compete in the market is by investing in know-how in order to always learn new technologies. This is linked to an important characteristic of high-technology contexts: the rapid obsolescence of products and fast evolution of technologies. It is not possible to succeed or even survive without a process of continuous improvement of products in order to add new functionalities, new services, and to favour the inter-operability with other technologies. This means devoting significant resources to technologies that are not mature or have not been officially introduced in the market yet in order to be prepared to provide services when they will be massively employed. The risk is that the technology may never be adopted or that it will take too much time to develop adequately which will result in cash-flow problems. The company, however, has no choice: as the key informant reports, for example, other Italian firms, initially bigger and more advanced compared to company 1, are closing down after having devoted all their efforts to the exploitation of their existing know-how without updating it; as the CEO of the company says:

> "... the necessary condition is continuing investing in know-how because if you stop, after a couple of months, for sure, there is someone that is able to do the same things as you which cost a lot less (...). ... thinking of reducing the labour cost at a level sufficient to compete with India and China equals to raising the white flag."

1.2 Marketing: an unsolved problem

Being the firm the result of the initiative of some engineers, marketing has always represented an issue for company 1, *the* issue. Notwithstanding the lack of specific knowledge and capabilities in the domains of marketing and management due to his educational background, however, the CEO, and the company as a result, has an extremely clear and elaborated idea of what marketing is, which role it should play in the company and how it should be performed. First of all, marketing is not the same as sales and is not reduced to advertising activities. Moreover, and as a consequence, it is not simply considered a function, the one usually involved only in the final phases of the development and production process, but a sort of "way of reasoning" that accompanies and inspires all the activities along this process. The fundamental role of marketing is the understanding of client's needs in order to be able not simply to solve, but also to prevent its problems. In the CEO's words:

> "... marketing for us is business development (...) What really creates value added is understanding the needs of the client, where it is, where it is looking, where and what the offer is and then being able to solve its [the client] problems and to offer the solution. "

Unfortunately, the company finds it difficult to efficiently translate these principles into practice. At present, the CEO is also responsible for marketing and sales activities: he has delegated all the other functions more directly linked to production hiring directors for these positions. Some attempts have been made to employ people with marketing capabilities and experience. These experts, however, usually lack the necessary technical knowledge of the product and the market: this strategy, therefore has not yielded the expected results and more than solving a problem has created new troubles. The solution to this puzzle seems to be that of having an engineer with strong technical abilities which develops into a marketing expert, as has been the case for the actual marketing man in the company, the CEO, who cannot, however, keep on performing also these activities especially if the firm continues to grow. Nonetheless, it is, rather difficult to find such a person because for an engineer not to work as an engineer is felt as a kind of defeat.

As regards the activities that are concretely carried out, participating in specialised trade fears is a must in this sector: it is a matter of visibility. These exhibitions offer the

opportunity to meet all the relevant actors of the industry and to let them know that the company is still in the market.

An important instrument to create loyalty and to also learn from clients is the on-line support, a service provided to company 1's clients through which specific inquires are posed to engineers who, within about 24 hours, are able to answer, either giving the solution, or indicating the user guide page in which the solution can be found, or delaying the solution of more complicated problems.

Market researches are not necessary for the activities of company 1 since its sector can be considered as a "big family" where everybody knows everybody else: there are the big names and the smaller reliable companies they work with and in total they amount to some tens, not thousands.

Much relevance is given, on the other hand, to the website that is constantly updated and renewed. The web pages provide the essential information about the company, its products, services and capabilities and is the most important communication vehicle of company 1. Indeed, communication is the first concern of the company. As it is often the case for high-technology products, the company has the problem of conveying to the (potential) client the characteristics and advantages of the solutions offered. There are two problems linked to this aspect. The first relates to the lack of proper human resources discussed above. If a technician has the task of visiting the client he/she is able to perfectly explain to another technician all the specificities of the product, but may have problems in translating the associated advantages in a way that is understandable by the people in the client company responsible for the purchase. Moreover, the level of confidentiality reached with the engineers of the client firm, and based on the sharing of common knowledge and interests, may lead the engineer of the company to illustrate, immediately and in detail, also the limits of the product offered. At a broader level, there is the problem of somehow educating the client because it does not always know where its problem is or have an erroneous or limited awareness about where the source of its problems lays. In this sense the CEO claims that doing marketing also means to create the right culture in the client company.

1.3 The relationships with clients

Building long-lasting relationships with clients is both a necessity and a choice for company 1: the high specificity of the products and services provided implies and requires a continuous interaction with the client, but through this interaction the company has the opportunity to learn, to improve its offer and, as a consequence, to grow.

The provision of services is the first step in the construction of deep relationships: it is the mean through which the company enters the client firm and its design and production processes. This allows it to understand the client and its needs in order to serve it better. If selling to that company is the final objective of the relationship building process, this is not the only one: by helping the client understanding the areas in which improvements are possible the company gains its trust and the relationship grows in depth and width. Reinforced by a series of maintenance services, these interactions imply a knowledge exchange that is bi-directional and engenders a virtuous circle: if at the beginning clients may gain most from the involvement of company 1 in their activities as a knowledgeable supplier who works to create a culture, as the relationship proceeds company 1 has the opportunity to learn from clients in a knowledge interchange which creates value added for both parties. This value added is what makes the difference to the client, otherwise it would simply look for suppliers that can provide the same product or service at a lower price. When a certain level of trust is reached, the relationship may evolve into co-development or co-production agreements. It is also possible that the client is not able (because it is too expensive or time consuming) to fully develop the solutions that it has eventually devised and asks the supplier (company 1, in this case) to produce them for the market, buying them at a lower price.

It is worth noting that this kind of interchanges are searched for with larger firms, which, anyway, represent almost the totality of company 1's clients. To the very few small clients, a sort of pre-packaged solutions are offered, even though, especially through the on-line support, it is possible to learn something from them as well. Large clients, besides the fact that represent a large amount of sales for company 1, are a fundamental source of new ideas: developing relationships with them is, therefore, a vital strategy even though much attention is also paid to the risk of becoming too much dependant on one or few of them.

As regards the management of such relationships, it can be defined as "dispersed" on both sides. At first managers are more directly involved in interacting with clients. As the relationship evolves the project leader enters the scene in order to take care of the implementation phases. In the client company many people are involved as well: technicians, those concerned with the commercial aspects and those more directly involved in the definition of the strategies of the company.

The company has also joined some partnerships at the international level[1]:

- *ARM Technology Access Partnership (ATAP)*, a network of independent Integrated Circuit (IC) design centres audited and approved by ARM according to their competence and experience. ARM designs the technology that lies at the heart of advanced digital products, solutions and devices and has created this net of satellite companies to provide its customers with a total system solution and adequate support;
- *OCP International Partnership (OCP-IP)*, a non-profit semiconductor industry consortium created to administer the support, promotion, and enhancement of the Open Core Protocol, the only fully supported, open licensed, complete interface socket for Intellectual Property (IP) cores;
- *Cadence Open Choice Program*, a program, promoted by one of company 1's suppliers (Cadence), which enables interoperability and facilitates open collaboration with leading IP providers to build, validate, and deliver accurate models for Cadence design and verification solutions;
- *Spirit Consortium*, an industry level cooperation focused on establishing multi-faceted IP/tool integration standards that drive sustainable growth in electronic design. It is composed by companies dedicated to the adoption of a unified set of specifications for configuring, integrating, and verifying IP in advanced System on Chip (SoC) design tool sets.

These are essentially marketing partnerships, in the sense that are an instrument to reach the market exploiting the network developed by larger partners. However, they often go beyond simple market arrangements and represent a sort of "reserve" of competencies and knowledge to which the company has the possibility to draw from when necessary.

[1] The information reported are drawn from the company web site and the specific partnerships web sites:
www.arm.com
www.ocpip.org
www.cadence.com
www.spiritconsortium.com

1.4 Locational and policy dimensions

The choice of locating the company in the area of Pisa has been the result of the origins and the educational paths of founders. The three original partners attended the University in Pisa and they were not very keen in moving to the USA (an option, the CEO specifies, that is still open): there it would have been much easier to raise funds and grow faster but they felt that their ideas about how to do business were not perfectly aligned with the American philosophy on this respect[2]. Therefore, it has not been the presence of other high-technology (small) companies that has inspired this decision and, indeed, this concentration does not translate in some cluster dynamics that benefit company 1. The presence of important Universities is considered an advantage because of highly skilled human resources available in the area, but it has not been a determining aspect that has influenced the locational decision of company 1. Indeed, human resources of this kind are usually highly mobile and, therefore, could be also recruited elsewhere.

On the policy dimension, the CEO is rather convinced that the attention given to the high-tech phenomenon in Pisa is somehow misleading and overstated. As an example he cites an article recently appeared in an Italian financial newspaper where the situation of the Province was assimilated to that of Finland. And indeed the percentage of GDP of the Province of Pisa devoted to high-technology investments was equal to that of Finland. However, the industrial spillovers of such investments are nearly zero. Therefore, if the presence of many high-technology firms in the area of Pisa is a reality, the importance of such a concentration at least for the same firms operating in that area, if not for the local society as a whole should be looked into. The professional interactions among these firms are rather limited: working with or for local firms is uncommon and usually does not result from a precise strategy. This lack of work-related relationships translates in the absence of any effort, and even any interest, in joining together to create a critical mass in order to influence the policy-making process on themes related to high-technology. In addition, there is a profound mistrust in the same policy makers that, the interviewee states, have been constantly unable to translate words into facts and that seem to be concerned with the problems of these firms only for promotional reasons. A similar opinion is also expressed with respect to the University which often proposes initiatives that do not always result in a tangible return for the companies involved.

[2] The company have specific ideas on what the role of the company should be inside the society. The explanation of this philosophy, however, is beyond the purposes of this presentation and this research.

Interestingly enough, the fact of not being conceived as a relevant interlocutor is considered by the CEO of company 1 to be negative more for politicians than for the company itself. While the company may obtain funds and what else needed for its activities autonomously (as done up to now), it can play a significant role for policy-makers and the society as whole, especially in terms of promotional initiatives worldwide and as a source of critical suggestions. And this for free.

1.5 Summary of key issues

Company 1 is a growing small firm in the semiconductor industry. Notwithstanding the technical background of its founders and employees, it has a rather elaborated idea of marketing, even though it is still conceived as an unsolved problem for the firm. What has emerged from the interview with the CEO is that marketing:

- is not (simply and only) sales;
- is relationship building;
- equals business development and, therefore, growth.

The most relevant limit in performing marketing activities is the difficulty to find proper human resources that possess both technical and managerial/marketing capabilities. At a broader level, the problem is the lack of attitude typical of non-American societies: the technical aspects receive a preponderant relevance but scant attention is given to the best way to present them for selling purposes.

Building long-term relationships with clients is a precise objective of company 1 since they are one of the most important sources of new ideas. Attention is also given to the creation of marketing relationships with other companies and organisations so that the strengths of larger coalitions may help company 1 to more easily reach the market.

Another element emerged from this case is the lack, in the area of Pisa, of clusters dynamics. It seems, in fact, that the high-technology phenomenon in Pisa does not translate (at least yet) in a "real" district: using the distinction presented in chapter 2 it is maybe better to define it an agglomeration of firms because the co-location in a rather limited geographical area of firms operating in the realm of high-technology is not perceived as a source of value added by these firms and there is not a clear awareness of the potential benefits that could emerge from such a concentration.

As regards the policy dimension, what comes out is a profound mistrust in the policy-makers and their capabilities to address the specificities of the high-technology sector. Besides interventions at the infrastructural level, company 1 would like to be considered as a relevant and knowledgeable interlocutor able to give practical suggestions in the discussions on high-technology related issues. More than obtaining something from the policy-making process, the aim would be, therefore, that of jointly create benefits for the industry and the Pisan area as a whole.

2. Case study 2 – From a market idea to a marketing problem

2.1 The firm and its context

HISTORY, STRUCTURE AND DATA

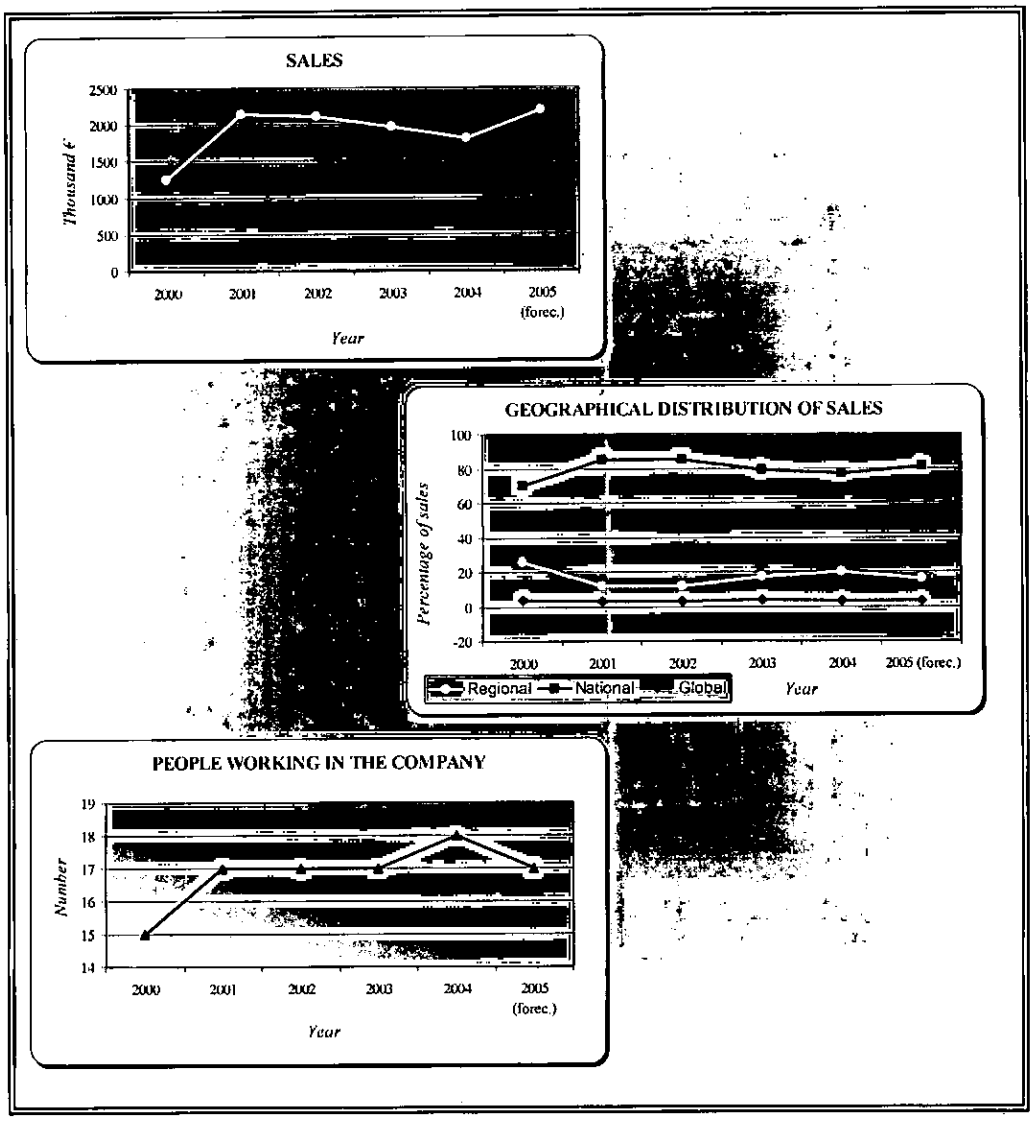
Company 2 works in the realm of industrial automation: it designs and produces numerical controls to be applied to machine tools in order to transform them from manual to automatic. Some data of the company are presented in table 4.2 and graphically in figure 4.3 overleaf.

Table 4.2 – Company 2: some data

	2000	2001	2002	2003	2004	2005 (Forec.)
Equity capital (thousands €)	10,3291	100	100	100	100	100
Sales (thousands €)	1255	2153	2113	1977	1815	2200
Investments in R&D (% of sales)	33%	19%	19%	22%	25%	23%
Marketing expenditures (% of sales)	0,5%	0,2%	0,2%	1%	2%	4%
Number of partners	4	4	4	4	4	4
Number of people working in the company	15	17	17	17	18	17
Geographical distribution of sales (% of sales for each market)	*Reg.* 26% *Nat.* 70% *Glob.* 4%	*Reg.* 12% *Nat.* 85% *Glob.* 3%	*Reg.* 12% *Nat.* 85% *Glob.* 3%	*Reg.* 17% *Nat.* 79% *Glob.* 4%	*Reg.* 20% *Nat.* 77% *Glob.* 3%	*Reg.* 16% *Nat.* 81% *Glob.* 3%
Number of patents	0	0	0	0	0	0

The history of this firm starts in the 1970s when its founders were working for an Italian company in Florence which proposed an innovative numerical control at the European and maybe world level. For its high-technology content, during the 1980s, the firm was acquired by Siemens who, for various reasons, after a while, lost its interest in that company leaving it alone and with a rather old product. The technical director of the firm – the key informant for this research – who had already become involved in its commercial activities, decided, instead of reconverting the firm, to create a new company. Together with other three colleagues, in 1994, he founded company 2 in order to exploit the experience and capabilities developed in their previous working activity. At present he is the president of the company.

Figure 4.3 – Company 2: some data

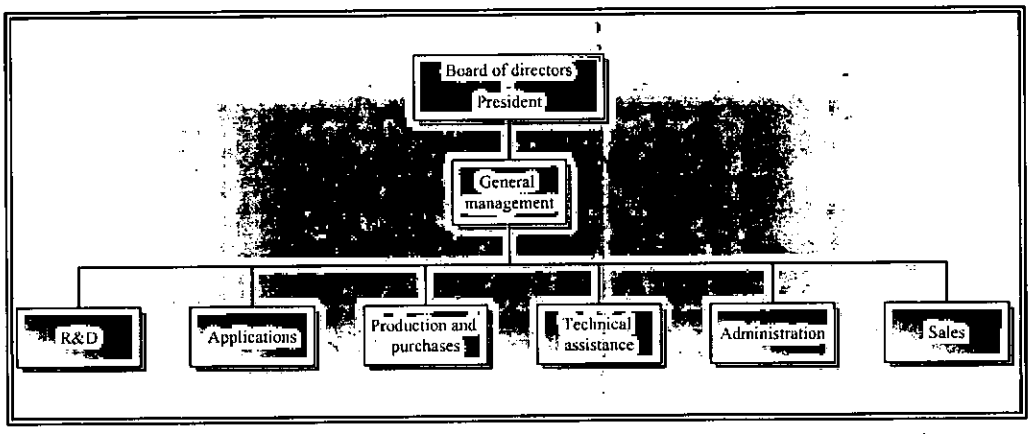


Although the founders had a technical background, the original strategy was based on a market idea and intuition. At that time, in the market there were, on the one side, big firms able to produce high-performing but rather rigid devices and, on the other, a large number of small firms with flexible products. This flexibility was mainly reached through the speed of their designing process to the detriment, however, of costs and quality of results. Company 2 identified a space between these two extremes which could be filled by an offer that was more *flexible* than that proposed by larger firms, but also with higher *quality* levels than that provided by small firms. In designing its products, therefore, company 2 had three main objectives in mind: reliability, low costs and flexibility. The main idea to meet these objectives was to create a universal platform that could be adapted to the specific characteristics of clients: in this way radical changes were not needed to obtain variations of the product, thus reducing both costs and the risk of critical mistakes, while ensuring flexibility.

Besides the fact that the product was able to fill a vacuum from the offer point of view, it was also something that the market, in that period, needed. Between the '70s and '80s, in fact, competition from East Asia was steadily intensifying and companies understood that, to be competitive, increasing productivity was only one way to face the problem. Flexibility was the imperative and to be reached it was necessary to improve machine tools by adding not simply mechanical devices, but "intelligence", that is software. If some producers of machines had resources enough do develop automation systems inside, other had not and company 2 addressed the needs of the latter.

Today 17/18 people work in the company: roughly 50% of them are devoted to design activities and the others assemble and test products. The production of the various components is outsourced to other companies. Figure 4.4 overleaf shows the organisation chart of company 2. As a result of the way in which the company was created, the areas related to technical aspects are efficiently developed because attention and resources were firstly devoted to the product to be realised. Administrative and sales activities, on the other hand, are underdeveloped and source of rigidities. As regards the administrative part, most of the work is performed by external accountants and this is a choice the company still wants to keep for a while. The necessity to evolve sales into marketing activities, as will be better explained later, is, on the contrary, a need that the company feels as a priority in this moment.

Figure 4.4 – Organisation chart of company 2



ACTIVITIES AND PRODUCTS

Company 2 started by providing systems that clients had to further develop. Later on, besides being a sort of R&D laboratory, it created a design department that vertically develops complete solutions according to the specific requirements of clients.

The activities currently performed by company 2 can be grouped into three categories. First and foremost, it produces Computerised Numerical Controls (CNCs) for builders of machine tools in the following sectors:

- metal milling;
- metal turnery;
- stone and ceramic processing;
- wood and plastics processing;
- thermic shear.

In developing these devices, precision in motion control, speed in data interchange and user-friendliness must be ensured and to reach these objectives it is essential to employ complex processors that are continuously evolving: in this lies the high-technology valence of the company. However, in order to supply a product that is innovative but also reliable, one of the inspiring principles of the company, the technology incorporated in the product has to be advanced but also mature, and company 2's activities are organised in order to find a balance between these two contrasting purposes. In the President's words:

> "Technology should be taken with care (...) You do not need to be the first of the class: it is better to be second but to offer a consolidated product instead of being first and providing a non-mature product."

Second, company 2 provides a series of collateral services linked to the products provided, that is:

- *technical assistance*, via telephone, fax, internet, provided by a team exclusively devoted to client management;
- *internet services*, through which the evolution of products are communicated and software updates can be downloaded by clients;
- *remote support*, a new service through which it is possible to interact via modem with clients' computers and machines in order to verify their conditions, solve eventual problems and upgrade them.

Third, the company also organises training courses on CNC programming and use. These courses are addressed to both clients' personnel, which has to further develop the product to adapt it to their specific needs, and to clients' clients (machine tools users) that simply have to use the final result of the development and production process as a whole.

CLIENTS AND COMPETITORS

Clients of company 2 are Original Equipment Manufacturers (OEMs) or system integrators, that is firms, that incorporate CNCs in the machine tools they produce, and sell them to final users. Roughly 90% of these clients are located in Italy but their final market is often global: therefore company 2 products are actually employed in a global market. The great part of the 10% of foreign clients are located in South America, Argentina.

In characterising these clients, the interviewee observes that very often they are somehow not aware of the potential of the technology they are using. The implications are twofold. On the one hand, the client may not require all the possible features and therefore it is easier for the company to satisfy its requests. On the other hand, the client may be very demanding in terms of functions the technology should perform, but not being completely conscious of the related potential it may misuse the device provided and feel dissatisfied. The role of the company in this case is more complicated because it has "to make the client digest the product" (President's words). Also for this reason the technology

employed, as explained above, is not the at the cutting edge of scientific discovery and the company has chosen to be a transformer and not an inventor of high-technology in order to offer more reliable products.

The competition company 2 has to face is the result of its original strategy described above. On the one hand, there are large companies that are mostly international multinationals; on the other, there are the small flexible firms which are mainly national.

2.2 Marketing: a "new" problem

The creation of company 2 is the result of a marketing vision of founders: they recognised that there was an unfulfilled need in the market and they addressed it with their offer. At present, however, the company is facing a marketing problem. The reason is that it realised that, to improve its activities, it needs to engage in a marketing effort on a continuous and systematic basis.

The activities that are within the domain of marketing, and managed by the President himself, are essentially linked to advertising. A great attention is devoted to the web site and investments have been made to be visible in specialised industry journals. The company also takes part to trade fairs but not autonomously: it joins some of its larger clients. This element characterises the commercialisation activities of the company. Indeed, being linked to large clients and exploiting their word-of-mouth mechanisms have been its most important selling vehicles: quite often the company develops devices that are linked to its clients' products and, therefore, while selling their product, clients secure orders to the company itself. This approach is considered to be sporadic and the aim is to transform it in a systematic method.

The main reason why the company feels the need to improve its marketing activities is because the related limits are considered one of the main impediments to its further development. Indeed, the meaning given to the term marketing is "understanding": understanding the market and its mutations and whether there are new spaces for new products. On this respect, the company intends to move in two directions. On the one hand, there is the impression that the same technologies the company offers could find application in other parallel sectors. On the other, there may be some new spaces in the same sector of industrial automation. The idea in this case is that only a minimum part of

existent machines are provided with CNCs, the remaining part being composed by rather small devices that make automation not convenient. The lack of specialised craftsmen, the always increasing need to certificate and trace the product and the related production process, the importance of flexibility and the imperative to increase productivity also in simpler productions, however, may call, in the next future, for a leap in numerical control technologies in order to make them more compact and convenient. Since these are only impressions and vague ideas, the company believes that a systematic marketing approach could help in understanding the real potential of such projects in order to answer questions like: Which other sectors can be reached by the company's offer? Will be there a large market for new smaller products in the current sector? If the changes occurring in this sector will be larger than expected, is it possible that compacting current technologies will not be necessary because existing bigger devices could be used instead?"

When asked how concretely the company intends to develop its marketing activities, the interviewee identifies two main objectives which reflect related problems. The first is to build the company's own distribution channels. At present, as already pointed out earlier, the company strongly relies on word-of-mouth and exploits the interconnections with its clients' products to reach its customers. For a firm which aims at improving its business, this approach is inadequate and the implementation of a marketing function to foster these growing activities needs to be accompanied and sustained by a well-organised selling structure.

The other aspect refers to the marketing function *strictu sensu* and concerns the human resources dimension. The problem is to find a person wo possesses both the theoretical marketing and managerial competencies and a deep understanding of the technical characteristics of the specific product. Some external consultants have been approached, but finding experts with both these elements it is not simple. In the President's words:

> "... we have not found people who deeply know our sector. I believe that doing marketing for soft drinks, clothes, bags or shoes maybe would not have been easier, but at least it would have been easier to find people who could help us".

An alternative solution the company is now considering is that of hiring a young person with the relevant theoretical competencies in order to gradually grow him/her up with the technical knowledge of the product and the culture of the company. Time is the main

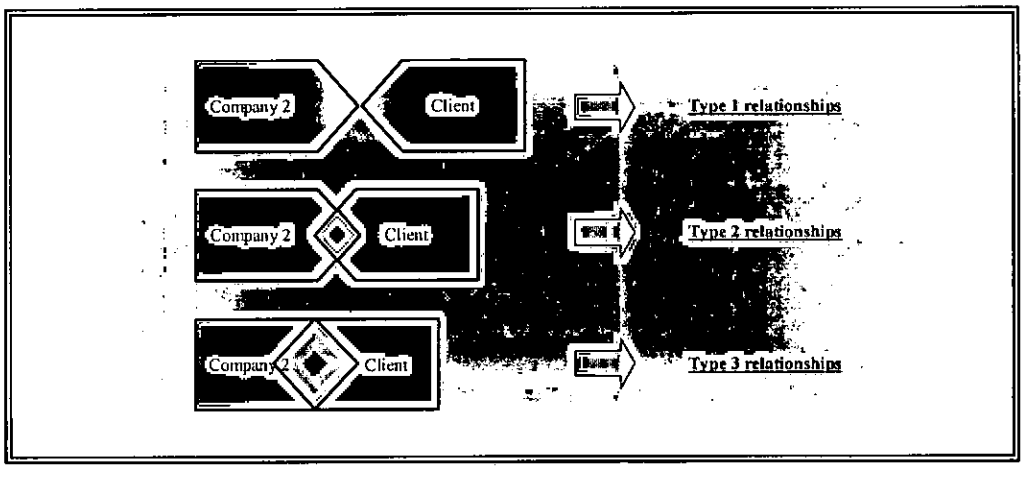
problem in adopting such an approach given the huge investments needed to form this person before having some kind of tangible results.

2.3 The relationships with clients

Company 2 essentially deals with three types of clients. A first category is represented by a client who asks for a complete turn-key solution. In this case the product is rather standardised and completely developed. A second, intermediate category is that composed by firms which look for a personalised device but are not able to fully develop it from the core technology. In this case the company designs the whole solution according to the specifics provided by the clients. A last category consists of those clients which acquire the core technology from the company and further develop it according to their specific requirements.

These different types of interaction between the client and the company have significant consequences on the type of relationship that is established between them as shown in figure 4.5.

Figure 4.5 – Types of relationships



In the first case, the interaction between the company and the client is rather limited since the latter simply acquires a product the company has already fully developed. Those that I label "Type 2 relationships" presuppose a greater level of interchange: the client requires a specific device which it is not able to completely develop itself from the basic technology provided by the company and therefore interacts with it in order to obtain

what needed. The company, therefore, plays the role of designer and technical developer for this client. The last case, "Type 3 relationships" are the deepest one and more relevant to the company. What is provided by the company in this case is a basic technology that the client further develops according to its specificities. The interaction with company 2 are very frequent because this further development occurs, indeed, in team. As the interviewee says "... their development is our development". In a simple but efficient metaphor, the interviewee distinguishes these three forms of relationships as follows: in the last case the company provides the client with the fishing rod and the fishhook; in the second case the client receives the fish it desired from the sea it required; in the first case the fish provided is equal to other fishes offered to other clients.

Even though from each interaction with clients something can be learnt, type 3 relationships are those with far more potential in terms of innovation and new product development. The interchange usually occurs between technicians at the higher level of the hierarchy in both firms (in the case of company 2 is the same President who first approaches the client) and, starting from a rough idea of what the client needs, an interactive development process evolves over time with benefits for both parties.

Formal collaborations and alliances with other companies, these are desired but not yet realised. There are some technical agreements with some large firms: these are not marketing or sales agreements but consist in the fact that company 2 develops some technologies and devices that are compatible with those of these large firms, which, more or less indirectly, end up finding clients for company 2.

2.4 Locational and policy dimensions

This discourse on collaborations with other firms leads us to another issue, that of the locational choice and, consequently, to the policy dimension. Notwithstanding the presence in the area of Pisa of a large number of firms operating in the various fields of high-technology, company 2 has not developed any form of collaboration with any of them. Indeed, this sort of high-technology cluster often cited by policy-makers not only is not perceived by the firm but it has not even represented the reason for locating there the company.

The creation of some form of synergies with local firms is something company is somehow looking for, but the main obstacle is seen in the lack of an institution, *latu sensu*, able to join together these small firms and to concretely address their activities and initiatives in order to transform this agglomeration in a "real" cluster. What is missing, in the President opinion, is therefore a representative and reliable "father" able to join these disperse children under a common roof and this could be the role the political class could play in this domain.

Some initiatives in this direction already exist. At present company 2 is part of *APICE*, a consortium of some companies operating in the high-technology sectors in the Province of Pisa. It emerges from the experience of TeCNA, the association representing the high-technology firms of the Pisan area sponsored by the CNA (the National Association of Artisans, Small and Medium Enterprises and their Associations). The consortium has the objective of promoting innovation, technological transfer and more generally the development of the associated firms essentially through:

- the creation of relationships, in Italy and abroad, with Public Administrations, Universities, financial institutions and venture capitalists;
- the creation of an observatory on the demand in order to address the activities of firms towards the real needs of the market;
- the constant monitoring of national and international bids;
- the promotion of training initiatives.

It should be noted, however, that the attitude of companies themselves is often an obstacle to the creation of deeper interactions among them. Instead of seeing the advantages of forming a common front in dealing with larger organisations (e.g., governmental institutions, Universities), these small firms seem to be much more concerned with the risk of losing clients or important secret capabilities in favour of competitors. Until this idea of defending one's "small garden" will not be overcome, the possibilities also for public initiatives to create a living cluster are rather limited.

2.5 Summary of key issues

Company 2 designs and produces numerical controls for industrial automation. It is a rather stable company resulting from a marketing idea able to fill a free space in the

market at that time. It is the result of the initiative of four founders with a technical background (both in terms of education and previous working experiences).

At this stage, the company feels it has the potential to grow further but it sees the development of a systematic marketing activity the fundamental way to this aim. The idea behind this desired development is that experts are needed to sense whether there are, on the one hand, new markets for the products the company manufactures or, on the other, new products within the same sector of industrial automation that can be produced. In the first case the question the company poses is whether there are parallel sectors in which numerical control is not used yet and significant benefits could be obtained from its introduction. In the second case, the idea is that there could be space to apply numerical controls in order to automate machine tools that up to now (usually for their limited dimensions or for their specificities) were considered too expensive to automate. Basically, the company would like to act, in a systematic way, as it did at the moment of its formation: sensing the market and filling the related gaps.

The main problem in developing its marketing activities is represented by the difficulty in finding a person who possesses both the managerial and marketing knowledge to perform this function and the technical capabilities about the product to which this function is to be applied.

The importance of creating strong relationships with at least some valuable clients emerges clearly from the interview. The interchanges with these clients are a fundamental source of ideas for new developments of existing products. Moreover, lacking its own distribution structure, large firms (also not client but with which the company has developed some form of technical agreements) become the most important vehicle through which company 2 reaches the market.

The choice of locating the company in the area of Pisa has not been influenced by the presence in the area of other high-technology firms. Indeed, although the company considers the creation of some form of collaboration with local firms as a potential to be exploited, to concretely reach this objective is rather difficult. On the one hand, because it is missing a strong actor able to join together all these various firms in order to concretely direct consistently their actions. On the other, because these firms are often suspicious and mistrustful and tend to jealously defend their activities and clients. The role of the

public actor, from the interviewee's point of view, should be that of representing, in a consistent and reliable manner, this point of reference and reunion for these firms in order to transform this agglomeration into a "real" cluster.

3. Case study 3 – The indirect way to the market

3.1 The firm and its context

HISTORY, STRUCTURE AND DATA

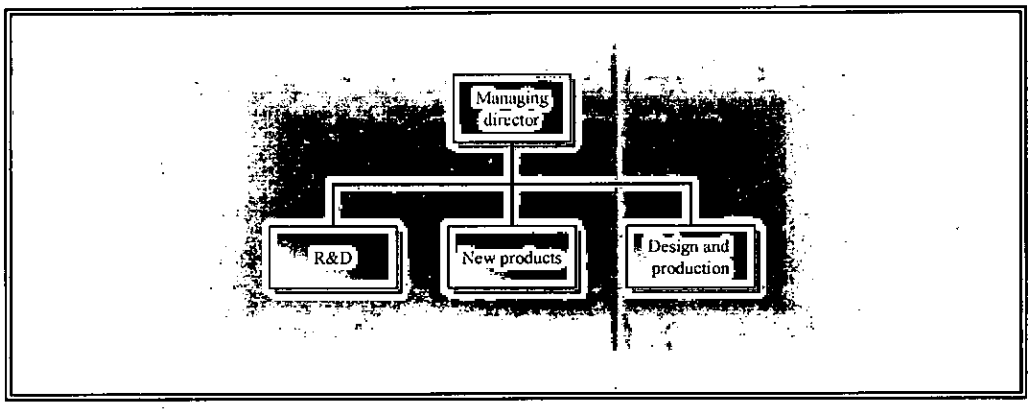
Company 3 develops advanced man-machine interfaces (hardware and software), with applications mainly in the biomedical field, and offers its consulting services as an engineering company in the domains of mechanical engineering and computer sciences. It is a spin-off from the Scuola Superiore Sant'Anna, one of the three University of Pisa, and started its activities in 1996 from the initiative of four researchers (two engineers and two computer scientists) who further developed an idea which had been elaborated in the University laboratories. This was a new type of sensorised glove to be used mainly for telerobotic, virtual reality and medical applications and for which a patent has been granted.

The first step, useful to obtain some initial financial resources, is represented by the project MORIS: funded by the European Union within the ESPRIT IV "Information Technology" programmes, its aim was to develop a two-wheel vehicle simulator to be used during the design, development and preliminary testing of new two-wheel vehicles. Company 3 was involved as a partner by the Scuola Superiore Sant'Anna and its role was that of developing the visualisation software.

Initially, and in theory, the support of the University should have been significant, but at the end the founders found themselves in the situation of managing a company without any managerial knowledge and experience, and this implied a readjustment of the initiative and of the related expectations. For this same reason, although the initial idea was that of being a manufacturing company, a part some experimental systems, not completely engineered, developed for research centres and Universities, the company ended up being essentially a consulting firm in the field of engineering and computer sciences.

The period between 2000 and 2001 represents a turning point in the life of the company. Following some clashes between partners, due to different views on how the company should be managed and should pursue its activities, three of them left the company. As a consequence, company 3 was completely restructured and at the beginning of 2001 it was in the market as a sort of new start-up. The only remaining partner, one of the mechanical engineers, who is the key informant for this case, became the managing director and succeeded in attracting other two partners and a fourth will soon join the company. The director is the only partner that actually works in the company (managing the company, its external relationships and supervising, when necessary, the productive activities), apart from another one, a researcher at the Scuola Superiore Sant'Anna, who, besides working for consolidating the relations with the University, has the role of identifying new promising avenues for future developments in the biomedical field. Other three people work in the company: one senior mechanical engineer with a Ph.D. and a bi-annual experience in the US in the field of robotic who supervises the R&D activities, another young mechanical engineer who, with a computer scientist, have more operational functions in design and production. The organisation chart of company 3 can be therefore represented as in Figure 4.6

Figure 4.6 – Organisation chart of company 3



What described above represents the organisational restructuring of company 3, but the turning point between 2000 and 2001 had an even more important consequence from an operational point of view: the company decided to return to the original project of being a manufacturing and not simply a consulting firm. This is considered by the director as a brave but necessary decision, also because the economic and productive situation of Pisa does not justify a company only devoted to consulting services in the field of engineering

and computer sciences.

Before analysing in greater detail its products and activities, table 4.3 and figure 4.7 overleaf show some quantitative data of company 3.

Table 4.3 – Company 3: some data

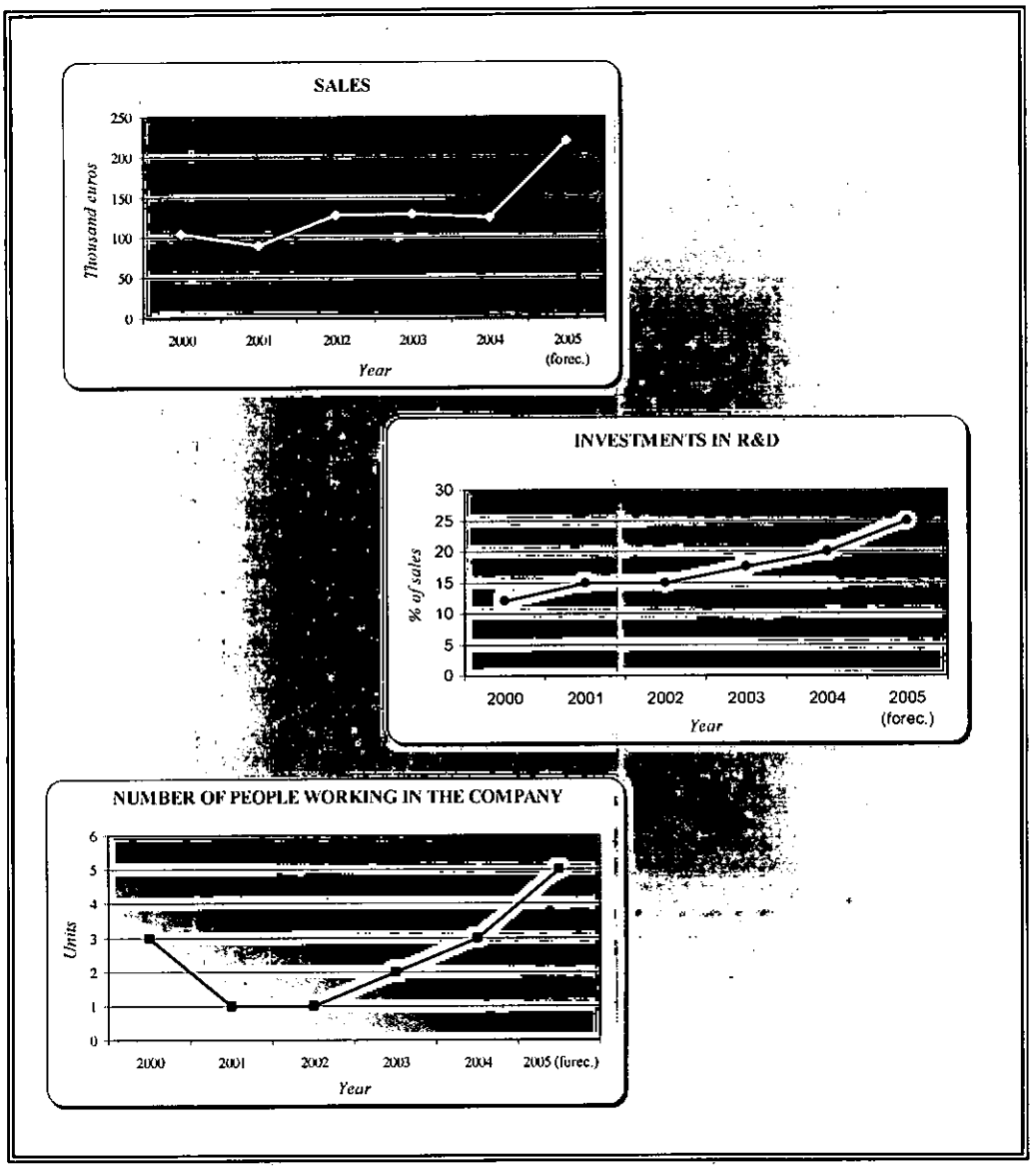
	2000	2001	2002	2003	2004	2005 (Forec.)
Equity capital (thousands €)	10	10	10	10	40	40
Sales (thousands €)	105	90	128	130	125	220
Investments in R&D (% of sales)	12%	15%	15%	17,5%	20%	25%
Marketing expenditures (% of sales)	0%	0%	2%	4%	5%	6%
Number of partners	3	3	3	3	2	4
Number of people working in the company	3	1	1	2	3	5
Geographical distribution of sales (% of sales for each market)	*Reg.* % *Nat.* % *Glob.* %	*Reg.* % *Nat.* % *Glob.* %	*Reg.* % *Nat.* % *Glob.* %	*Reg.* % *Nat.* % *Glob.* %	*Reg.* % *Nat.* % *Glob.* %	*Reg.* % *Nat.* % *Glob.* %
Number of patents	*Italy* 1 *EU* 0 *US* 0	*Italy* 1 *EU* 0 *US* 0	*Italy* 1 *EU* 0 *US* 0	*Italy* 1 *EU* 0 *US* 0	*Italy* 1 *EU* 1 *US* 1	*Italy* 2 *EU* 1 *US* 1

PRODUCTS AND ACTIVITIES

Up to the beginning of 2001, company 3 was in the market mainly as a consulting company able to sustain client firms in all the development phases, from the first conceptualisation of an idea to the final product. These consulting services consist in:

- technical drawings;
- virtual prototyping;
- structural, cinematic and dynamic analysis;
- project design with an approach cantered on the user;
- engineering, accompanying the client through the phases of ideation, prototyping, testing, pre-series production, certification.

Figure 4.7 – Company 3: some data



At present the company still performs such consulting activities, also as a source of financial resources, but, as pointed out earlier, it is now becoming a manufacturing company. Since its establishment the company has manufactured different prototypes devoted, mainly, to the biomedical sector. The complexity of these products, that is, their high-technology content, is related to their *interdisciplinarity*, that is the presence of mechanical, electronic and software parts: they are small devices which allow, with their mechanical and electronic components, the collection and registration of a rich series of data, and the complex control is facilitated by simpler virtual interfaces.

The first of these devices was the sensorised glove already cited. Another one is able to monitor, in real time, the main physiological angles of the knee during the walk and the other normal activities. It can be mounted on both the lower limbs and, with simple changes, to supply dynamic information about the elbow's articulation. Company 3 has also designed a sensorised suit for motion capture activities in order to give, in real time, all the information relating to the position and performances of the user's joints articulations. This feature is obtained by means of a kit of position sensors, patented by the company, applied in specific zones of the device.

The product which represents the real starting point of company 3's manufacturing activities, however, is a mechatronic system for capturing in real time the positioning of a point in space. Its main application is in the field of rehabilitation of the kinetic chains of the upper limb. The role of the company in the entire production process is to design the device and to assemble the components that are produced by micro-mechanical firms operating in the Pisan area.

CLIENTS AND COMPETITORS

Concerning the consulting part of its activity, the market of company 3 is essentially local and is composed by various firms needing support in the fields of mechanical engineering and computer sciences. The main category of clients for the manufacturing activities is represented by hospitals and private clinics. It is worth noting that the technology *per se*, the so called *general path*, could have other applications if incorporated in other devices. The biomedical sector, however, seems the one where these technologies are, at present, more relevant and the operators more receptive. As will be better explained in the following section, the production of the device is in its final stages and the market will be initially national.

As regards competitors, the company has conducted a limited market research and it seems that this product would be the first of this kind to enter the market and not only in Italy. The managing director, however, admits that there is the risk that, at the moment of the actual launch, other similar devices, for example from the USA, could be in the market. It is a fact, nonetheless, that this is a niche sector which unlikely would interest large international groups in the biomedical field.

3.2 Marketing: the indirect way

Given the recent reorganisation, it is maybe not too surprising that the marketing function is not formally organised in the company. It is the managing director that supervises the external relationships of the company and, for the part related to the collocation of the product in the market, the company has chosen a sort of indirect way.

When company 3 decided to become (also) a manufacturing firm, it presented the prototype of its product to various potential partners. One of them, headquartered in Florence, showed interest in this idea and the two firms reached an agreement. This commercial partner is present in the market also as a producer and contributes to the manufacturing of the product providing the electronic part. One of the most important advantages of this agreement is the fact that this larger partner has already developed a distribution structure which company 3 can exploit. Moreover, the specifics of the device could only come from the final users of it, that is medical doctors or hospital operators: company 3 had the opportunity to also exploit the already existing relationships of its partner with a large number of such actors with a significant reduction in time and costs.

Notwithstanding the fact that the partner is larger and it has been operating in the market for a longer time, the agreement is rather balanced at least in some respects: for example the product will reach the market with the logo of both companies on it. This was a condition strongly wanted by the managing director of company 3 in order to maintain the individuality of the firm and to make it known in the market. Indeed, although the relationship with this commercial partner is satisfactory and the company is also looking for other partners for other of its products, the aim is to build its own distribution network and enter the market on its own.

Internally, the commercial part is basically completely absent, and the reasons are essentially two. On the one hand, there is a lack of financial resources which would allow the company to exploit external professional consultants. On the other, there is the difficulty in finding a person to be eventually hired with the necessary managerial, marketing and technical competencies. Moreover, the products to be sold are rather specific and also the final market (the medical sector) has its peculiarities. Combining all these competencies is not easy and, at best, requires time. At present, time and resources are lacking in the company. The interviewee, however, would like to develop inside,

maybe in 2/3 years, such marketing capability together with a distribution and commercial structure, two aspects of the same activity.

At present, the activities which are part of the marketing strategy of company 3 are the participation to trade exhibitions and the presence on the internet. For the specific product which is part of the agreement described above, the commercial partner has acquired some advertising space in specialised journals, but company 3 does not have any possibility to exert influence on this decision.

Marketing plays two important roles for the company, the interviewee says. One is that to gain visibility, trying to push clients to go over the simple interest often shown for the "strange" and "curious" devices the company offers. The other is to communicate to the final users what these devices are, what they can perform and also what their limits are. This problem of communication seems to be especially severe in this case because of the difficulty in interacting with doctors who see the same problem from a different perspective and who often speak a "different language".

On some respect choosing what I termed the indirect way to the market may represent, in the future, a sort of advantageous shortcut for company 3.

3.3. The relationships with clients

When speaking of the relationships the company entertains with its clients it is important to distinguish between its two main areas of activities.

As regards the consulting activity, interactions are rather simple in the sense that the client usually has a clear idea of the service needed and the company merely acquires the related specifics behaving consequently. There may be adjustments along the way that require the two parties to meet and interact more than once, but the interchange is usually at a rather basic level. This often happens when the client does not simply give the specifics but pretends to have a strong role in the interchange, behaving like a technicians by virtue of its experience in the field. In this case the company has limited degrees of freedom and there are few possibilities of growth for both parties. It is also possible, however, that the client is more permeable and, starting from the solution of a problem or the provision of a service, the company is able to establish longer and deeper

relationships with that client. In any case, the flow of service and knowledge is one-way, in the sense that it is company 3 that somehow transfers its capabilities to the client.

The situation changes when the manufacturing activity is considered. As already noted, the major source of complexity of the devices designed and produced by company 3 is their *interdisciplinarity*, that is the need to combine knowledge from the different fields of mechanics, electronics and computer sciences at minimum. Since it is rather difficult for a single company to master all these disciplines, or, at least, to master them in an efficient way, it is much more common that the relationship with the client is more interactive and that the interchange is bi-directional. More precisely, in the case of company 3, this type of relationship is not established with the client, intended as the end user of its product, but with the commercial partner who represents its connection with the market. And indeed this is an example of a marketing alliance which, however, implies or is part of a larger productive collaboration. To manufacture a device able to adequately perform the functions for which it is produced, especially in the biomedical field, it is necessary to have continuous interactions with final users and to be sure that the medical knowledge they possess is "transformed" into technical language, specifics and components, and *vice versa*. This process, in the case of company 3, occurs through the mediation of a commercial partner.

Therefore, while recognising the value of building relationships with clients, company 3 is in a phase where its main focus is still in the technology aspects of its activity and relies on the mediation of a third party to establish and benefit from these relationships.

3.4 Locational and policy dimensions

Company 3 is located in the centre of Pisa, in a ancient building facing the Arno River. Pisa represented somehow the natural locational choice when the company was established since three out of the four original founders were from Pisa and there all of them studied and worked in the University laboratories for a while. The choice of the centre of the city is related to the fact of being primarily a consulting company: a nice surrounding, a fascinating building rather close to the train station for those coming from out of town seemed the right choice for the type of activities performed.
At present, with the reorganisation of the company and the introduction of a manufacturing activity this choice may need to be revised. The managing director

recognises that the company needs more space to perform the assembling and testing functions related to the products they intend to manufacture. For the very first stages there is a room in the present location where these activities may still be performed and a collaborator has a little laboratory that the company can use when these tasks will increase. But these are short term solutions and a more radical decision should be taken. The presence of many technological poles is advantageous and attractive: the possibility to have many small firms operating in close or related sectors can be an opportunity to build with them collaborations which, at present, are rather limited. A possible solution could be that of acquiring (or renting) a space in these places while keeping the actual location only for the consulting activity.

Therefore, if the presence of many other technological firms has not represented the first reason for locating in the Pisan area, the company recognises the potentials associated with this agglomeration and hopes that, in developing its manufacturing activities, it will benefit from this situation. Moreover, it should be remembered that company 3, as a spin-off company from the Scuola Superiore Sant'Anna, maintains significant relationships with that University.

As regards the political dimension, being a company that has recently gone through a profound restructuring, the first imperative is that of finding resources to finance its activities. This problem is becoming even more severe given the competition coming from countries with lower labour costs that strongly compete on prices. The alternative could be to work *with* companies operating in these countries, outsourcing parts of the activities, but there are many difficulties in interacting with them and in obtaining products or components with the required characteristics and quality levels. Facilitating the access to resources is, in the opinion of the interviewed managing director, one of the main initiatives that the public actor can promote in favour of small company like company 3.

3.5 Summary of key issues

Company 3 is a spin-off company from the Scuola Superiore Sant'Anna in Pisa that operates in the field of mechatronics, robotics and virtual reality. Since its establishment, it operates as an engineering consulting company in the domains of mechanical engineering and computer sciences. From 2001, after a complete restructuring, it is

becoming a manufacturing company which develops advanced man-machine interfaces (hardware and software), with applications mainly in the biomedical field.

Given the recent changes in its structure, the marketing function is completely absent and the company has established an agreement with a commercial partner to reach the final market. This indirect way to the market has many advantages for company 3. First of all, it can rely on the distribution channels already developed by its larger partner. Second, the company can exploit the net of interconnections that its partner has with final users (essential medical doctors) in order to adapt the devices to their specific needs thus keeping in touch with the market. Interacting with this category of clients, moreover, is not easy and requires the ability to somehow transform its medical knowledge into a technical language and *vice versa*. Training or hiring people with such capabilities would require a lot of time and resources. Third, given the fact that the product will reach the market with both its logo and that of the commercial partner, company 3 will have the advantage of gaining visibility in the market. This is considered to be fundamental for the future of the company, which would like, hopefully in the next 3/4 years, to go to the market alone.

As regards the relationships with clients, the two main areas of activity of the company should be distinguished. Concerning the consulting services, the interactions tend to be at a relatively basic level and there is little interchange: the opportunities to grow associated to exchanges of knowledge and capabilities are rather limited for both parties. When considering the manufacturing activity, the company recognises the importance of a constant interaction with both the final user, in order to understand what is needed, and with other companies, in order to combine the different capabilities needed to produce such complex devices which a single company, especially if small, cannot master alone. At present all these interactions are mediated by the commercial partner company 3 has chosen to collocate its first product in the market.

Even though the locational choice has been somehow natural for company 3 given that three out of four of the original partners were from Pisa, that they all studied in Pisa and some of them worked in the University laboratories for a while, it is recognised that the presence of other high-technology firms in the area is an advantage especially for its consulting activity. For the next future, when the manufacturing activity will be further developed, the interviewee hopes to benefit even more from this situation.

Finally, as a small company that has undergone a period of restructuring, the first and foremost request to the policy-maker is an easier access to resources to finance growth activities especially in the light of the tough competition from countries which, taking advantage of lower labour costs, can strongly compete on prices.

4. Case study 4 – The right approach to the "wrong" target

4.1 The firm and its context

STRUCTURE, ACTIVITIES AND DATA

Company 4 started its activities at the end of 2002 and is the result of the initiative of two former University colleagues that, after some other work experiences, decided to join together and create this firm with two subsidiaries: one in Pisa and one in Perugia. The core business of the company is in the realm of domotic, a term that may need some explanations.

Domotic is the science that studies the automation of every-day objects with the aim of improving comfort and safety, optimising costs, simplifying the use of the various devices in houses, offices and yachts while emphasizing the aesthetic side and creating emotions. *Personalisation* is the key word when designing such solutions: as it is possible to read in the web site of company 4: "If domotic was a suit, we would surely be their tailors". To give an idea of what domotic is all about, table 4.4 overleaf offers some examples.

In the field of domotic, company 4 designs automation systems highly innovative and extremely personalised: they are not realised *for* the client but *on* the client. This objective is achieved through the use of reliable and user-friendly technologies: touch screens, remote controls via mobile phones and Personal Computers are some of the interfaces which allow a centralised control of the various subsystems of houses, offices, etc. On this respect the firm can be considered a system integrator of technologies that it rigorously selects, and it is also able to develop on them in order to reach a greater level of personalisation or to expand the available functionalities.

Table 4.4 – Domotic solutions: some examples

Functions	Examples
Lighting	Remote control of internal and/or external lights. Variation of light intensity. The control can occur also for groups of lights.
Audio Multi Room	It is possible to listen to music in different rooms of the house and with different volume intensity keeping a single audio source.
Home Theatre	With integrated and user-friendly remote controls it is possible to coordinate all the audio/video devices to create the preferred atmosphere for the show to be watched.
Automatic openings	Pushing a single button, doors, windows, blinds and all other accesses can be controlled, singularly or in groups, also following different scenarios: e.g., windows are closed when it starts raining.
Air conditioning	Temperature and dampness can be differently regulated in different zones of the house. It is possible to activate air conditioning at distance, before going back home. This also allows an optimal management of electric power expenditures.
Burglar alarms	This kind of alarm is integrated in the domotic system and is therefore activated, for example, with the same button that switches off lights and closes windows when leaving home.
Video cameras	Visible or non-visible, they can be watched from normal televisions, Personal Computers or from other devices away from home. They can send an e-mail when they register something strange.
Technical alarms	Emergencies due to gas leakages, fires, floods or other similar problems can immediately be detected and often automatically solved. The system can send an SMS to the cellular phone to warn about any of these problems.
Irrigation	Different timers can be applied to the system and the irrigation can be programmed differently depending on some external conditions: e.g., amount of rain fallen.
Access control	It is possible to limit the access to some zones and to be informed on who and when tries to access. Only authorised people can access these areas.
Remote control	All the previous functions can be controlled and modified through different devices such as mobile phones and Personal Computers.

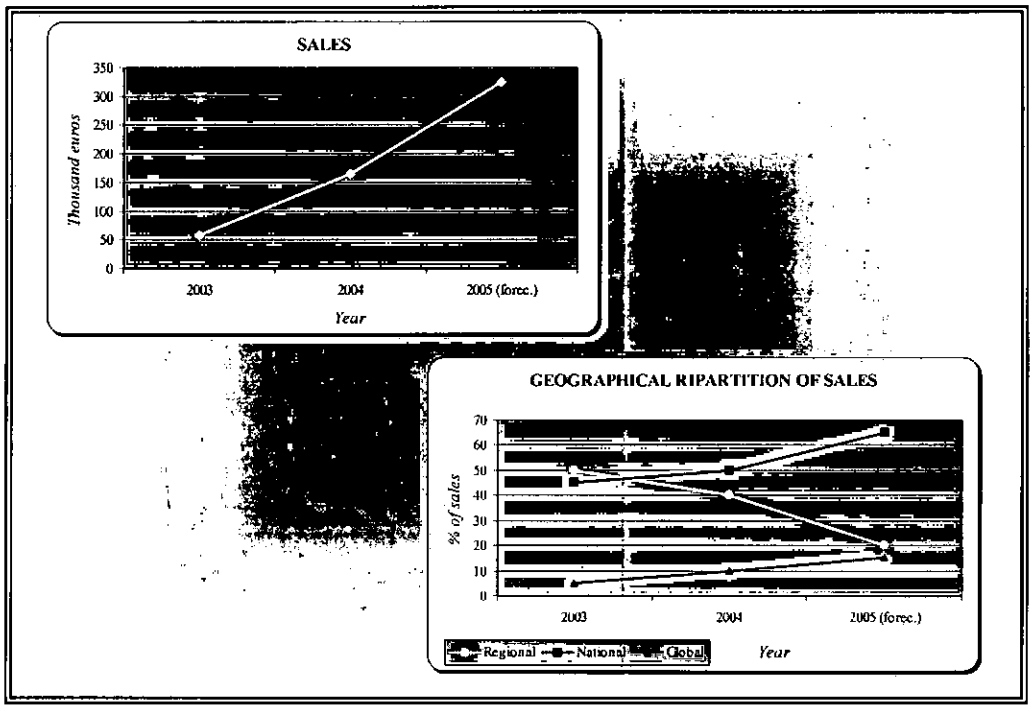
The field of domotic is relatively new and, at present, there is excess of offer and the process of expansion of the market seems to proceed slower than the founders of the company expected. For this reason, they diversified the activities of the firm in two directions. First, the company completely designs and produces TV lifts for plasma televisions. This object has the function of hiding, while also protecting, this kind of televisions, lifting them up when needed. The product was created having mainly the market of yachts in mind: the function was, therefore, primarily protective, because the device has the capacity to limit or to avoid damages due to vibrations during navigation. At present the second function of this TV Lift, that of hiding the television, is becoming more important. This is associated to a sort of new trend: if some years ago having a plasma TV was considered something to be boasted, now it is something that should not to be visible in a house.

A second and more recent direction of diversification is the development of Home Theatre systems or high fidelity audio structures, that is, the design of exclusive audio systems not integrated with automation structures. It is worth noting, furthermore, that, when not available in the market, the company has the capability to develop those hardware or software solutions needed to allow different pieces of the whole system to work together. Table 4.5 and Figure 4.8 present some basic data of company 4.

Table 4.5 – Company 4: some data

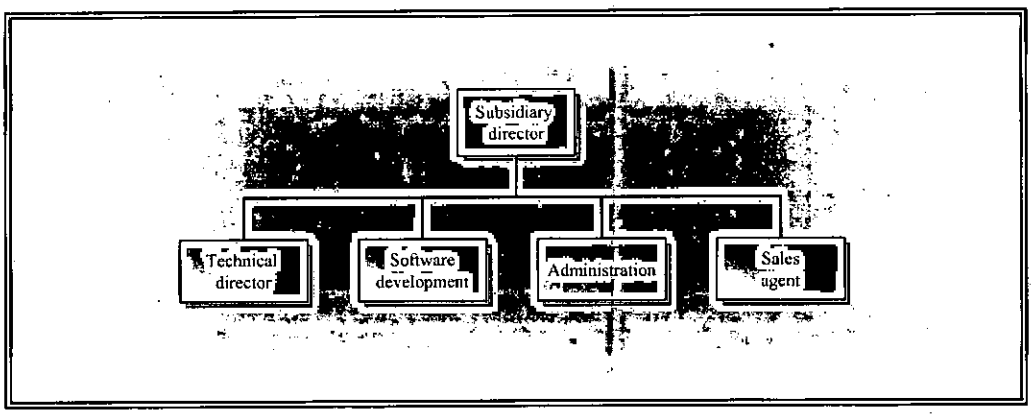
	2003	2004	2005 (Forec.)
Equity capital (thousands €)	10	10	10
Sales (thousands €)	58,309	165,091	325
Investments in R&D (% of sales)	5%	5%	5%
Marketing expenditures (% of sales)	10%	8%	6%
Number of partners	5	5	5
Number of people working in the company	3	4	4
Geographical distribution of sales (% of sales for each market)	*Regional* 50% *National* 45% *Global* 5%	*Regional* 40% *National* 50% *Global* 10%	*Regional* 20% *National* 65% *Global* 15%
Number of patents	0	0	0

Figure 4.8 – Company 4: some data



At present 9 people are working in the company, which are distributed among the two subsidiaries in Pisa and Perugia. Taking that of Pisa as an example, the organisation chart of company 4 can be represented as in figure 4.9 (the structure of the subsidiary located in Perugia is identical).

Figure 4.9 – Organisation chart of company 4



CLIENTS AND COMPETITORS

The domotic solutions and the Home Theatre systems have mainly a national market, while the TV Lift for plasma televisions is also distributed abroad. The company serves around 10/15 clients per year and they are final clients: individuals who decide to equip their houses with the domotic devices described above.

The typical client of company 4 is what has been defined in chapter 1 a "technology enthusiast", that is a person who is extremely fascinated by the last technology developments and is eager to adopt the most recent devices available. They are usually rather young and rich: quite often they are people who are building their second house or are acquiring a yacht and have the economic possibility to incorporate these technologies in their projects. Indeed, the offer of company 4 is appropriate for independent houses which are still to be built and, apart from some simpler devices, not for apartments or houses already built,.

Here is the strange situation described by the interviewee, the director of the Pisan subsidiary. The target client of the company when it started its activities was an older person compared to the actual client, who was not very keen in using technologies and who was somehow overwhelmed by the continuous evolution of the devices he/she had to deal with in everyday life. The aim, therefore, was to simplify the life of these people by

creating simple systems, easy to understand and use, in order to enable them to completely benefit from the opportunities and advantages offered by technology.

The reason for this situation may be linked to the newness of domotic solutions and, in fact, the market is still characterised by excess of offer over demand. As a consequence, competition is rather confused because it is still not clear who does what and is also very difficult to evaluate the quality of the offer of different companies. Indeed, the fact that it is not always possible to distinguish between firms devoted to the medium-to-low and medium-to-high segments of the market creates problems for the entire sector. Moreover, the limited dimension of the final market implies that very few if any firms have the possibility to operate only in the field of domotic: often they decide to diversify their activities with the risk of making still more difficult for a potential client to identify the right supplier.

4.2 Marketing: the right approach for the "wrong" target

As many small firms in the high-technology sector, also company 4 considers marketing as its less developed function. It is possible to identify two main areas of problems. The first concerns visibility and is related not only to the company itself, but to the sector as a whole. As already pointed out earlier, the sector is characterised by excess of offer and the market has little knowledge of the possibilities offered by companies operating in the realm of domotic. Before making the company visible, therefore, the imperative is to somehow inform the market about what domotic is and that it can be a solution to many needs. As the interviewee says:

> "... a need that we very often say it is hided. We are convinced that each client today, each person potentially today has a need which we would be able to solve."

In this sense the director says that the most important aim for the marketing activity of the company is not to *convince* the client, but to *identify* him/her. The problem is that resources are scarce and the means that could reach more effectively the greater number of individuals (essentially, television and media in general) are the more expensive and at present the expenditures required are not justified by the returns created by such form of advertising. This is what has happened abroad where larger firms than company 4 have

invested significant resources in such forms of advertising and they have not obtained a return for what it had been spent. It is a sort of vicious circle: more investments are needed in order to inform potential clients on the advantages of domotic solutions, but these investments are not justified by the limited actual target market.

The other problem is somehow linked to the first one. These kind of solutions are not, as a rule, part of our daily life. To give an example, the television is part of our life, we have been seeing advertising on televisions for years, we are able to somehow compare different offers and there are people, friends, we can confront our opinion with. This situation does not apply to domotic, where seldom, if ever, we have friends who have already matured an experience in such devices to be able to give advice on products or suppliers. Finding information is also complicated by the confusion that, as mentioned earlier, characterises the sector.

As a result, the instruments concretely used to perform marketing activities, besides the participation to trade fairs, are essentially two. The first and most important, also in terms of returns, is the internet and this reflects what said about the characteristic of the actual client of the company. Since, contrarily to what initially imagined and expected, the client is mainly young and technologically educated, the company has to strongly invest in the communication instrument that more easily today reaches this segment of the market: the internet.

The second marketing strategy is based on contacting architects and those responsible for the electric system of a building in order to show the multifaceted potentials of the domotic solutions the company is able to offer. The idea is that, as these people are interacting with the potential customers of the company, i.e., people who are planning to build a new house, they can present the company's products to their clients behaving as a sort of broker.

Therefore, the marketing activities are extremely focused and the company does not use "dispersive" instruments (e.g., mailing lists) to reach clients: the idea is to link each form of communication, as much as possible, to the presence of a person. This in order to build *trust* which becomes the key element which characterises the entire relationship between the company and the client. In evaluating the marketing effort of the company, therefore, the director complains more in terms of quantity than in terms of approach: more

architects and engineers should be contacted, more trade fairs should be attended, etc. Having more resources may help the company to adopt a different approach too (e.g., hiring a marketing specialist or engage in large scale advertising in mass media), but at present this is not possible and, moreover, the dimension of the actual market points to a slower but more professional development of the company.

4.3 The relationships with clients

The fact that clients of company 4 are typically final users, slightly changes the perspective from which the relationships it builds with them should be considered. It is interesting to consider the concepts presented in chapter 2, about the characteristics and implications of business-to-business situations and the relevance of developing a relationship marketing approach, in order to see to what extent they apply to this business-to consumer context. This is what has been done in Table 4.6.

Table 4.6 – Industrial and relationship marketing in a business-to-consumer context

Industrial and relationship marketing ...	... in a business-to-consumer context
In an industrial context the interaction is between complex entities and multiple actors are involved in the decision making process which can become rather complex	**NO** and **YES** – in this business to consumer situation the complexity is only on the company side, but the decision process may be rather complex and involve more people (e.g., family)
In an industrial context the client is buying not simply a product but the company as a whole	**YES** – the lack of knowledge of the client is replaced by a high level of trust on the firm
In an industrial context, the homogeneity of customers can hardly be assumed and from a relationship marketing perspective, clients should be treated as individuals	**YES** – the high level of personalisation of the solution provided to a given client limits or impedes any form of standardisation
In an industrial context, it is possible and common that the client is involved in the design and production process of the supplier and, from a relationship marketing point of view, quite often clients are the main source of new ideas	**YES** and **NO** – the level of participation of the client is obviously very high in order for the firm to provide what the client exactly wants, but his/her lack of knowledge in the domotic field makes it rather unlikely that new ideas come from him/her
At the basis of a relationship marketing approach are the assumptions that acquiring a new client is more expensive than maintaining an existing one and that the profitability of a relationship increases with time	**NO** – it is rather unlikely that the client collaborates with the company for more projects[3] and the process of acquiring new one is constant

[3] To be precise, it should be specified that it is possible that a client asks more than once the products and services provided by the company. The most likely case is that of a client who has applied company 4's systems in building his/her house and decides to apply them to another house or to his/her yacht. But these are rather uncommon cases.

What can be concluded from the table above is that a certain level of interaction between the company and its clients is needed in order to understand what is to be provided. These interactions, however, can be considered one-shot and do not and cannot evolve into long-term relationships, as those described in chapter 2, where there is a bi-lateral exchange of knowledge and capabilities between entities that in this way learn from each other and grow. What the company acquires in dealing with its clients is mainly *experience* that can be exploited in other projects with other clients.

The discourse changes slightly if we consider the relationships that the company develops with architects, engineers, electricians and all those people that more directly interact with the potential client of the company. As already explained above, indeed, one of the pillars of the marketing strategy of company 4 is to promote, or, better, to communicate the solutions offered to these categories that can therefore behave as brokers for the company. In this case these contacts may evolve into long-term relationships and can become an interchange of ideas and capabilities from which both parties can benefit.

4.4 Locational and policy dimensions

The location of one of the subsidiaries in Pisa has been the result of different factors. One and maybe the most obvious is that the two initiators of this project had attended the University in Pisa. After some experience in other places, they were looking for a place where to live and not only for a place where to work. From this point of view Pisa had advantages both from a personal point of view (a nice place to live) and for professional reasons: in the Pisan area there were strong competitors in the domotic field, although with different specialisations, and this was considered a stimulating challenge for the company; Pisa was also close to cities like Viareggio where there is a rather developed marine sector for the production of yachts that, at the beginning, had been conceived as an important market for the company 4' systems (even though at present this is not the case); Pisa hosts three important Universities which provide not only an educated workforce but also opportunities for collaborations and cultural exchanges.

When asked whether the presence of other high-technology companies represented a reason for locating the company in Pisa, the interviewee answers that they do not feel part of a cluster and the interactions with other firms in the neighbourhood are limited if not completely absent.

From a policy point of view, what is mainly asked are resources to foster growth or to make more visible and accessible the already existing opportunities to gain funds.
Other public initiatives considered important are the stimulation of aggregation of companies with different specialisations and operating in not-overlapping fields but with similar needs, in order to promote cross-fertilisation and opportunities to exchange experiences.

4.5 Summary of key issues

Company 4 is a growing small company in the rather new field of domotic, a science dealing with the automation of objects of our every-day life. Given the newness of these devices and the limited present market, the company also develops Home Theatre systems and produces TV lifts for plasma TV.

The most interesting aspect of the marketing activities of the company is the fact that it has developed the right approach for the "wrong" target. The aim of the company, indeed, was to facilitate the approach to technologies of middle-age, technology-resistant, rather rich people. As a matter of fact, the actual market for its solutions is composed by young technology enthusiasts that are keen in adopting each last released device. Being aware of this situation and that there is a generalised lack of knowledge about domotic solutions, the marketing approach of company 4 is organised around two main pillars:

- strong investments in communication via the internet;
- continuous contacts with architects, engineers, electricians and all those people that are in direct contact with the potential clients of the company.

In evaluating their marketing effort, the interviewee recognises that there is a sort of vicious circle: more resources would be needed especially to make domotic, before than the company, more visible, but spending these resources is not justified at the moment given the limited dimension of the actual market.

As regards the relationships with clients, the fact that the company deals with final customers makes it almost impossible to develop those relationships which could evolve into co-development and bi-lateral exchanges of knowledge and capabilities which are the basis of a relationship marketing approach as described in chapter 2. The interactions are almost one-shot (even though they can last also 4/5 years), but what the company

acquires is *experience* which can be spent in other projects with other clients. Deeper and long-term relationships are, on the other hand, developed with architects, engineers and the like that behave as a sort of broker for the company and where a more significant exchange exists.

As regards the locational choice, personal reasons coexist with other factors like the presence of strong competitors, the proximity to the marine sector of Viareggio and the presence of Universities. The company, however, do not feel part of a cluster and do not draw any benefit from being located nearby many other small high-technology firms.

Finally, what is required to policy-makers is an easier and larger access to resources to finance growth and the promotion of moments where firms can confront each other on common themes.

5. Case study 5 – Marketing: the unnecessary function

5.1 The firm and its context

HISTORY AND STRUCTURE

The history of company 5 is mainly that of its founder, the actual CEO and the key informant for this case. When the electronic company for which he was working closed down and he could not find a new job, the only choice, besides that of emigrating abroad, was that of creating his own company. It was 1993 when he established an engineering company providing customised projects for the electronic firms in the local area and sometimes also for the CNR (National Research Council). There were, however, strong fluctuations in this type of work and the objective was to abandon such activity and to provide a defined identity to the company through the creation of a specific product. Various attempts were made, but these products were all commercial failures. The inspiration for the right product came from a friend, an amateur astronomer, who asked the founder of company 5 to produce for him a digital cooled camera. Roughly 50 units of this first model were sold and this was the initial step of the very first Italian company that designs, produces and markets its own line of professional cooled CCD[4] cameras, customized devices, software and digital image systems.

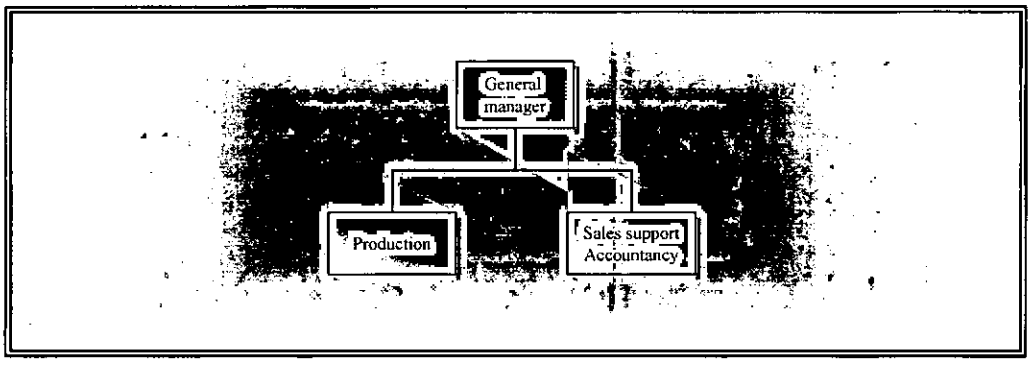
[4] CCD stands for "Charge-Coupled Device" and refers to an instrument whose semiconductors are connected so that the output of one serves as the input of the next.

The firm was very small and a fundamental role was played by its founder. In 2002 some people became interested in this small firm and there was an attempt to transform it into a large company. As a first step, the individual firm became an S.r.l. (Limited Liability Company) with a large Board of Directors composed by 12 people among which lawyers, bankers and people coming from previous experiences in very important companies who were considered, therefore, somehow experts in the managing function. The projects were pretty ambitious: one of the objectives was also to quote the company in the stock exchange.

The result of this attempt, however, was not satisfying: too much money, in the opinion of the founder, was spent for activities that did not have any significant return and too many words were not translated into concrete facts. Above all, the main mistake had been to treat a small firm as it was a large one. Basically, these people had the competencies needed but did not adopted the right approach to the type of company they were dealing with.

After about three years, the originator of the whole experience left the company and re-started as an individual firm at the beginning of 2005 with the same product. The company is very small. The founder is the general manager, but, in the light of his long experience in the field, is also responsible for the hardware and software development. Another person organises the production activity and a third one deals with clients and with the administrative part of the business. The organisation chart of the company 5 is shown in Figure 4.10.

Figure 4.10 – The organisation chart of company 5



The activities are performed inside the company are very limited and the most part of the production of components is outsourced. More precisely, company 5 designs the device,

assembles and tests the mechanical and electronic parts that are outsourced, mounts the CCD sensor, which is the core and the most fragile part of the entire product, and performs the final test. This strategy corresponds to a specific choice of the founder who, after the failed attempt, described above, to transform the company in something more structured, has decided to "... stay this way". It is difficult, in his opinion, to find human resources, both in the technical and managerial fields, to create a larger and more structured company and maybe this is not even necessary given the specificities of the final market. Indeed, we are speaking of a niche market. There are other companies, essentially in the USA, that operate in this sector, but provide very expensive and completely standardised devices. The competitive advantage of company 5 consists in its ability to offer an highly customised product at a reasonable cost and the software and accessories needed.

Given the fact that the company (re-)started its activities only at the beginning of 2005, significant historical data are not available. Two points are important to be mentioned, however, to understand the order of magnitude of its activities: the forecasted sales for 2005 are 400 thousand euros which, for the 95%, come from the global market.

PRODUCTS, CLIENTS AND COMPETITORS

What company 5 produces is a wide set of highly customised digital cameras which instead of a film use a CCD cooled sensor which has the advantage of accumulating much more light than a normal film camera. To have an idea, while a film is able to accumulate 2/3% of light, a CCD sensor accumulates around 40/50% of light. Together with the camera, the related software and all the other accessories are provided. The multidisciplinarity of the product represents the source of its complexity and its high-technology valence. In creating such devices, problems in the field of electronics, software, mechanics and physics are to be solved and, in order to provide a service to the client, the company has to master, at least to some extent, all these subjects. Indeed, the fact that the majority of components are produced in outsourcing, does not allow company 5 not to have these competencies, because, as a systems integrator, it has to be able to deal with all the subsystems of the final product.

The main characteristic of the technology underlying these products is its applicability in the most disparate fields. Some extreme examples may be interesting. Barilla (maybe the most important brand in Italy for pasta) has acquired some of company 5's devices and

has mounted them on an airplane which, flying over their grain fields, allows to forecast the future harvest. Another example is in a completely different filed. There had been a homicide in a hotel and the investigators were using the traditional luminol as an instrument to detect the presence of blood around the room. The limit of luminol is that it vanishes very easily and can miss smaller spots of blood. Company 5's instruments were used because they were able to overcome this problem. A third example is in the field of medicine: at present the firm is providing to a Korean company a device to be used in the diagnosis of cancer. It is basically a scanner which is able to see the eventual (very feeble) fluorescence, produced by samples of blood previously treated, which is the sign of the presence of cancer.

From these examples it is evident that the applications of these products range from medicine to biology, from physics to astronomy, from spectroscopy to many other fields. Clients, as a consequence, may be very different. Quite often they are very large firms that incorporate these devices in their products. For example, a company producing digital radiographic systems manufactures all the mechanical parts of the instrument and the related software but acquires from company 5 the filming head. In most cases clients are Universities or research institutes and these are mainly located in the Far East, like Singapore and Korea, which are the countries that, at present, are investing most in research activities. As regards Europe, Belgium is the first market for company 5, while Italy is definitely a marginal client. In most cases clients need to be guided in their choices: it is very unlikely to find experts that already know what they need. The most knowledgeable are in the field of astronomy because they were the first to use these devices. Others may have profound knowledge of their field of research but may not have a clue about what these products are able to do or not. They may risk to buy very expensive devices that are not the best answer to their needs and for this reason company 5 assists them in orienting their choice.

Concerning competition, this is rather limited. In Italy there have been some companies but they all failed especially after the downturn in the sector in 2001. The most important competitor is in the USA, but it works in different segments of the market and do not provide any form of customisation. The dimension and characteristics of the related market are completely different. In the words of the founder:

"It is like to say that it produces Mercedes ... we do not give any noise to it ... we work with bicycles and that is even much for us".

As regards Europe, there is a large company in Germany, but it manufactures only a very specialised product for a specific application which is beyond the interests of company 5.

5.2 Marketing: the unnecessary function

Notwithstanding the small dimension of the business, the company has clients in many parts of the world and collocates its products through representatives in various countries. These, however, rarely play an active role in promoting company 5's products mainly because they also sell devices provided by other companies. The real commercial vehicle of the company is its web site that provides in great detail all the relevant information on the products and the activities of the company. Indeed, these representatives are usually contacted by clients who have acquired information on the internet and have realised that there is a representative in the area where they live and operate.

As regards advertising, the company has had only one experience: it bought a space in a specialised international journal for a certain period. The returns were rather satisfying: even after the end of the campaign, people were still contacting the company for information.

This has remained the only marketing experience of the company (besides the continuous adjournment of the web site) because its founders do not considers necessary to develop this function. From the words of the founder it is evident that the meaning given to the term marketing is very close to that of advertising and is not needed because the company is in a situation of excess of demand. Many large firms (Leika many years ago and Samsung more recently, to make two examples) asked for company 5's products, but its structure, which is able to provide only 3 to 5 cameras per month, did not allow it to take these orders that were irremediably lost.

Looking for an understanding of this curious situation, it emerges a sort of vicious circle. On the one hand, the founder claims that the lack of resources impedes the growth of the company. These resources are primarily human resources and at three different levels. The first, and most important for the interviewee, is the managerial level: the firm needs

somebody that has the knowledge and experience to manage a company and a company of this type, that is, a small high-technology enterprise. On a second level, more technicians should be needed for the production activities and, also in this field, notwithstanding the presence of important Universities in the area of Pisa, the search is not easy because young graduated do not possess sufficient experience in the field which plays a fundamental role. The third is the commercial level, intended in terms of capable representatives who know the product and the technology enough to explain it to potential clients. In all these cases the problem is that the capabilities and knowledge required are highly complex, specific and difficult to acquire. The problem of resources seems not to involve (at least not at a significant level) the financial aspect, therefore the interviewee was suggested to hire somebody, to grow him/her inside the company, to teach the technical features of the product offered and the related activities performed, and to transfer him/her the company culture. Another problem was raised at this point: that of time, both in the sense that a long time is required for this person to be operative and productive, and in terms of the lack of time (of the founder, essentially) to engage in the teaching task.

The impression that emerges from this discussion is that the founder, maybe also as a consequence of the bad experience with the previous attempt to enlarge the company, is not interested in increasing the business, in a sort of "Peter Pan syndrome", and in some cases it has openly declared: "... we'll stay this way", and also: "... we are well beyond what we can do and we do not look for more".

5.3 The relationships with clients

The high level of customisation of the products provided makes it inevitable that some kind of relationship is established between company 5 and its clients. The founder of the company distinguishes between two types of clients. On the one hand, there is a rather knowledgeable client who trusts the company and with whom it is possible to interact at a certain level and to develop a long-lasting relationship. On the other hand, there is the unsatisfied client who usually has not properly understood the way the device provided functions and who will not ask for company 5's products any more.

The first type of client is obviously an important resource for the company: just with the provision of software or hardware adjournments or some support services, the company

has significant profits besides the selling of the camera *per se*. Moreover, a loyal client represents a significant source of advertising through word-of-mouth processes. When the relationship with a client assumes the characteristics just described, the interaction with him/her provides the company with important feedback about the product. Indeed, it is very difficult to check every single aspect of the device and it is practically impossible to forecast the performance and drawbacks, of its applications.

Notwithstanding these advantages, the creation of long-lasting relationships with clients is not part of a specific strategy of company 5: it is something that happens and even the founder cannot explain why. Together with those clients who criticise the company for not being able to perform its job, there are those (in the interviewee words) "... you don't know why, to be honest, who, instead believe in you". The strange aspect of the attitude of the founder towards these relationships, and of the company as a consequence, is that they are seen almost as a trouble, especially when they originate from a process of customisation. In his words:

> "... we wouldn't do customisation because it is a hassle (...) we even have too many products and we would like to sell those and possibly those easiest to manufacture, because there are also those complicated which takes more time. And not being structured is tremendous".

In terms of exchanges of knowledge and capabilities, the founder recognises, as pointed out above, that the company gains feedback and experience from the interaction with the client, but claims that it is often necessary to explain the client (especially those of the second type, the less knowledgeable) many technical aspects of the device being provided. The company also tried, some time ago, to organise some type of courses for clients, but later on the idea was abandoned.
The company does not entertain any relationships with other firms, even though there has been an attempt to find a large optical firm providing many types of similar devices that could be interested in distributing, through its distribution channels, company 5's products as well. By now, however, this objective has not been achieved.

5.4 Locational and policy dimensions

The actual location of company 5 is in a small town in the Province of Pisa. Originally, the company had the experience of operating within a Technological Pole (again in the Pisan area) where other small high-technology firms were located. This experience, is, however, not valued positively by the founder. The first reason is because of the costs associated with the location in the complex underlying structure of the Pole. The other relates to the impression of being somehow exploited for promoting the image of the Pole in the interests of the various politicians. For example, many politicians, in different circumstances, were invited to visit the Pole to show the richness of the structure. Company 5 was, in particular, one of the most cited and visited given the fact that it was one of the very few companies that performed manufacturing activities *strictu sensu*. In such occasions, promises were made, but few initiatives were organised to concretely support the high-technology sector.

As regards the existence of a cluster, as often claimed by policy makers and mass media, the interviewee does not perceive any benefit associated with the location in an area where other small companies in similar sectors operate and with which the relationships are rather limited. He regrets the mental closure of many of these companies which reflects the inertia of the typical Italian firm. However, at the same time, he complains about the fact that building interactions with them would have the consequence of increasing the already heavy workload of the company.

When asked what kind of initiatives could the policy-maker promote in order to support the high-technology sector in the area, the founder of company 5 expresses a profound mistrust in the political class. In his words:

> "... they [policy-makers] are not in touch with the world and with reality: they are closed in their departments which don't have anything to do with reality".

He claims that he is not able to envisage possible initiatives in this field and simply lists the problems a small firm has to face when it is established and when it tries to grow. First of all, bureaucracy: too many documents are required and the risk of making mistakes for which you can be severely punished is very high. Second, finding resources: if you do not already have money it is basically impossible to receive money from the banks. Third, the high costs of hiring people and the complexity of the labour market.

Finally, the limits of the research world which performs a type of research which is interesting only for people in the academia and very often completely detached from the real world, "... [the research is] closer to God than to us", in the words of the interviewee.

The only suggestion given to the policy maker is to see things and firms as they are and to work in the real world, which is rather different from that presented in books, newspaper, documents and the like.

5.5 Summary of key issues

Company 5 is the very first Italian company which designs, produces and markets its own line of professional cooled CCD cameras, customized devices, software and digital image systems. Established in 1993 it has gone through a deep restructuring and basically re-started its activities, with the original founder, at the beginning of 2005. Two people, besides the founder, work in the company and the production of the various components is completely outsourced. Only the design, the assembling and testing activities, and the incorporation of the sensor are performed inside.

The interesting aspect of the activities of the company is that it operates in a situation of excess of demand and scarce, if not null, competition. For this reason, apart from the continuous adjournment of the web site, which is the most important source of visibility for the company, marketing, as an instrument to stimulate demand and sales, is not considered necessary. Indeed, the founder fears that marketing would further increase the already large demand which the company due to the fact that it is unstructured would not be able to satisfy.

This philosophy is reflected in the way relationships with clients are managed. While the value of a loyal customer is recognised, there is not a strategy aiming at acquiring and maintaining clients. It is something that simply happens: even the founder is not able to explain why some clients trust the company and become precious interlocutors in the long-run. Customisation, which represents the value added of the company compared to its larger (mainly American) competitors, is usually the vehicle through which the relationship with a client is established. Notwithstanding this fact, customisation is mainly seen as a trouble because it is complicated and time consuming.

As regards the location, the interviewee does not perceive any cluster dynamics and criticises the mental closure of local firms, too much worried about their personal interests. The relationships it has developed with these firms are, therefore, rather limited also because they are considered a source of troubles. Indeed, they might translate in an heavier workload, which is, as already said, not required, not searched for and not desired by the company.

With respect to policy-makers, they are considered as people living in their own world, with no contact with reality. They should, in the founder opinion, go and see what happens inside firms in order to understand what is *really* needed in order to support them, especially in the high-technology sector. Among the problems cited, bureaucracy, high costs of the workforce, difficulty in finding financial resources and the abstractness of University research.

6. Case study 6 – Marketing: the following step to growth

6.1 The firm and its context

HISTORY, STRUCTURE AND DATA

Company 6 operates in the field of industrial automation and robotics. It is a young company which is the result of the passion of a young engineer who is the general manager and the key informant for this case study.

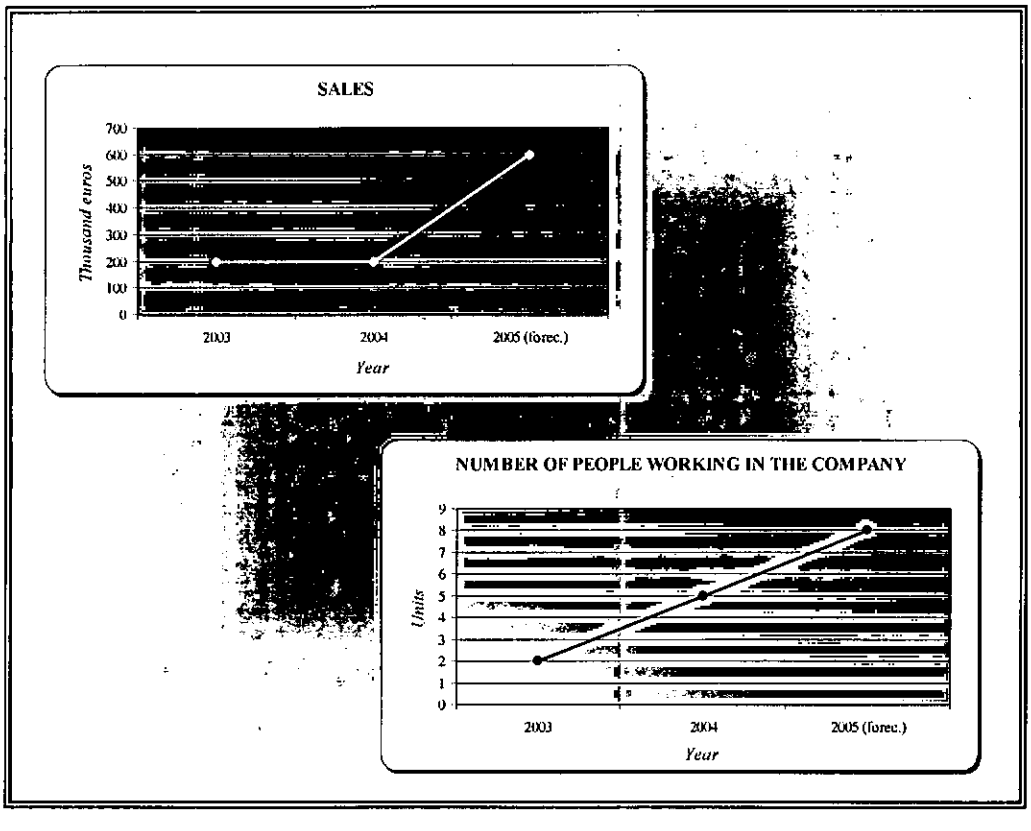
The history of this company is rather brief. After a period as a consultant in the field of mechanics, the founder wanted to create a firm to produce robotic milling islands for the marine sector. Exploiting the relationships and contacts developed during the period as a consultant, he established company 6 in 2003 headquartered in his house. The original project was to immediately become a company operating in the field of robotic and industrial automation, but, especially at the beginning, the consulting activity was the main source of revenues. Indeed, the idea was that of self-financing the activity of the company, and consultancy was a good way to reach this objective. Later on the company had the opportunity to benefit from the initiative of the *Fondo Rotativo*, a fund created by the Italian Financial Law in 2004 whose resources are employed in the acquisition of short-term minority equities in the capital of medium and large firms in order to stimulate and finance their growth programmes. The resources obtained from this

initiative helped the company to install its first system. At the moment, specific attention is given to the software part, which is considered the focal element of the whole activity. Table 4.7 and Figure 4.11 show the most important data of the company.

Table 4.7 – Company 6: some data

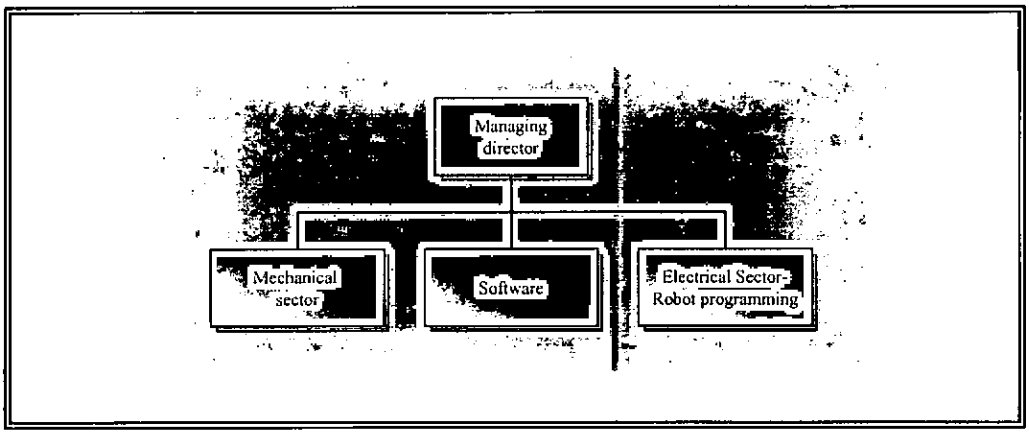
	2003	2004	2005 (Forec.)
Equity capital (thousands €)	10	111	111
Sales (thousands €)	200	200	600
Investments in R&D (% of sales)	90%	90%	80%
Marketing expenditures (% of sales)	2%	2%	5%
Number of partners	2	3	3
Number of people working in the company	2	5	8
Geographical distribution of sales (% of sales for each market)	*Regional* 0% *National* 100% *Global* 0%	*Regional* 0% *National* 100% *Global* 0%	*Regional* 0% *National* 80% *Global* 20%
Number of patents	0	0	0

Figure 4.11 – Company 6: some data.



After three years, the people working in the firm are eight. The founder is both the managing director of the company and the technical director: in fact, after having consulted his colleagues, he is the one who takes the strategic and design decisions. He also defines himself as "the glue and the engine" of the company. A mechanical engineer is responsible for the mechanical sector, and there are also the software and the electrical divisions (see Figure 4.12 overleaf). Within this last division, the devices are assembled and tested and robots are programmed. An important characteristic of the workforce of this company is that it is composed by very young people who were hired soon after the degree and, therefore, without any kind of experience. This was not exactly an explicit choice of the founder, because with more experienced people the growth process of the company would have been much faster. Nevertheless, he is also rather proud of this decision: these young people are experiencing a fast growth inside the company and are becoming rather autonomous in their functions. This allows the founder to delegate some of the activities that, up to now, he had to perform personally.

Figure 4.12 – The organisation chart of company 6



PRODUCTS AND ACTIVITIES

As already said, the activities of company 6 are essentially of two types. On the one hand, it is a consulting firm which designs objects for the mechanical sector. It provides, therefore, a sort of support to the technical office of its clients and they, on the basis of company 6's projects, produce the components for their machine tools. Being expert on the use of CAD (Computer Aided Design), company 6 often offers support on this software, providing a sort of training to its clients.

On the other hand, there is the robotic sector in which the company behaves as a systems integrator. The company designs the whole system from the mechanical, electrical and software points of view. The actual production of the various components is realised by external companies on the basis of the designs of company 6, that assembles the final system which is later incorporated in the robot so that it can perform the functions the client requires.

CLIENTS AND COMPETITORS

The typical client of company 6 is a firm working in the mechanical sector. As regards the part of robotics, however, each manufacturing company could potentially be its client, because in any production process there may be the need or the advantage to automate parts of the production line. The activities devoted to the initial target of the company, that is the production of robotic milling islands for the naval sector, are still in their first phases of development: the first milling system was to be sent to the University of Zürich the week after the day of the interview (November 2005).

Clients are mainly in Italy: few in Tuscany and most in the Northern Regions of the Country (e.g., Piemonte and Lombardia). The 20% of sales are realised in Spain and Switzerland. As regards the typical characteristics of these clients, they are usually extremely prepared in their sector of activity, but have some difficulties in understanding the product the company is offering. In this sense, the company has sometimes to educate the client and it is important to give the client the opportunity to physically see what is being offered.

As regards competitors, these are mainly small companies located in the area of Pisa and this is essentially due to the rather newness of the solutions offered. The traditional, large, mechanical Italian company, with many employees, which produces lots of automated systems each year is not able to deal with the problems that these high-technology companies are specialised in. The problem of these large automation companies is that they have performed their activities in the same way for 20 years, they have used the technology only in a single way and now they are unable to follow the recent developments or new applications of these new technologies. The advantage of small firms like company 6 is the ability to deal with problems at a different level and to exploit different technologies. Also at the international level the competition is rather limited, even though large groups are becoming interested in this new sector. This situation is creating some problems to smaller companies, included company 6, because they

recognise the importance of not operating as islands and the need of finding partners to collaborate with. But these larger partners may "absorb" the knowledge and capabilities these specialised firms have already developed with the consequence of potentially losing their competitive advantage without any significant benefit deriving from the collaboration.

6.2 Marketing: the following step to growth

The interviewee has no doubt that marketing is the missing piece in the company. He recognises that the technical capabilities needed to perform the manufacturing and consulting activities are present in the company and, as people were hired for their knowledge and expertise in these technical fields, somebody who has a marketing background should be part of the staff of the company. At present, while searching for a person to perform the marketing and commercial activities, the main responsibility for this function is on the founder.

Even though the interviewee claims that any marketing activity is performed in the company, this is not completely true. First of all, the firm takes part to industry exhibitions and advertises its products in some journals. More presence in specialised journals should be necessary, but this kind of advertising is rather expensive. The company is not provided with a distribution structure and the commercial part *strictu sensu*, that is those actions which are more directly linked to the selling of the product, are responsibility of the general manager who contacts clients, essentially robot-makers, visits them, shows the devices and so on. These contacts with robot-makers are an important vehicle of visibility for the company and originate relevant chains of word-of-mouth.

There is, however, the awareness that more need to be done besides the use of those that have been defined "operational instruments": marketing is something broader and does not resolve into the commercialisation of the product. The interviewee has a rather clear idea of what he would like the marketing person to do inside the company and this reflects a rather advanced vision of what the marketing function can be and can do in a firm. The objectives of such a function are considered to be essentially three. First of all, there is the need to analyse the demand in order to understand in which sector the products offered by the company can be applied. Indeed these are many and rather

different; as an example the interviewee cites as potential clients the producers of yachts, those working with fibreglass, the producers of toys and furniture. After having identified the various sectors, a list of potential clients should be created in order to contact them, to find the relevant person inside the company to whom the product should be presented, to send brochures and every necessary document and possibly to meet them for a face-to-face demonstration. It is implicit that all the documents and the brochures should be previously prepared in an efficient, professional and captivating format: this shoud be another task of the marketing person.

A second objective of marketing should be a market research on the side of the offer. As already said, competition is not very pressing at present, but still it remains important to understand what competitors are doing, how they are doing that and where they are moving to.

A third point which somehow links the marketing function to the commercial activity, is the creation of a distribution system based on representatives. The basic idea is to publish insertions, looking for local representatives, in the local newspapers of those Regions and areas which, from the market research described above, can be considered promising markets for the company. For example, in the case of the marine sector, these places could be Sardinia, Versilia (Tuscany) and Marche.

The interviewee has not a clear idea about the characteristics the person performing the marketing activity should possess. Maybe for the experience in the field of human resources he has had up to now, where all the employees are young people without any practical skill, the founder is looking for somebody smart and clever, who has ideas and the will to work for the wealth of the company. Of course, a background in managerial and marketing subjects, if not absolutely required, is clearly appreciated. Having previous knowledge on the types of products and technologies the company deals with is not deemed essential and, again, this seems the result of the experience with the other employees: a clever person has the possibility to learn what is necessary to know in order to present and sell the product. In the founder's words:

> "... I believe that it is not necessary to be an engineer to understand these things; it is only necessary to have the will to understand. I am absolutely convinced of this".

The knowledge about the product, it is worth noting, has to be mastered by the marketing person since there are many clients rather prepared on the subject: they may ask very specific questions on the product and this person cannot make mistakes. What the founder is strongly convinced of is that this knowledge can be acquired once the person is already part of the company.

What is very interesting is that, notwithstanding the limited resources available, the short life of the company and the related major risks associated with the fact that the firm is still not stable, the founder has no doubts about the necessity to organise the marketing function and to hire a person for this in order to allow the firm to grow. Generally speaking, the lack of financial resources is a major limit to improve the marketing function, even in terms of what have been termed "operational instruments": being present in international markets or participating in international exhibitions, for example, are costly activities which a small firm like company 6 cannot afford.

6.3 The relationships with clients

The type of products provided, besides the consulting activity, are usually highly personalised: the client asks a specific software or mechanical device to perform a specific function. As a consequence, there is the necessity to interact with clients on a regular basis and this may evolve in a more or less stable relationship over time. Indeed, the philosophy of the founder, which he is trying to instil in his employees, is that a company is established to serve a client as longer as possible and that, besides price, being reliable is fundamental.

It is not always possible to achieve the objective of building a satisfactory relationship with a client, especially when the latter has a closed attitude and is jealous of its activities and knowledge: in this case it is even difficult for company 6 to really understand what is needed to better satisfy the client. The approach typical of company 6 is that of being open, because, as pointed out earlier, notwithstanding the capabilities a firm may possess, it cannot succeed or even survive operating as an island.

Clients are an invaluable source of knowledge for company 6 and employees are stimulated to ask clients about their activities and to be curious. In fact, if it is true the company has some specific know-how, there is much to learn from clients as well. The

result of this constant pushing employees to be close to clients is that employees themselves are now able to deal with clients independently, while, some times ago, all the interactions with them was managed by the founder.

As regards relationships with other companies, the open attitude of company 6 applies to this aspect as well. At present, it is selling its software to potential competitors, in the sense that, being these companies producers of machine tools, they are potential competitors. Indeed, the sector is becoming interesting for many large firms even though, at the moment, they are actually working in other sectors or in other segments. These companies often involve company 6 in some initiatives: for example they go to clients or to exhibitions together. The founder is conscious that this can be risky in terms of leakages of company knowledge and capabilities, but, in his opinion, this is the only way to grow; in his words:

> "... or you stay closed in yourself or you risk";

and also:

> "...one has to understand that, in order to grow, in order to have the maximum, you also need to give".

6.4 Locational and policy dimensions

As it is the case for many other high-technology companies located in the area of Pisa, the reason for establishing the company in the Province is linked to the educational background of the founder: he studied in Pisa, he started working there and he liked the city as a place where to live. The previous consulting experience, moreover had provided him with a series of contacts that he could exploit once he established his own company.

The presence of other high-technology firms in the area, on the other hand, has not represented a significant motivation to locate there the company. Not only a sort of cluster atmosphere is not perceived, but the interactions with local companies are very limited if not completely absent. The reason, the founder claims, lies in the fact that all these firms tend to have a very close attitude which reflects their fear of losing clients or fundamental capabilities in favour of competitors. As pointed out many times in this case

study, this is an attitude that company 6 does not share and understand: interacting with other organisations and sharing different experiences is fundamental for the prosperity of a firm. On the other hand, there is a strong relationship with the University: for example, students who spent a couple of months in the company for the development of their final dissertation are now part of the staff.

Concerning the policy dimension, as a small firm, company 6 mainly asks financial resources. It has already benefited from the *Fondo Rotativo* (see above), but in order to survive it is always necessary to develop new technologies and this process requires significant financial resources. The founder recognises that many initiatives providing this kind of support to innovative growing companies may already exist: they, then, should be more visible and easily accessible. The idea of the interviewee is not to receive (a lot of) money *per se*, but to be supported when valuable projects are to be realised. In his words:

> "... because I perfectly know that if I don't do new things, I don't have many expectancies to live. Policies are needed to help those who want to do things aiming at growing and thus at improving the technology and the know-how".

The financial aspect, however, is only one part of the problem and can be useful in facing the technical side of the activities of the company. In fact, apart from the lack of resources, the company is capable to resolve the technicalities linked to its activity or it knows where to find the solutions to its eventual problems. The most severe weakness of the company, however, is in the managerial and commercial parts. As the interviewee says:

> "My parents are not entrepreneurs (...) ... one who wakes up and becomes an entrepreneur immediately able to earn money, either is born this way and has it in his/her genes, or ... But the majority of people, like me, are not entrepreneurs. Thus, not having any experience, I often need a support for the strategic decisions".

His concern is that of having the opportunity to interact with people who have matured a long experience in the field of managing a company, especially in the marketing

functions. The idea is, therefore, that of a sort of strategic-commercial support that firms can exploit in form of consultancy provided by public structures in the area.

6.5 Summary of key issues

Company 6 operates in the field of robotics and provides consulting services to mechanical companies. Is a very small firm which is now becoming concretely a systems integrator, designing the whole system from the mechanical, electrical and software points of view. The actual production of the various components is outsourced, but the assembling and testing activities are internalised.

The marketing actions that, at present, are performed by company 6 consist essentially in the participation to trade fairs and in advertising its activities in some journals. The responsibility of these activities is on the founder, who recognises the need to hire somebody to more efficiently perform the marketing function. Indeed he has a clear idea about what this function should consist of. First of all, it is be necessary to identify the sectors in which the company's products may be applied and consequently draw a list of potential clients to be later contacted. Second, a deep analysis of the competition, even if it is still limited, is essential to understand who is doing what and how. Third, more effort should be devoted to recruit representatives in the various most promising local markets in order to create a distribution structure the company can rely on.

The problem is to find a person who has the managerial and marketing capabilities to perform such activities, although the policy the company is following is the one which has characterised its strategy in relation to human resources up to now: it is looking for a young clever person, even with no experience, in order to grow him/her inside the company as it has been the case for all the other employees in the company.

Company 6 considers important the establishment of relationships with clients because they can be an invaluable source of new knowledge and ideas: employees are encouraged to be curious when dealing with a client. This is not always possible, given the fact that many firms have a rather close attitude which impedes a real and advantageous interaction from which both parties could benefit.

This closure is often perceived by the interviewee in the other small firms operating in the area of Pisa and it is an attitude not shared by company 6, since the founder is strongly convinced that, in order to grow, a firm cannot operate in isolation and to obtain something it should be willing to give as well. Therefore, the company do not perceive any benefits associated with its location in the Province of Pisa and the locational choice has been the consequence of the fact that the founder had studied in Pisa and in this area he had his first work experience which provided him with some contacts that he could exploit once he established his own company.

As regards the policy dimension, the first and foremost request is in terms of financial resources to be used in the realisation of innovative projects. The founder admits that many initiatives in this sense may already exist: they should be made more visible and easily accessible. If these resources may be important for facing the technical part of firm activities, more supportive initiatives should be provided in the areas of management and marketing: having the possibility to interact with people who have developed a long experience in these fields could be an interesting service the public sector can organise especially for small firms like company 6.

7. Case study 7 – Marketing: the external expert task

7.1 The firm and its context

HISTORY, STRUCTURE AND DATA

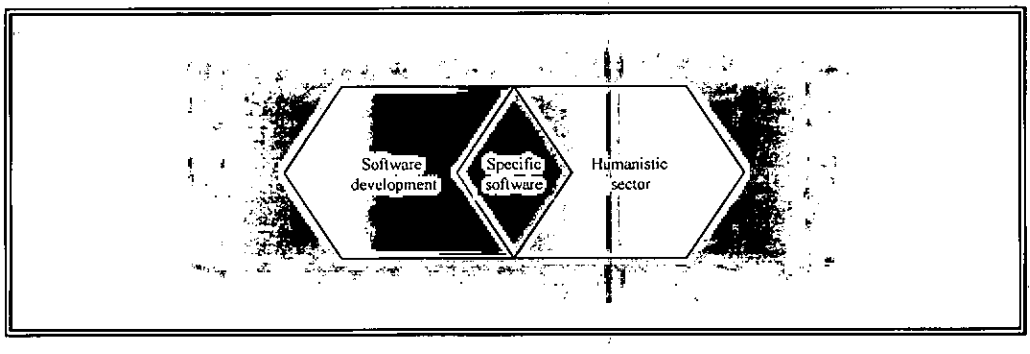
Company 7 is a Limited Liability Cooperative Company established in 1995 that operates in the field of Information Sciences and located in a Technological Pole in the area of Pisa. It was the result of the initiative of some students in Physics who became very interested in the internet technology and tried to build something that could allow them to earn some money enjoying themselves. The consequence of these premises was that the activities *strictu sensu* did not start before 1998, when the company somehow structured itself more properly and its founders gain awareness of what they wanted to do.

In 1998, in fact, some of the original partners left the company and new people entered: these were people working at the *Scuola Normale Superiore* in Pisa (one of the three Universities of the city) in the Research Centre on Information Sciences for Cultural Heritage. What they were interested in was the application of software solutions to

humanistic disciplines. After the experience at the University, they wanted to create something on their own and, through common contacts, instead of starting from zero, they converged into the already existent company 7.

The main characteristic of this company is the mix of competencies on which it is based. Roughly, half of the people working in the cooperative have a degree in humanistic disciplines (e.g., History) while the other half has a scientific background (e.g., degrees in Physics, Engineering, Mathematics). The contamination between these different disciplines allowed the company, since the beginning, to develop software solutions as any other "normal" software house, and to provide services to catalogue cultural heritage. There is, moreover, an intermediate area: that related to the development of software solutions for the field of cultural heritage, that is, not a general but a specific software. Figure 4.13 graphically shows this intersection of capabilities which represents the distinctive element of company 7 and the source of value added on which it is continuously investing in.

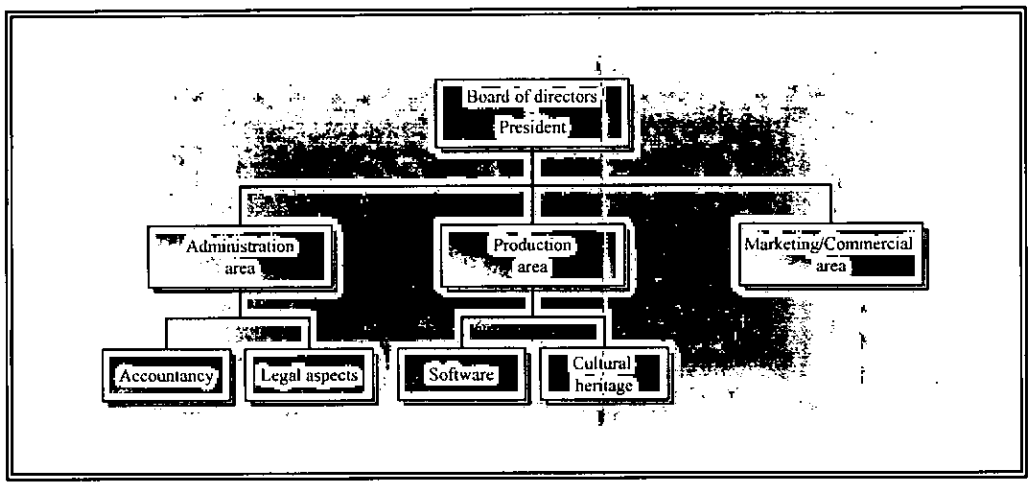
Figure 4.13 – The intersection of capabilities in company 7



The people working at various titles in the cooperative are 25. Roughly 50% of them are employees, the others are collaborators. The number of partners is 21 even though not all of them actively work in the company. Therefore, there are partners who do not work in the firm and people working inside the cooperative who are not partners. They are organised as shown in the organisation chart presented in figure 4.14. At the head of the organisation there is a Board of Directors with a President, who is the key informant for this case study. The administration area has been sub-divided into a part that deals with all the accountancy problems, while another part is responsible for all the legal aspects: the management of partners, the revisions of the statute or the internal regulations, the

supervision of all the steps necessary to take part to special projects. The sub-division of the production area reflects the two main fields of competencies of the company: therefore there is a software division and a cultural heritage division. As regards the marketing and commercial area, there are not sub-divisions, even though for a period, in order to exploit the funds obtained from a ministerial project, there was a distinction between sales and communication. At present, this distinction has been abandoned because there is not an appropriate structure to support this sub-division. The key informant for this case study, beside being the President of the Board of Directors, also works within the commercial area with other three people: one has a humanistic background, but has historically managed the relationships with clients in that segment; another one has had previous experiences in other small local firms in the commercial function; the third has a role more directly linked to communication (e.g., web site adjournment, creation of informative documents on products, ideation of brochures specific to different targets, etc.).

Figure 4.14 – The organisation chart of company 7



Notwithstanding the strong competition in the area, especially for the part related to the software activity, company 7 is growing and this is reflected in the data provided and reported in Table 4.8 and in Figure 4.15 overleaf.

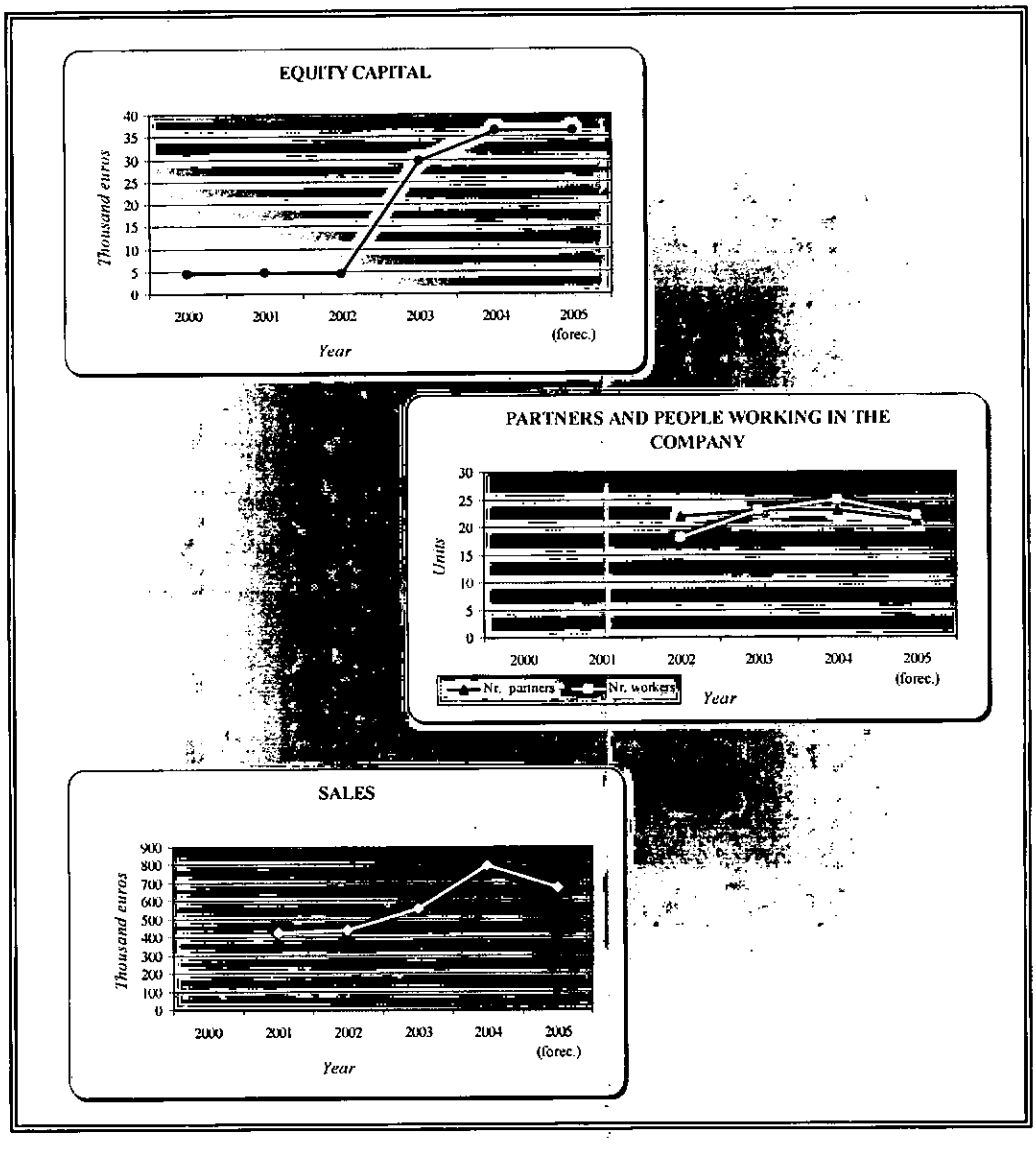
Table 4.8 – Company 7: some data

	2000	2001	2002	2003	2004	2005 (Forec.)
Equity capital (thousands €)	4,389	4,595	4,390	29,589	36,311	36,311
Sales (thousands €)		424,365	439,217	555,699	797,575	676
Investments in R&D (% of sales)				15%	8%	10%
Marketing expenditures (% of sales)				2%	5%	12%
Number of partners			22	23	23	21
Number of people working in the company			18	23	25	22
Geographical distribution of sales (% of sales for each market)	*Reg.* % *Nat.* % *Glob.* %	*Reg.* % *Nat.* % *Glob.* %	*Reg.* % *Nat.* % *Glob.* %	*Reg.* 86% *Nat.* 14% *Glob.* 0%	*Reg.* 65% *Nat.* 35% *Glob.* 0%	*Reg.* 78% *Nat.* 22% *Glob.* 0%
Nr. of patents	0	0	0	0	0	0

PRODUCTS, ACTIVITIES AND CLIENTS

In order to describe the activities and products of company 7, it is possible to follow two paths. On the one hand, there are the two areas of specialisation described above: software capabilities and management of cultural heritage. Following this path, as a *software* developer, company 7 started by offering the design of data bases and the creation of dynamic web interfaces compatible with the most diffused data base management systems. Later on it has developed solutions to specific needs of Public Administrations and other institutions. In the area of *cultural heritage*, company 7 offers services linked to the traditional archival activity aiming at the production of research instruments (inventory, census, guide), and performs activities more directly related to the use of information technologies specific to these domains. These two areas, as mentioned earlier, somehow interact and contaminate each other. The result is the provision of software solutions specifically tailored for the humanistic and cultural heritage world.

Figure 4.15 – Company 7: some data



There is, however, another path which can be followed to describe the activities of company 7 and which cut across the first one. This path takes into consideration the clients served by the company. It is possible to identify four groups of clients:

- *ecclesiastic world* – specific software and services are provided to dioceses, parishes, religious and other related institutions. These services are usually complete solutions and support services for libraries, historical archives and the historical-artistic heritage. The most important example in this field is the choice by CEI (*Conferenza Episcopale Italiana* – Italian Episcopal Conference) of company 7' software for the inventory of the historical archives of all the dioceses at the national level;

- *Public Administration* – open source solutions, systems for the management of documentation flows, specific applications and services for the administration of current documentation are some of the services provided to public institutions of various types. An example is the collaboration of company 7 with the *Agenzia Toscana per la Protezione Ambientale* (Tuscany Agency for Environmental Protection) for which it has developed particular applications and software solutions which have provided the company with specific competencies which it is now exploiting in the management of collaborations with other similar Regional Agencies.
- *University and research centres* – systems for the management of the documentation flows within the central administration and personalised solutions of different types represent the main offer to Universities, education structures and research centres. One example is the application provided to the Scuola Superiore Sant'Anna in Pisa which allows students to apply on-line to the entry exams to the School. From this simple project, now company 7 is developing for this institution a more complex system for the management of administrative documents, of students' carrier and of didactic programs;
- *firms* – this is a residual sector because seldom private firms have libraries or complex archives that need the solutions provided by company 7. Sometimes has happened, however, to develop customised solutions for specific problems. An example is the development of a complete hardware/software system for companies operating in the management of parking areas.

Concerning the location of these clients, the diffusion of company 7's offer varies depending on the type of product considered. As regards the software solutions, the diffusion is mainly regional and the company is also present in some other regions beyond Tuscany. As for the provision of services in the field of the cultural heritage, the market is regional or even sub-regional. It is possible, on the other hand, to speak about a national presence of company 7 in the field of software solutions applied to the world of the cultural heritage.

It is interesting that, notwithstanding clients (or interlocutors, as the interviewee likes to call them) seem to ask the same "product", this is seldom the case. For example, the specific applications and software solutions the company has developed for the Tuscany Agency for Environmental Protection seemed to be easily transferable to other Agencies in other Regions, but the logic of standardised offer does not apply when moving from

one client to the other. It is for this reason that the President of the company describes the activities of the company as something "in the middle between a consultancy and the development of a product". Every solution, therefore, needs to be adapted and adjusted to the specific reality in which it has to be applied: of course the company does not start from zero every time because from each project it gains experience that can be exploited in other contexts.

COMPETITORS

When considering the competition company 7 has to face, it is again necessary to distinguish between its three areas of specialisation. Concerning the provision of software solutions, especially devoted to Universities or Public Administrations, competitors are mainly national and they often are very large companies against which company 7 hardly succeeds. As regards the intermediate area of software for the cultural heritage, competition, especially in the field of the management of historical archives, is rather limited. The exception is represented by the segment of libraries in which there are large companies which operate at the national and even international level. Finally, in the provision of services for the cultural heritage, company 7 has to face a sort of non-structured competition often represented by volunteers or by groups of students performing University stages.

7.2 Marketing: the external expert task

"Doing marketing, up to now, has meant very little" in company 7, the interviewee claims. The main reason is the same that holds for many high-technology companies: partners (and the employees even more) are all technicians. This holds also in this cooperative where the number of partners is high (more than 20) and being a "technicians" does not only mean to be an engineer: also those with a humanistic education perceive themselves as technicians in their field.

Moreover, it is not just that marketing has been neglected during these years, but even the commercial activity *strictu sensu* has never received particular attention. None of the partners who established the firm had an idea of what selling something meant and, on this respect, there was also a certain level of arrogance: "Why people shouldn't come to me and my company given that I'm *so* good?" (President words).

At present, they are developing a specific set of activities around their most important product, that devoted to the historical archives. There is a dedicated person who deals with the problems related to customer satisfaction and, more generally, manages the relationship with clients. The idea is to create high levels of loyalty while providing clients with always-new and -advanced solutions. On some respect the company has started from the easiest part: the organisation of the commercial activities of a well defined product. Indeed, the situation becomes more complicated when dealing with that part of the activity which has been characterised in terms of consulting services. Indeed, the commercial activity in this case is performed by two people: one who has the role of consultant and the other who is more concerned with the commercial aspects of the interaction.

The President claims that, as it has been the case for the commercial activity described above, now the company perceives the need to develop a marketing function. The meaning given to marketing is rather wide, in the sense that it is seen as the instrument to build longer term strategies able to redefine the image of the company in the light of clearly identified objectives. In the interviewee's words:

> "... trying to identify what we want our cooperative to be in one, two, three years and starting to prepare the related long term strategies".

This wide view on marketing and its fundamental role in the company is expressed again in an extremely clear and emblematic way by the President of company 7 in these following words:

> "I am convinced, based essentially on nothing (...) that we have arrived at a sort of threshold; that is, if we aspire to go beyond our actual dimension and to continue growing, we have to demolish this barrier which can be demolished only having a more professional approach to the strategies to access the market and to promote the company".

The way in which this marketing function should be introduced in the company is gradual. What the company is looking for at present is a knowledgeable external interlocutor able to understand what the company needs and what it can obtain form that. They have already found somebody who could be the right one, but up to now there has

not been the time to develop a relationship on a continuous basis. The long term perspective is, however, that of stabilising the situation by hiring somebody with the necessary competencies to perform these activities. At present, in fact, it is considered more important to have the possibility to interact with experts capable of identifying a direction the company can follow and only after assigning the responsibility of leading the company along this way to an internal resource.

7.3 The relationships with clients

Since the offer of the company is primarily a consulting service, more than a product, it is inevitable for it to interact on a constant basis with clients and to develop long-term relationships with them. As the President claims, the clients the cooperative had in 1999, are still clients because, when proposing a solution to a first problem, the company has the possibility and ability to show what other products and services it could offer. There is, however, the opposite problem: that of acquiring new clients. This difficulty is becoming even more severe because, especially in the segment of the Public Administration, resource restrictions lead to a situation in which the small projects (those company 7 is more suited to deal with) are developed inside by these public institutions. They decide to go to the market only with large projects and bids to participate to which company 7 is often too small.

The creation of long-lasting relationships is now the result of a specific strategic choice of company 7, but it has not always been this way: at the beginning things simply happened. When the cooperative realised it was offering mainly projects and services which required interactions with clients and not pre-packaged products, it understood it was fundamental to work in the direction of building strong relationships with these clients in order to tie them to the company as much as possible. A loyal client is an important source of revenues for every firm.

Besides the obvious advantage that a set of loyal clients provides in terms of profits, the interviewee recognises how much he and his colleagues have learned in the process of developing different solutions for their clients. If it is true that the company transfers its knowledge to its interlocutors, it acquires the ability to develop solutions in the different sectors and areas in which these solutions may be applied. What is learned from a client becomes a patrimony for the people involved and, as a further step, for the company as a

whole. As already said, even though the same type of institution asks for the same service (e.g., a University), what is provided by the company is never the same solution. From the previous experience in the same field what the company learns is to deal with the problem and with the type of institution it is facing. It is through the direct interaction with the specific client that the final application is obtained and often it is very different not only from what the company has previously developed in similar situations, but also from what the client had initially imagined. This is the result of a concrete interaction between knowledgeable parts from which both have to gain.

As regards the management of these relationships, while at the beginning they were responsibility of the President, now there are groups of people from different functions who take part to a single project with a project manager who coordinates them. The objective is in line with the discourse made before: if in the development of a project and in interacting with the client there is something to learn, the more people participate to its realisation, the more the company as an organisation has to learn.

Notwithstanding the location in a Pole, where other technological small firms operate, the interviewee claims that the relationships with other firms are very limited. The reason may be the strong overlap between the activities of these firms, many of which operate in the software development field. It is rather recently that the situation has changed a bit. First of all, company 7 has established a formalised alliance with a start-up firm operating in the Pole (with which it also shares some of the offices), and an informal agreement with a software house also operating in the Pole. In the first case the 4 engineers who constitute the firm work full-time for company 7; in the second case the two companies have managed to put aside the sources of possible conflicts and collaborate in an equilibrate manner, deciding when one project could be better developed by one or the other or could be jointly undertaken.

The company is also approaching another type of partners. These are large firms, usually operating at a national level, that have the dimensions and resources to participate to national and international bids. As pointed out earlier, up to now the clients acquired by the company were mainly the result of a direct effort and this was also possible because the projects they were asked to develop could be undertaken by the company notwithstanding its small structure. More frequently, now, many institutions perform inside smaller projects and organise bids for larger ones. If Company 7 wants to take part

to these bids, the only way possible is to join larger companies which have the necessary resources. Therefore, the company is now presenting itself to these different firms, showing what it is able to do and what are its distinctive capabilities. This situation has also forced the company to really analyse itself in order to structure the company in a more rational way and to focus on what represents its real competitive advantage, which is mainly linked to the mix of software and humanistic competencies that have been already described above.

7.4 Locational and policy dimensions

The answer to the question why company 7 is located in the area of Pisa is very clear. Most partners of the cooperative come from outside Tuscany, but in Pisa attended the University where they met. After they graduated, there were personal projects of many of them which were linked to Pisa and the surrounding and there they decided, therefore, to work establishing the company.

The presence of other small high-technology companies in the area (and in the Pole more specifically) not only has not represented the reason for locating the company where it is, but it is a situation that does not provide it with any significant advantage. Maybe because the overlap in activities of many of these firms, the fear of knowledge leakages predominates the possible benefits of joint strategies aiming at creating a critical mass.

As regards the policy dimension, the general attitude of the interviewee is quite positive: he sees the public sector as rather active in the high-technology field. What the company would need is support concerning the training and professional adjournment of employees. He recognises that it may be that both the structures and resources may be already available and it is the company's fault not to be informed or able to exploit them. However, a grater level of visibility would be advisable.

7.5 Summary of key issues

Company 7 operates in the field of Information Sciences since 1995, although it assumed a more organised structure in 1998 when new partners joined the company. The partners have capabilities in two main fields: one is that of information technologies, the other is that of humanistic disciplines. The contamination between these different disciplines

allows the company, since the beginning, to develop software solutions as any other "normal" software house, and to provide services in cataloguing and inventorying cultural heritage. There is, moreover, an intermediate area: that of the development of software solutions for the field of cultural heritage, which is, not a general but specific software.

Marketing is still an underdeveloped function and at present only some commercial activities linked to the main product of the company are being performed. One of the problems in organising the commercial activity, besides the fact that everybody working in the company is a technician in his/her field, is linked to the characteristic of the offer of the company which has a strong consulting component.

The company, however, recognises the development of a more strategic and structured approach to the market as the only way to go beyond the threshold, in terms of dimensions and activities performed, it has actually achieved. The approach in the short term is that of finding an external expert able to identify the needs of the company in this field and to trace a path to follow. In the long run, the idea is that of hiring a person to deal with marketing problems in a dedicated manner.

Relationships with clients are considered fundamental: if, at the beginning, they were something that simply happened, now they are the result of a specific strategy of the company. The reason is not simply that of having loyal clients in order to guarantee a certain flow of revenues to the company. From clients there is much to learn and, given the high level of personalisation of the solutions offered, interacting with them is crucial to provide the right product. Moreover, these interactions enrich the knowledge and capabilities of the people involved in the specific project and, as a consequence, of the company as a whole.

Besides clients, company 7 has recently developed two agreements (one formal an one informal) with two firms operating in the Pole. In addition, it is now trying to adopt another strategy to find new clients. If up to now clients were approached in a direct way, more recently the company is trying to join larger partners in order to take part to national and international bids from which it would be excluded because of its small dimension and consequent limited resources.

The location in the area of Pisa has been a decision linked to the personal choices of partners who attended the University in Pisa and there they were already building their personal lives. The presence of other small companies operating in the high-technology field has not represented a reason to locate the company where it is and, also at present, the firm does not perceive any benefits deriving from its location in the area.

The attitude toward the public sector is rather positive and the only "request" is for a more incisive support in the field of training and professional adjournment of employees.

Chapter 5
Discussion and conclusions

1. Introduction

In the previous chapter case studies have been described objectively in order to introduce the seven companies and their stories from the point of view of the interviewees. The interpretation of these "facts", the explanation of the lesson learned and the implications for theory will be discussed in this final chapter. The limited number of cases does not allow any form of generalisation. The conclusions, however, can provide some suggestions which can be useful in building some form of analytical, instead of statistical, generalisation (see chapter 3 on these concepts).

The next section will present a general overview of case studies, whereas section 3 provides a more formal cross-case analysis. Section 4 reconsiders part of the literature on marketing in the light of the analysis of the cases and proposes a model to be statistically tested in a further more quantitative study.

2. The general lesson

MARKETING

The firms described in the empirical part of this work are small or very small high-technology companies. The number of people working in these organisations (including those at the managerial level) never exceeds 30 units but two of them consist of only 3 units, and their market is mainly national. Notwithstanding their size, these firms develop very complex high-technology products and have highly sophisticated technical competencies. As also suggested by the literature on high-technology, and especially by that related to small firms operating in high-technology sectors, these engineering capabilities are often not associated with an appropriate managerial and marketing background: even when their organisation chart presents a commercial or marketing

division, the activities carried out by these departments are rather limited and mainly related to communication and sales.

What was somehow unexpected, was the idea that most of these firms have about marketing. First of all, the interviewees recognise the limits of their firms in this field and they are convinced that marketing is the missing element which hinders their capacity to grow. For example, the president of company 7 claims that, in order for the company to grow further, it is necessary to have "a more professional approach to strategies to access the market and to promote the company". Second, notwithstanding the technical or engineering background of all the interviewees and of most of the people working in these companies, their conceptualisation of marketing is rather elaborate. Whereas communication and sales are the first operational activities they are concerned with, they consider marketing a strategic function which provides a broader outlook on the environment which complements the technical aspects of business activities. The president of company 2 associates the term "understanding" with the idea of marketing and the words of the CEO of company 1 are emblematic in this respect:

> "... marketing for us is business development (...) What really creates value added is understanding the needs of the client, where it [the client] is, where it is looking, where and what the offer is and then being able to solve its [the client] problems and to offer the solution. "

The question that arises at this point is: "Why have these firms not developed a marketing strategy yet?". The answers can be grouped into three categories:

- lack of general resources (including time);
- lack of human resources, that is, lack of people with both the technical and marketing/managerial capabilities necessary in the field of high-technology;
- stage of development, of both the firm and the market, which forces companies to still devote more attention to other activities.

RELATIONSHIPS WITH CLIENTS

An important element of the strategies of the companies is to build relationships with clients. Some considerations, however, are needed on this point. Generally speaking, the variety of applications of a technology and the high level of personalisation it allows, makes it almost inevitable for these firms to frequently interact with their clients.

Moreover, companies are aware that building relationships with their clients has at least two main effects: on the one hand, they acquire loyal customers which are a source of revenues and, therefore profits; on the other hand, clients can be an important source of ideas for new products. Of course, this is not always the case. As also explained in the literature review presented in chapter 2, companies have to choose the customers with whom they intend to interact on a more regular basis. The classification of clients proposed by the president of company 2 may be useful in this sense: there are clients that only require a turn-key solution which could be already pre-packaged by the supplier; there are those that provide strict specifics to the producer and this implies some level of interaction between the client and supplier; the third type of client develops its requirements with the supplier and is open to an interactive process of co-development with the latter. It is especially this third kind of clients which has an open attitude, which is capable of transforming a simple exchange of specifics, requirements and adaptations into a relationship that benefits both parties involved in terms of joint improvement and growth.

In some of the cases presented, the possibility to develop the close relationships described above is limited. For example, company 3 recognises the importance of relationships based on trust with its clients for the consulting activities, but, with respect to its emerging manufacturing production, it has a significant relationship only with the commercial partner which represents its link with the market. Company 4 has mainly final customers which ask for the company's services only once: if it is true that the firm gains experience from each project it develops, it is not possible to properly "learn" from these clients[1]. Company 5 is an exception in this respect. It is forced to interact with its clients in order to personalise the offer (which is the main source of its competitive advantage), but it would avoid these interactions because they require time and may result in a higher workload than desired.

An element which seems to join all these firms with respect to relationships with clients is that they perceive the creation of these exchanges as "normal". In the case of company 7, the creation of long-term relationships at the beginning happened by chance: it was in a later (and more stable) phase of its development that these relationships were searched for because of the recognition of their importance. Apart from this case, building

[1] On the contrary, it is more likely that more interesting relationships could be built with architects, engineers and other more knowledgeable people which deal directly with the final customer of that company.

relationships with clients is not the result of a specific strategy, but represents the "normal" way to do business in these companies.

LOCATIONAL AND POLICY DIMENSIONS

Even though the locational and policy dimensions are subjects less directly linked to the main topic of this thesis, that is, marketing in high-technology contexts, a number of interesting points emerged from the interviews.

As regards the choice of location, these firms where established in Pisa and its surroundings mainly for personal reasons: usually founders were born or studied in Pisa and there they started their personal projects. The dynamics linked to the presence of many small firms operating in various high-technology sectors, not only has not represented, for founders, a reason for locating their companies in and around Pisa, but they do not perceive any benefit deriving from this concentration of firms, often described as a cluster.

Concerning the policy dimension, most of the key informants of interviewed firms do not believe in the capacity of policy-makers to concretely promote initiatives useful for the high-technology sector and there is a general sense of mistrust. An interesting point which emerged is that, when asked which specific initiatives they would considered effective for their companies, the answers provided by the interviewees were mainly twofold: on the one hand, they asked for easier access to funds; on the other hand they considered important the development of initiatives able to transform the agglomeration of high-technology firms in the area of Pisa into a "real" cluster, with more opportunities for interaction and with the provision of more services including training and consulting regarding managerial and marketing issues. Usually, the first answer was provided by the firms that are in an earlier phase of development, while the second was mentioned by larger and more stable firms.

3. A deeper analysis

The analysis presented in this section is an attempt to find common characteristics among the firms which were part of the case study: while the previous section provided a general overview, this section will offer a more formal cross-section comparison of cases.

The starting point is linked to the main topic of this work: marketing. If it is true that marketing in these firms is strongly underdeveloped, their managers perceive this problem and the same concept of marketing in different ways. From this point of view, two groups of companies can be identified depending on whether their managerial team[2] perceives the need or not to further and more formally develop marketing in the firm. The companies perceiving this need, Group A, are firms 1, 2,6, and 7. The other three firms (3, 4, and 5), which form Group B, do not consider the development of marketing as crucial, at least in this phase of their development. The reasons they mention for not being interesting in marketing are, however, different. Company 3 is in a phase of restructuring and is moving from being only a consulting company to become a manufacturing firm: at present it does not have the necessary resources to invest in marketing. Company 4 operates in a market which is still rather new and in which supply exceeds demand: what is needed is a further development of the market in order to justify more investments in marketing. Company 5 seems not to have any interest in developing its marketing capabilities essentially because this could lead to an increase of demand which it would not be able to satisfy. Table 5.1 shows the repartition of the companies om Group A and B.

Table 5.1 – Firms grouped according to their attitude toward marketing

Group A	Group B
Need to further develop marketing activities	*A further development of marketing is, at present, not a priority*
Firms: 1 2 6 7	Firms: 3 4 5

The analysis presented in the next pages is based on the following question: "Are there any other aspects that the firms in the two groups have in common?". What is searched for are factors characteristic for the firms of one group (or at least for the majority of them) but not the companies in the other group, that is, elements able to distinguish between the two groups[3].

[2] The term managerial team is used here to refer to the people that have the responsibility of defining the strategy of the company. This term has been chosen because it is sufficiently general and able to encompass terms like CEO, board of directors, president, owner, etc.

[3] It is worth noting that the limited number of firms makes this sort of analysis of a limited value, and the objective is to provide at least some suggestions for further discussion and analysis.

3.1 Cross-case analysis

In order to identify the characteristics able to distinguish between the two groups of firms, both "objective" concepts (linked to size, age, etc.) and other more "subjective" elements were taken into consideration. The latter type of elements are subjective in the sense that they are not linked to numbers, but emerged from the interviews: sometimes there was not an explicit sentence of the key informant referring to that concept which, therefore, was deduced from the interview as whole. The cross case analysis is presented in table 5.2. The boxes related to the various firms, divided by group, contain a tick when the concept expressed is valid for a specific firm. The first row is the point of departure, that is, the element used to distinguish the two groups. The total columns are useful to identify those elements which distinguish the two groups. Even though this approach may not seem very rigorous and although in a few cases deciding whether to tick a box or not was not a straightforward decision, the analysis is useful as it provides a general picture which actually emerged from the case studies.

Table 5.2 – Main characteristics of Group A and Group B

The firm ...	Group A				Total		Group B		
	1	2	6	7	A	B	3	4	5
... feels the need for more structured marketing	√	√	√	√	4	0			
"OBJECTIVE" ELEMENTS									
... had an age of 7 years or more in 2004*		√		√	2	2	√		√
... had 12 people or more working in it in 2004*	√	√		√	3	0			
... had sales in 2004 higher than the average sales*	√	√		√	3	0			
... had mainly an international market in 2004*	√				1	1			√
"SUBJECTIVE" ELEMENTS									
... has an elaborate marketing approach	√	√	√	√	4	0			
... looks for "learning" bi-directional relationships	√	√	√	√	4	0			
... often transfers knowledge to clients	√	√		√	3	2		√	√
... is in a rather stable phase of development	√	√		√	3	1			√
... operates in a turbulent market	√		√		2	0			
... has a feeling of mistrust towards policy-makers	√				1	2	√		√
... primarily prefers policies related to training, debates and other formative initiatives not necessarily linked to the provision of funds	√	√	√	√	4	0			

*Company 5 provided data only for 2005.

The various elements considered need to be better explained. the quantitative data refer to the end of 2004, with the exception of firm 5. This firm originally was founded in 1993, but it provided data only for 2005 (forecast) because there have been changes in its

organisational structure and the founder re-started his business at the beginning of that year.

The threshold **age** of 7 years is the average age of these companies at the end of 2004 (for firm 5, the age was counted from 1993, year of its first establishment)[4]. **Sales** and the number of **people working in the company** are two indicators of the size of the firms, which, as expected, are somehow correlated (firms with higher sales employ more people). The average sales of the firms for 2004[5] was used, as well the average number of people working in these firms. The information on the **final market** (mainly national or international), was provided by the firms as they filled-in the table inquiring into all the other quantitative data regarding their business.

Concerning the more subjective factors, **elaborate marketing approach** refers to the idea, already expressed above, that many of the interviewed firms consider marketing a fundamental function and not simply a set of operational tools linked to communication and advertising. Therefore, they recognise the complexity and the strategic value of that function. The **"learning" bi-directional relationships** considered in the table are those which firms search not simply for cash flow reasons or for the mere adaptation of products, but are those relationships from which both the firm and its clients learn something and for this same reason they are established. Therefore, this concept does neither encompass those interactions that are somehow inevitable nor those in which the company benefits only in terms of the experience it acquires (e.g., company 4). The idea of the **transfer of knowledge** to the customer derives from the fact that many firms claimed that they often have to explain the product or the technology to the client firm or, in the words of the CEO of company 1, to "create a culture". Company 2 also organises formal training courses when required. In order to establish whether a firm is in a **stable phase of development** or not, the words of key informants in the interview as a whole have been considered. Some firms were pretty much concerned with every-day problems, often linked to delivery time and search for funds: in this case I considered them as still being at an early, and therefore more turbulent, phase of development. As regards the market situation, according to the words of the key informants and to their general description, I considered **turbulent markets** those dealing with state-of-the-art, rapidly

[4] It is important to note that in order to consider as founding date of company 5 the year 2005, the age of all the other firms should be increased by one year and the reference point would be the average age at 2005. The result, however is the same: the average is 7. The only difference would be for company 5 (which would not have a tick in that box), without any significant change in the interpretation of data.
[5] The average sales equals 781.380,69.

changing technologies. For example, whereas for company 1 it is essential to continuously invest in know-how in order not to be out of the market in a couple of months, the president of company 2 claims that they deal with rather mature technologies: "You do not need to be the first of the class". The **feeling of mistrust** towards policy-makers of some companies derives from previous experiences they had with members of public institutions at different levels. The last row of table 5.2 refers to the propensity of firms to prefer **supportive initiatives,** *latu sensu*, in which they can express their concerns and exchange ideas with other companies or with policy makers, to programs more directly linked to the provision of funds.

3.2 Interpretation

In interpreting table 5.2 the leading question is: "What differentiates Group A from Group B?".

Three elements are valid for all the firms in Group A but do not characterise firms in Group B. The first regards their idea about marketing: notwithstanding the engineering or technical background of their founders and of employees, firms in the first group consider marketing as a strategic function that should inspire all the other activities of the firm and should not be relegated to the last phase of the development and production process. Moreover, marketing is not equated with sales and it is not simply considered a set of operational tools useful to advertise the product and to convince the client to buy. The idea of marketing shared by firms in Group B, on the contrary, is more operational and linked to the commercialisation of the product or service.

The second factor is the open attitude of firms in Group A which search for relationships with clients able to enrich the company with new insight and which can provide growth opportunities to both parties involved. These firms consider such relationships as vital for their survival and success, but they cannot be established with all clients. Only with the most knowledgeable clients, those with a more open attitude which reflects their will to interact with a supplier in a bi-directional, reciprocal and constructive way which goes beyond the simple exchange of specific and product adaptation requirements, such relationships are possible. Firms in Group B do develop relationships with their clients, but these are primarily linked to the necessity to personalise the company's offer and to facilitate the commercialisation of the product (for the last case, see company 3).

The last element shared by all the firms in Group A but not by those in Group B is related to the policy dimension. Firms in group A are mainly interested in initiatives able to provide an added value to the high-technology companies operating in the area of Pisa. During the interviews the following suggestions were made: the promotion of workshops or moments in which companies can meet each other and discuss on themes of common interest; the organisation of training courses for employees; the creation of consortia or similar forms of organisation in order for the high-technology sector to become a strong actor in public and political life of the area; the provision of consulting services especially on managerial and marketing topics which represent the main problems for this type of firms.

An element which does not strongly differentiate between the two groups (it is shared by firms 1,2 and 7 in Group A and by firm 5 in Group B), seems, anyway, to be intuitively important: the phase of development of the firm. If the firm has reached a situation of relative stability and is less concerned with everyday problems of looking for more funds or of complying with the delivery time, it could be more capable of developing a broader and more long-term view on the company as a whole, beyond the technicalities of every single phase of the production process.

Two other elements are rather important to distinguish between Group A and Group B: although they are not shared by all the firms in the first group (the exception being company 6 in both cases) they do not characterise any of the firms in Group B. The first of these factors relates to the number of people working in the company: firms in Group A are larger than those in Group B with a number of employees[6] above the mean for the seven firms. The second factor is another indicator of the size of the company and, as expected, confirms the observation made with reference to the number of people working in the company: three out of four companies in Group A shows sales for 2004 above the mean sales for the seven firms and are, therefore, larger than the three firms in Group B. The consideration of these two quantitative factors draws attention to the situation of company 6. It shares with the other firms of Group A many of the "behavioural" elements, but not those more "objective" and mainly related to dimensional measures. It differs from the other firms of this group but still it does not belong to Group B because,

[6] It is worth noting that the term employees is not used in its literal meaning: it refers to the people working in the company, including managers, collaborators, etc.

notwithstanding its small size and "youth", it has already developed an advanced perspective on marketing and a mature attitude towards relationships with clients.

With all the limits linked to the restricted number of companies considered, it can be concluded that firms which are more concerned with a further development of their marketing activities tend to be larger than other firms. Neither age nor the international orientation of companies appears an important element in this respect. Moreover, these firms tend to have rather elaborate and advanced ideas about marketing, which is not reduced to a set of operational tools, they look for bi-directional relationships with clients from which both parties can learn and grow, and, in terms of policy, they are primarily interested in initiatives offering firms opportunities for discussion, consulting with regard to managerial and marketing topics, and the creation of consortia or associations that allow the high-technology sector to be a strong actor in public and institutional debates.

The analysis of the empirical results presented above leads to the reconsideration of part of the literature that has been examined in chapter 2. The part of the literature that more directly relates to the foregoing discussion is that on market orientation: indeed, the fact that some firms do not perform marketing in a formal sense but still interact with the market in ways different from that "prescribed" by the literature, calls for a reconsideration of this literature. This will be the subject of the next section.

4. The two steps of market orientation

4.1 The market orientation framework

The concept of market orientation has been studied extensively in the literature. The main aspects of this approach and the main critiques moved against it have been described in the first chapter of this study.

There is general agreement on the fact that market orientation derives from and is somehow the operational translation of the marketing concept which has its pillars in three basic ideas (Kohli and Jaworski, 1990):

- customer focus;

- coordinated marketing;
- profitability.

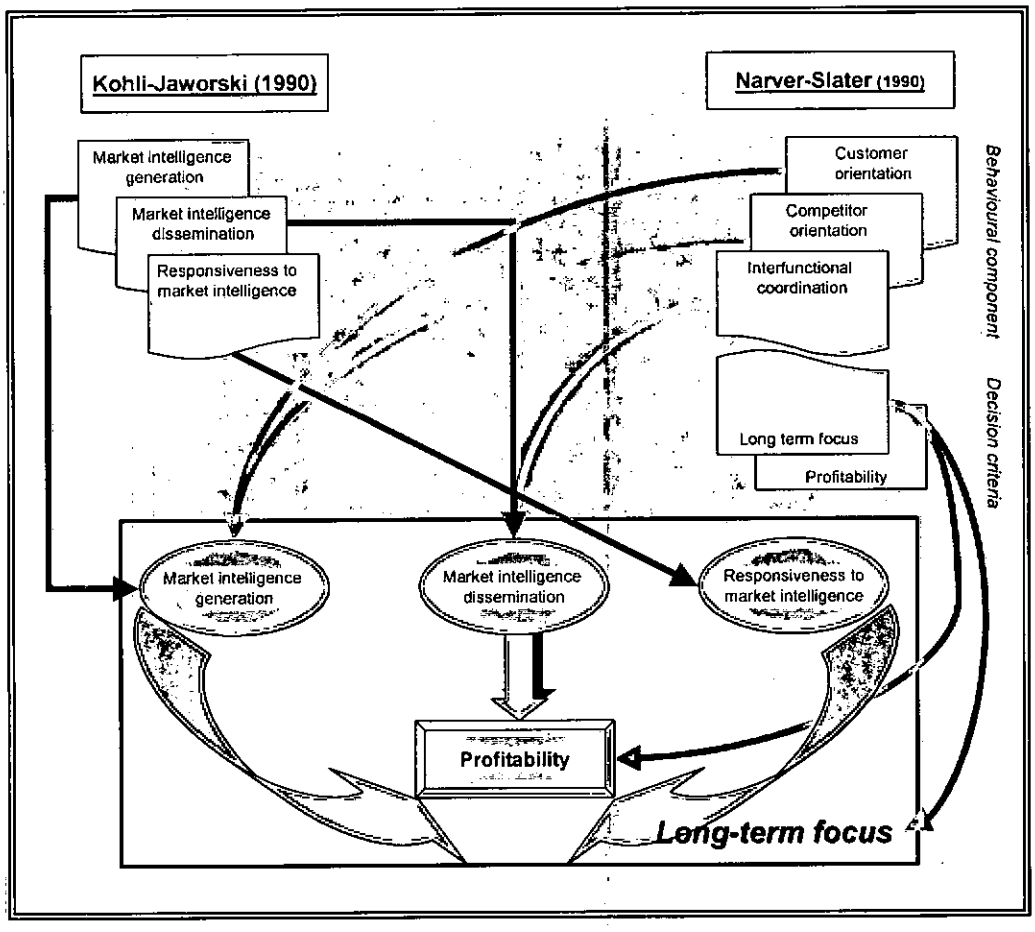
By focusing their attention on either one or the other of these pillars, researches have conceptualised market orientation in different ways: in their study, Lafferty and Hult (2001) have identified five perspectives from which the same concept has been studied. Considering the overlaps of these different perspectives, they have created a framework where market orientation results from the interaction of the following ideas (Lafferty and Hult, 2001):

- an emphasis on customers;
- the importance of shared knowledge and information;
- the role of interfunctional coordination;
- the relevance of responsiveness to market signals.

Lafferty and Hult (2001), moreover, have categorised the various perspectives into two basic approaches: the managerial and the cultural approaches, or, as Langerak (2003) calls them, the behavioural and the cultural approaches. The *behavioural approach* focuses on the identification of the specific actions linked to generating market intelligence, its dissemination within the company and the responsiveness of the organisation as a whole to this information (e.g., Kohli and Jaworski, 1990). The *cultural approach* underlines the importance of a shared organisational culture which places the creation of superior value for the customer at the centre of business activities (e.g., Narver and Slater, 1990).

When interpreting the case studies presented in this research, the conceptualisation of market orientation that will be considered will take into consideration and will somehow integrate the approaches of Kohli and Jaworski (1990) and Narver and Slater (1990). Figure 5.1 describes the way in which these two approaches have been integrated to form the framework.

Figure 5.1 – The market orientation framework used to interpret the results



The market orientation concept used in this study is presented by the white rectangle with green boxes and arrows at the bottom of figure 5.1. The behavioural approach of Kohli and Jaworski (1990) considers market orientation as the "... organizationwide generation, dissemination and responsiveness to market intelligence" (p. 3). The idea of market intelligence has a broader meaning than just customer focus because it encompasses also the exogenous factors that affect customer needs and both the present and future needs of customers. The cultural perspective proposed by Narver and Slater (1990) consists of a behavioural component and two decision criteria. The behavioural component has three dimensions: customer orientation, competitor orientation and interfunctional coordination. The two decision criteria are long term focus and profitability.

The first two behavioural dimensions considered by Narver and Slater can be easily associated with the Kohli and Jaworski's construct of "intelligence generation": this

construct, thus, assumes a broader meaning because it considers not only customers but also competitors. Moreover, as Slater and Narver more explicitly clarify in a later work (1998), not only expressed but also latent needs should be taken into account. The "interfunctional coordination" component can be compared with the concept of "market intelligence dissemination" which refers to the diffusion, beyond the marketing function, of all the relevant information on the market. The two decision criteria proposed by Narver and Slater (1990) are interpreted in a slightly different way. As regards the long-term focus, instead of a decision criteria, is considered here as an attitude of the firm which is usually implicit in its culture. Profitability, on the other hand, is seen as a result of market orientation more than one of its components.

Having described the underlying framework, some points need to be clarified before being able to go ahead with the interpretation of the results of the empirical study,. First of all, in what follows no attempt is made to measure the level of market orientation of firms: instead the concept is used to interpret the relationship between the firm and its market and how this relationship influences its internal activities. Second, the analysis is not normative in absolute terms, in the sense that it is not an attempt to understand whether, in general, it is good or bad to be more or less market oriented (this point refers to the critiques moved against market orientation described in chapter 2). The study is concerned with the search for consistency of market orientation with the various phases of development of the firm. As a consequence, the study does not enter into the debate on the antecedents and consequences of market orientation: in particular, this means that the impact of market orientation on profits is not taken into consideration.

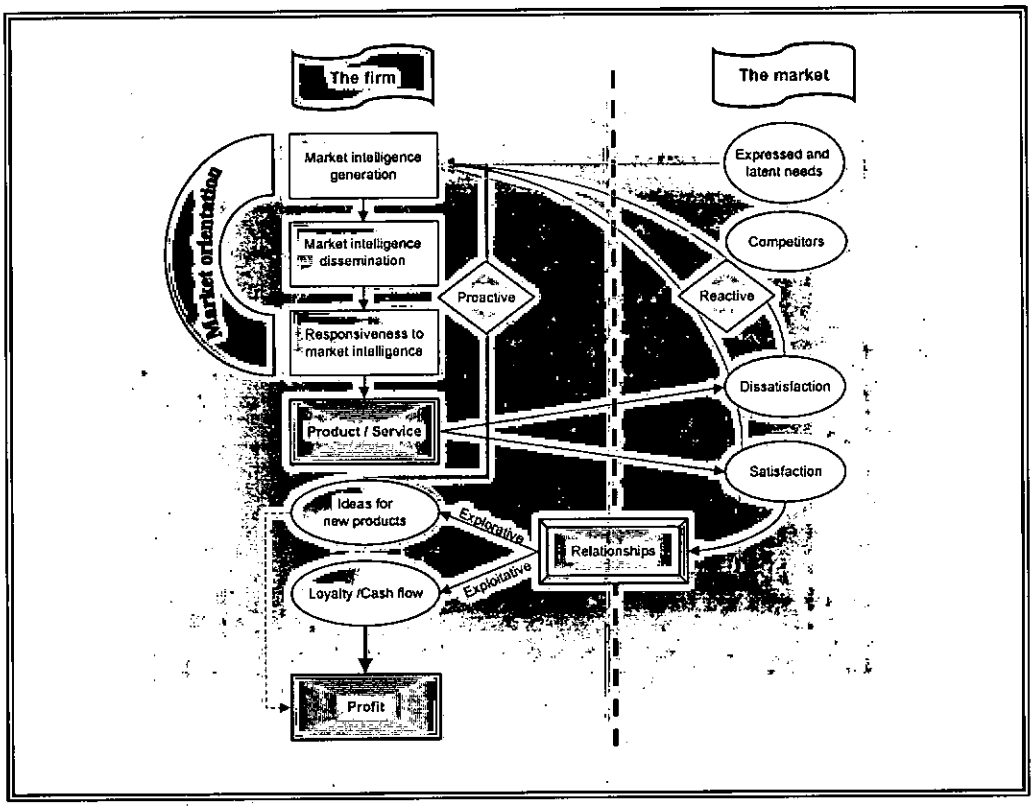
4.2 Market orientation: theory and practice

The marketing concept as a corporate philosophy considers long-term profits as the final objective of the company. To reach this objective, it is crucial to ensure maximum value to customers and marketing has the central role of coordinating all other functions through the communication of customer needs in order for the company to be able to satisfy them (Kohli and Jaworski, 1990).

Market orientation, as already said, provides the operational instruments to apply the marketing concept. Following the literature and the framework described in the previous

sub-section, the process that links the internal activities of a company to its market can be schematically represented as in Figure 5.2 overleaf.

Figure 5.2 – The role of market orientation: the theory



The theory suggests that a market oriented firm, in order to maximise profits, first has to know the expressed and latent needs of its customers. Moreover, to know the market, or to generate an effective market intelligence, means that the company also has to know its competitors, what they do and how they do it in order to decide its positioning in the market and to define its offer. After having largely diffused this information, through the coordination of the various functions, the firm is ready to develop its product or service and to launch it onto the market. Even though it is implicitly assumed that reliable market intelligence should lead the firm to offer what actually satisfies its clients, it may be possible that the latter feel not satisfied. In both cases (satisfaction and dissatisfaction) the firm receives feedback from the market which contributes to enrich the market intelligence *already generated* and to the consequent adjustment of the company's offer.

The long term focus of business activities (see also figure 5.1) leads the company to build long lasting relationships with its clients (Narver and Slater, 1990) (usually the most

satisfied with its offer) to reach at least two main objectives: first, to have loyal customers able to ensure a certain cash flow to the company (and therefore to create profit); second, to obtain, at least from the more knowledgeable customers, ideas for the next generation of products. In the first case the intent of the company is more *exploitative*, in the sense that the firm is searching a source of revenues based on what it is already able to do. In the second case the company's perspective is more *explorative*, because clients are seen as a source of innovative ideas rather than as simple buyers (cfr. March, 1991).

As the term "exploration" suggests, the second type of relationships only indirectly leads to more profits, but, above all, they allow the company to generate *new* market intelligence which represents the starting point for a new generation of products. Therefore, there are two types of feedback the firm receives from the market. The first is within the known domain of the firm's current activities and is related to the level of customer satisfaction. The second feedback is mediated and enriched by the creation of relationships with clients and has the potential to move the company towards new products or services. Whereas the strategy following the first situation is a *reactive* one, the second is more *proactive*.

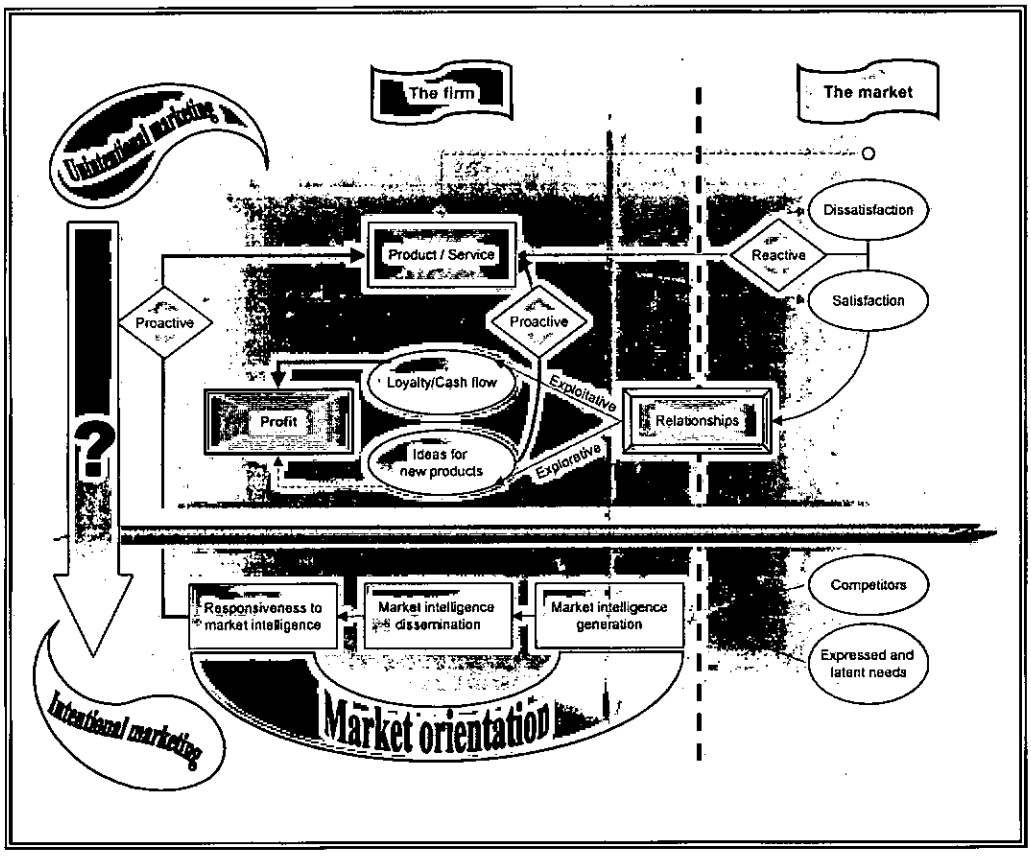
The links between the firm and the market that have been observed in the case studies presented in the previous chapter, however, seem to follow a different path, which is portrayed in Figure 5.3 overleaf.

The history of the firms described in the case studies is the outcome of the initiatives developed by of one ore more technicians who created the company to pursue a project or even a dream. Except for company 2, which was established by people with a long experience in the field built by working for another company, the other six companies started from the product, the service, the innovation or the idea. They did not carried out a systematic study of the market in terms of customers and competitors: on the other hand, they were not completely blind, of course[7], but it was not a clear calculation, related to a formally developed market intelligence, that guided them at the beginning. If this seems like a risky strategy, it has an important advantage over the one "prescribed" by the theory as depicted above (see figure 5.2): the open-mindedness of founders, linked also to their youth and enthusiasm, allowed them to somehow "sense" the environment and, thus,

[7] In figure 5.3, this idea is represented by the small yellow point linked by a dashed line to the product/service box.

to recognise not only the existent market but also to detect other emerging markets. As a consequence they were able to be rather innovative and this is the imaginative human process through which new markets come into existence; indeed as Hamel and Prahalad put it: "New markets are seldom created by some mysterious process of spontaneous generation" (1991, p. 82).

Figure 5.3 – The role of market orientation: the observed pattern



When the product or service is launched onto the market, the company receives feedback in terms of satisfaction or dissatisfaction of clients. According to this feedback, the product is modified and re-launched following an iterative process. This sort of loop between the firm and the market is seldom linear and rarely occurs between two neatly distinct organisations. On the contrary, the feedback interactions very easily evolve towards long lasting relationships, which both ensure a cash flow to the company and provide it with insights and ideas for new products.

There are two interesting aspects in this process. The first, which in many points resembles that presented in the literature, is that, very often, at the beginning, the company and its managers do not explicitly look for such relationships: instead they often are the logical and somehow inevitable consequence of the characteristics of the product and the high level of personalisation high-technology products and services usually allows. The second aspect, is that, even when the firm understands the value that can derive from such superior knowledge of the customer, they are not completely aware of the fact that this *is marketing*, not in a formal and systematic way, but still marketing. In fact, the first answer to questions like: "How do you perform marketing in the company?", or : "What does marketing mean to you?" often was: "We do not do any marketing". However, as the interview continued, key informants described many activities, especially those linked to the interactions with clients, which can be considered forms of marketing. For this reason in figure 5.3 the process above the grey line has been defined as *unintentional marketing*: it is not because managers and employees perform activities without knowing it, but because they do not recognise the importance or relevance of these activities in terms of marketing. Indeed, notwithstanding the technical background of the people working in these companies and the fact that they recognise their limits in the marketing and managerial domains, they almost always have very broad and elaborate ideas of what marketing is or should be and, apart for company 5, they rarely equate it with advertising or sales. For this reason, they see marketing as a function which is almost completely missing or absolutely underdeveloped in their companies and therefore, *at a certain point*, they feel the need to "jump" the grey line and become intentional marketers who systematically analyse their clients (actual and potential), study their competitors and let this information circulate in the company and orient its strategic decisions. In this sense, the process has been interpreted as a **"two-steps approach" to market orientation**: before the formal market orientation described in the literature, there is a phase in which the approach to the market and the relationships between the firm and its clients are more unstructured and intertwined with the other activities of the firm.

The questions that arise at this point is: "When do firms feel the need to move from unintentional to intentional marketing and why?"; "Which factors lead firms to develop a more formal marketing approach?". The empirical work developed in this research does not provide answers to these questions, but may be useful in identifying possible paths which can be the object of further research.

4.3 A model of the two steps of market orientation

Based on the conclusions drawn from the cross-case analysis, this section proposes a set of propositions related to the factors which lead small high-technology firms to move from what I have named *unintentional marketing* to a more mature form of *intentional marketing*. As already pointed out before, the limited number of firms studied is not a strong basis for drawing specific implications, but the criteria used to select them (see chapter 3) make these cases useful in providing interesting and useful insights able to trigger further research on this topic.

In interpreting the empirical results, it has emerged that some elements characterise those firms that feel the necessity to further develop their marketing activities. Among the quantitative elements, there is the size of the firm, measured either in terms of number of people working in the company or in terms of sales. Of course, this consideration is expressed in relative terms: it would be rather difficult, if not impossible, to establish a threshold beyond which firms develop an attitude toward formal marketing, also because there are at least sectoral differences to be taken into account. As a consequence:

> **Proposition 1**: the larger the firm, the more likely it is that its managerial team feels the need to move from unintentional to intentional marketing.

It has been discussed above, that in firms that are in a more stable phase of development, the managerial team is more likely to elaborate a broader and long term view of the company which is not restricted to everyday technical problems nor to the search for funds. This wider view also regards a more mature conceptualisation of marketing which is usually intertwined with other functions, often in a subordinated way. Even though from empirical research the age of the company did not emerge as a significant element to identify firms willing to develop a more formal marketing function, it seems, intuitively, that the stability of the company is somehow related to the age of the business which, after the difficulties of the start-up phase can focus on longer-term projects. Therefore:

> **Proposition 2a**: the more stable the phase of development the firms is undergoing, the more likely it is that its managerial team feels the need to move from unintentional to intentional marketing.

Proposition 2b: the older the firm, the more likely it is that its managerial team feels the need to move from unintentional to intentional marketing[8].

One of the problems often faced by small high-technology companies is their almost exclusive technical orientation. These firms are usually established by young engineers who have an idea or a dream and, in realising it, often neglect the marketing and commercial aspects of their projects. What emerged from the case studies presented in this research, however, is that, notwithstanding their technical background, the managerial team often has a clear idea of what marketing means, how it should be performed and which benefits the firm can obtain as a consequence of its better implementation. Marketing is not reduced to a toolkit to be used in the last phases of the development and production process in order to convince the client to buy: it is a strategic function that should influence all the activities of the company. A managerial team with such an elaborate understanding of marketing is an important factor pushing the firm toward the development of more formal and structured marketing. As a consequence:

Proposition 3: the more elaborated is the idea of marketing of the managerial team, the more likely it is that the firm is pushed to move from unintentional to intentional marketing.

Another characteristic of the firms which are willing to develop a more formal approach to marketing is their active search for bi-directional relationships with clients from which both parties can learn and grow. The versatility of many modern technologies makes interaction between client and supplier almost inevitable at least to adjust the final product or service to the specific requirements of the client. The learning relationships described above, however, go beyond this simple exchange of specifics and reflect an open attitude of the firm t consciously runs the risk of being exploited by the counterpart because it knows that there might be more to gain than to lose. Therefore:

Proposition 4: the more open is the attitude of the managerial team to look for bi-directional learning relationships, the more likely it is that the firm is pushed to move from unintentional to intentional marketing.

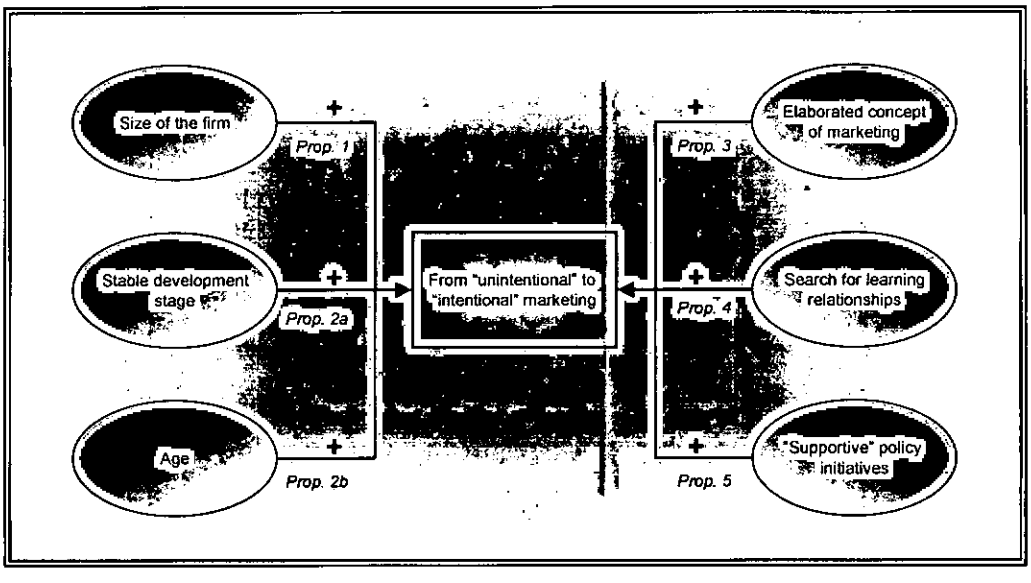
[8] It is also possible, following a different strategy, to use age as a proxy for the stability of the development stage of the firm.

The last proposition takes into consideration the policy dimension. An element common to firms belonging to Group A is the priority which is given to public policies that do not necessarily consist in the provision of funds or similar aids, but have a more supportive content. Key informants of these firms mention as possible valuable initiatives the provision of training courses, the creation of consulting services related to management and marketing, the organisation of workshops or seminars where high-technology firms can discuss common problems and which could result in the creation of consortia or similar organisations that could represent valid partners in the public debate. As a result:

> **Proposition 5**: the more the managerial team prefer supportive public policy initiatives, the more likely it is that the firm is pushed to move from unintentional to intentional marketing.

Figure 5.4 presents a graphic representation of the propositions and the model described above.

Figure 5.4 – A model of the two steps of market orientation



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Appendix A
Interview outline

THE FIRM

History

Activities

Organisation

Products

Clients, markets and competitors

THE MARKETING ACTIVITIES

What does it mean to do marketing in your company?

Which objectives do your marketing activities have? Why do you perform marketing activities?

When does it become important to do marketing: immediately after the creation of the company or in later phases?

Why does it become important to do marketing: which factors or situations push or pushed you to do marketing?

What relevance and role does marketing have in the company life? In which moments do you pose marketing problems?

How do you concretely perform marketing activities'

Organisation

People employed (number, competencies, education)

Main activities

What difficulties do you encounter in performing marketing activities?

How do you evaluate you marketing efforts?

Strengths and weaknesses

Areas in which changes are needed: why? In which direction? How? Have you already started?

Which challenges?

RELATIONSHIPS WITH CLIENTS AND OTHER FIRMS

What kind of relations do you have with your clients? Do you develop deep and long-lasting relationships with clients? What do they consist in?

Why do you engage in such relationships? Which objectives do you pursue in building such relationships (e.g., access resources and/or competencies; product personalisation, co-production, etc.)?

Are these relationships "necessary and inevitable" for the kind of product you produce or are the result of a specific choice and research?

Who are the clients you engage in these relationships with(localisation, relevance, etc.)? How do you choose these clients?

Who does manage these relationships?

Which role and relevance does the client have inside the company? In which phase of the process is the client involved?

What impact do these relationships have on the management of the company?

Do you engage in marketing relationships with other firms?

With which companies (suppliers, competitors…)?

With which objectives and results?

DIMENSION, LOCALISATION AND POLICY ISSUES

Which are the specific difficulties in performing marketing activities that you face because of your small dimension?

What opportunities and advantages are associated with the small dimension?

Why are you localised in the Pisan area? Are there cluster dynamics?

How can public policies help firms in high-technology contexts to be more proactive?

Is there room for collective actions that firms can engage in in relation to marketing problems?

Appendix B

Quantitative information table

	2000	2001	2002	2003	2004	2005 (Prev.)
Capital stock (thousands €)						
Sales (thousands €)						
R&D investments (% of sales)						
Marketing expenditures (% of sales)						
Number of partners						
Number of employees						
Sales repartition (% of sales in each market)	Regional National Global	Regional National Global	Regional National Global	Regional National Global	Regional National Global	Regional National Global
Number of patents	Italy EU US	Italy EU US	Italy EU US	Italy EU US	Italy EU US	Italy EU US